

UTAH BIG GAME RANGE TREND STUDIES 1997 Volume 1



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REPORT FOR FEDERAL AID PROJECT W-135-R-18**

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

**UTAH BIG GAME
RANGE TREND STUDIES
1997 Volume 1**

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Performance Report for Federal Aid Project W-135-R-18

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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 1997 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 or 1989 with rereads in 1989 and 1997.

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

 Pleasant Grove Ranger District

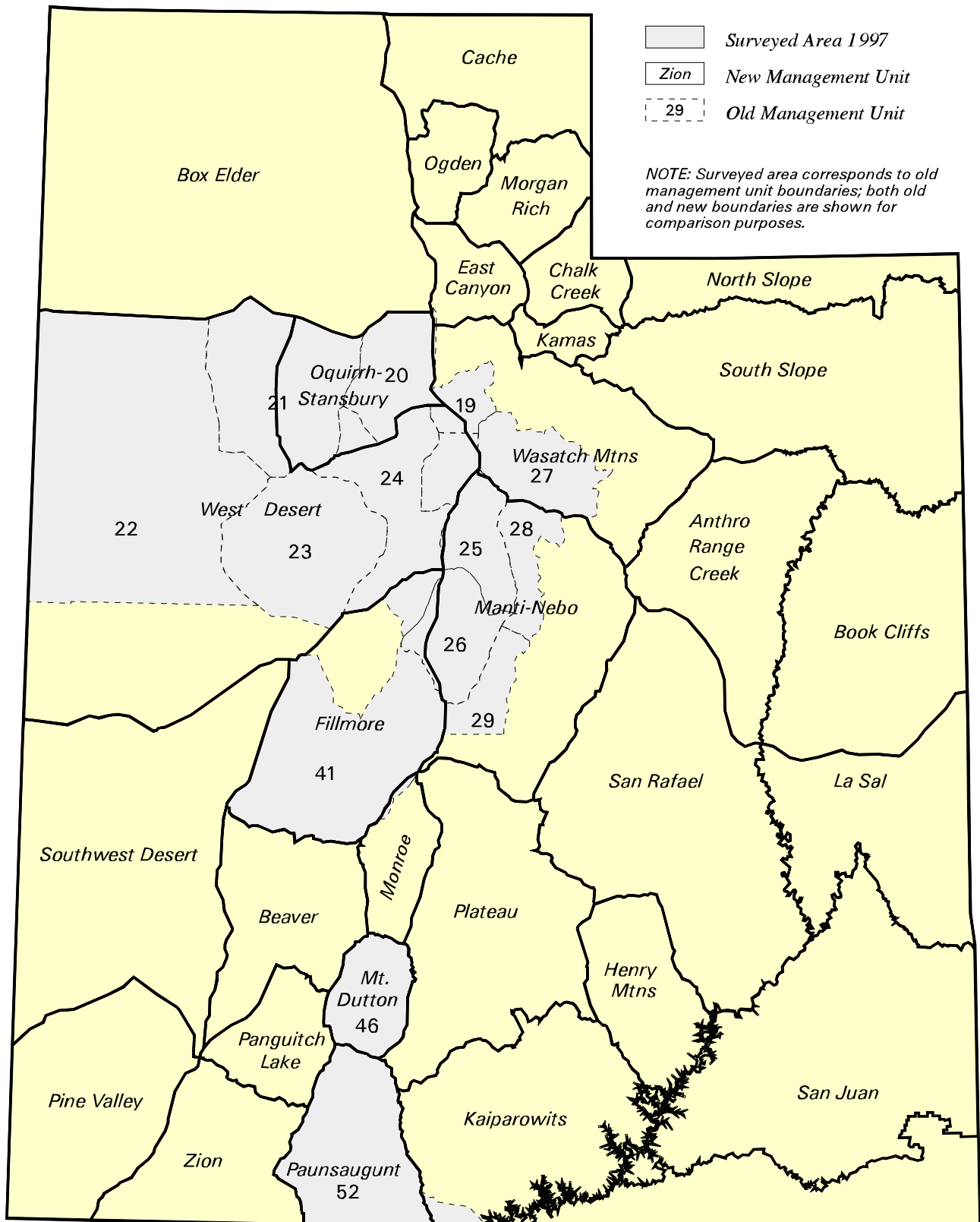
 Spanish Fork Ranger District

Manti-La Sal National Forest

 Sanpete Ranger District

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

Management Units Surveyed in 1997



RANGE TREND STUDY METHODS

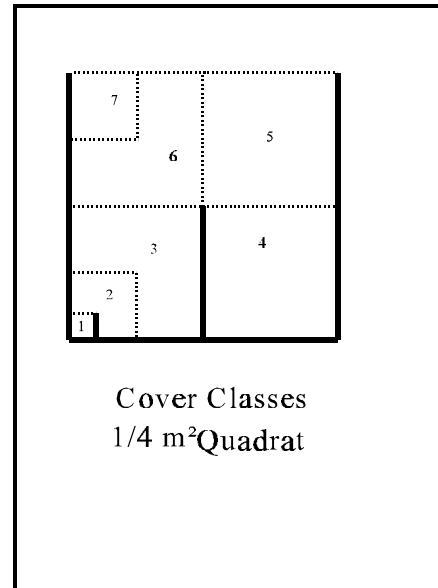
Trend monitoring studies depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetative or habitat types within a unit, it is necessary to concentrate on specific sites and/or "key" 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

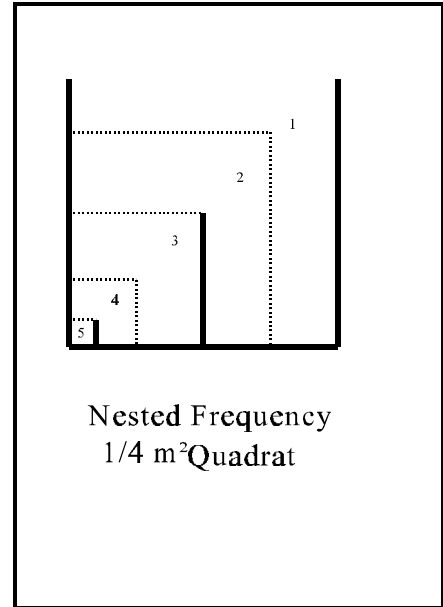
Determining vegetational characteristics for each "key" area is determined by setting up 5 consecutive 100 ft base line transects in the area of interest. This 500 ft line is the baseline and one, 100 ft belt is placed perpendicular to each 100 ft section of the base line at random foot marks and centered on the 50 ft mark. A 1/4 m² 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.

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.



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 (¹U.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 with low numbers. Each 100th acre shrub strip is divided into 20, 5 foot segments. Presence or absence is now determined by these strip segments to give a more accurate measure of shrub frequency. This larger sample will better reflect changing 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 inventory 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 $\alpha = .10$. 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		Quadrat Frequency		Average Cover % '94
		'87	'94	'87	'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	Average Cover %	
		'87	'94
B	Amelanchier utahensis	18	2.25
B	Artemisia tridentata wyomingensis	86	16.28
B	Chrysothamnus viscidiflorus	71	3.62
Total for Browse		175	26.85

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	%OM	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:

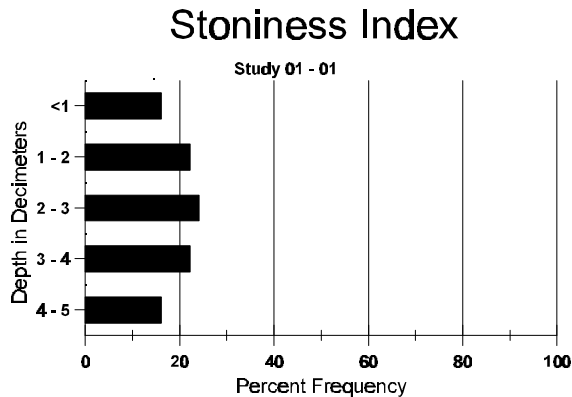
Ultra acid	<3.5
Extremely acid	3.5-4.4
Very strongly acid	4.5-5.0
Strongly acid	5.1-5.5
Moderately acid	5.6-6.0
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Slightly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
Very strongly alkaline	>9.1

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 use patterns on the site.

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

Type	Quadrat Frequency '94
Rabbit	44
Elk	28
Deer	14

It was determined that we needed additional information on pellet-groups. Therefore, a much larger sample distributed over a larger area is now read in conjunction with the vegetative transects. The pellet-group transect has a minimum of 50, 100ft² circular plots which are placed through the area. These are usually two parallel transects of 25 plots on each side of the vegetative trend transect. The number of recent pellet-groups for wildlife (usually deer and elk) and pats for cattle are recorded. That number is then converted to days use per acre. If more precision is required, the transect is marked permanently and the pellet groups within the circular plots are removed or marked.

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	-	-	-	-	-	-	-	-	-	940		47	
Y	87	2	1	1	-	-	-	-	-	-	-	-	-	266		4		
	94	10	-	-	-	-	-	-	-	-	-	-	-	200		10		
M	87	20	15	3	-	-	-	-	-	-	-	-	-	2533	13	17	38	
	94	96	26	3	4	-	-	-	-	-	-	-	-	2580	18	32	129	
D	87	2	4	-	-	-	-	-	-	-	-	-	-	400		6		
	94	94	4	2	1	-	-	-	-	-	-	-	-	2020		101		
X	87	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	94	-	-	-	-	-	-	-	-	-	-	-	-	120		6		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'87		42%			08%			02%			+33%							
'94		13%			02%			10%										
Total Plants/Acre (excluding Dead & Seedlings)												'87	3199	Dec:	13%			
												'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 (²U.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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¹U.S. Department of Interior Bureau of Land Management. 1996. Utilization Studies and Residual Measurements, Interagency Technical Reference, BLM/RS/ST-96/004+1730.

²U.S. Department of Interior Bureau of Land Management. 1996. Sampling vegetation attributes, Interagency Technical Reference, BLM/RS/ST-96/002+1730.

Welsh, S. L., N.D. Atwood, S. Goodrich and L. C. Higgins. 1987. A Utah Flora. Great Basin Naturalist Memoirs No. 9. Brigham Young University. 894 pp.

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.

WILDLIFE MANAGEMENT UNIT - 16 - MANTI-NEBO

Boundary Description

Utah, Carbon, Emery, Juab, Sevier and Sanpete counties - Boundary begins at the junction of US-6 and I-15 in Spanish Fork; southeast on US-6 to Price and SR-10; south on SR-10 to I-70; west on I-70 to US-89; north on US-89 to SR-28 at Gunnison; north on SR-28 to I-15 at Nephi; north on I-15 to US-6 in Spanish Fork and beginning point.











This new management unit boundary is now made up of portions or whole herd units of seven old herd units. These old herd units include all of 28-NW Manti, 29-SW Manti, 30-NE Manti, 31-SE Manti, and portions of 25-North Nebo (now divided between management units 16 and 19), 26-South Nebo (now divided between new management units 16 and 21), and 42-Salina (also divided between new management units 16 and 25). The Manti-Nebo wildlife management unit incorporates a total area of almost 2,250,000 acres. For deer, 47% is winter range, 46% summer range, and 7% is considered yearlong range. The majority of the summer range is on the U.S. Forest lands (72%), while as much as 35% of the winter range is on private lands. For elk, 36% is winter range, 40% summer range, and 24% is classified as yearlong range. Here again the majority of the summer range is on U.S. Forest lands (78%), while as much as 28% of the winter range is on private lands. The one aspect of elk range that could emerge as a problem is that 64% of the yearlong range is on private property. This unit has been subdivided into 3 subunits, 16A - Nebo, 16B - Manti North, and 16C - Manti South. Each subunit will be discussed separately in this report.

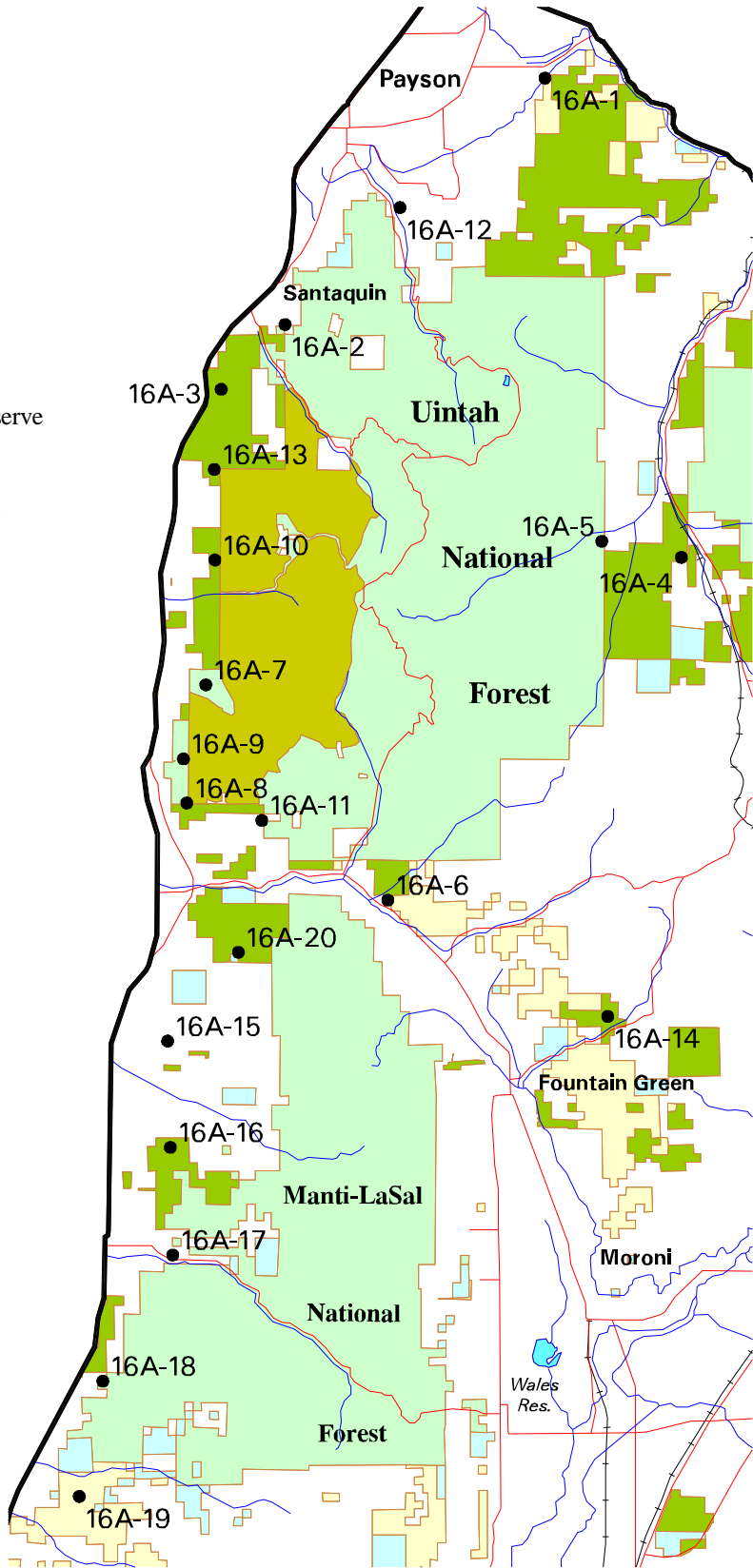
For the sake of adding simplicity to the discussion of range trends, the new and much larger management unit has been divided into three smaller subunits (16A, 16B, and 16C). However, subdividing the large wildlife management unit does not overcome the problem of size and the logistics of travel because the western portion of the unit is in the Central Region and the eastern part of the unit is in the Southeast Region. With the state-wide range trend program on a five year rotation, that would mean that after the Central Region was read during the summer of 1997, the Southeastern Region's side of wildlife management unit 16 would not be read until two years later in 1999. For that reason, the discussion of trends for this wildlife management unit will be divided between the two regions into two different yearly reports because of the logistics and time involved in moving base camps and the short field season prohibits traveling back and forth across the plateau.

The Manti-Nebo Wildlife Management Unit incorporates approximately 1,033,643 acres of deer summer range and 1,063,573 acres of winter range. Summer range primarily occurs within the U.S. Forest Service boundary but 35% of the winter range on the unit is private land. Elk range numbers approximately 854,237 acres of summer range and 786,463 acres of winter range. Unit management goals for deer are to achieve a target population size of 60,600 deer, 38,000 wintering deer on the Wasatch Plateau or Manti Mountain portion of the unit and 22,600 on the Nebo portion. The management objective for post season buck to doe ratio is 15 to 100 with 30% of these bucks being three point or better. The target winter herd size for elk on the unit is 1,000 for the North Nebo area and 12,000 for the Wasatch plateau. Management objectives for the herd composition are to attain a minimum bull to cow ratio of 8 bulls to 100 cows with a minimum of 4 mature bulls to 100 cows.

Management Unit 16A

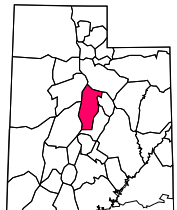
Legend

-  Forest Service
-  BLM
-  State of Utah
-  Private Land
-  Wilderness Area
-  State Wildlife Reserve
-  Water Body
-  Transect Location
-  Road
-  Water Course



Map Scale 1:348,480 (1" = 5.5 mi)

Unit Location



WILDLIFE MANAGEMENT UNIT - 16 - MANTI-NEBO

WILDLIFE MANAGEMENT SUBUNIT - 16A - NEBO

Boundary Description

Utah, Juab, Millard and Sanpete counties - Boundary begins at the junction of Interstate 15 and Highway US-6 in Spanish Fork; southeast on US-6 to Highway US-89 at Thistle junction; south on US-89 to Gunnison and Highway SR-28; north along SR-28 to Interstate 15 at Nephi; north along I-15 to US-6 in Spanish Fork.

INTRODUCTION

The Manti-Nebo management unit incorporates most of the old North and South Nebo deer herd units.

The old North Nebo deer herd unit included about 490,240 acres. Physiographically, the unit was dominated by high mountains such as Santaquin Peak, Bald Mountain, and Mount Nebo. Mount Nebo represents the southernmost extension of the Wasatch Range. These mountains constitute the heart of a diverse and productive summer range making up about 29% of the deer herd unit. Normal winter range makes up about 32% of the area. The Mount Nebo summer range has a long history of high hunting success and depredation problems, a growing elk herd and limited winter range.

The principal limiting factor and management concern on the unit is the lack of good condition winter range, especially severe range on the west side of the unit. In this area, from Spanish Fork Canyon south to Nephi, the normal winter range averages 2 miles or less in width. Severe winter range is even more narrow, ranging from as narrow as a few hundred yards, up to one and one-half miles. Total severe winter range accounts for only about 12% of the area. However, the winter range on the east and south sides of the unit is more expansive, but not nearly as critical. Some of the major problems related to the limited winter range, especially low elevation severe winter range on the unit include; restricted access to traditional wintering areas west of I-15, predominately private ownership of critical ranges (63% of normal winter range) and agricultural depredation. To remedy the situation, the Division of Wildlife Resources has acquired approximately 12,800 acres of winter range in the unit (7% of winter range) and has attempted treatments and rehabilitation in these critical areas. The Nebo unit remains on the list of top deer herd units requiring winter habitat revegetation action. The available winter range, especially critical areas on the west side of the unit, remains threatened by development, mismanagement and a high fire hazard from cheatgrass.

The key areas identified and sampled with 11 trend studies in 1983 are still priority areas. Three new studies were added in 1989. A majority of the studies are on Division land. However, much of the critical range is under private ownership and was not sampled due to restricted access and limited management opportunities. The 11 permanently marked trend studies originally read in early August 1983 were reread in mid-July of the drier year of 1989 and then again in late May of 1997. All sample big game winter range areas, although many sites had some evidence of summer deer occupancy. The studies range in elevation from 5,000 feet to higher elevation sites (about 6,500 feet) in Rees Flat and Big Hollow. The prominent winter range vegetation types that were sampled include: mixed oak/big sagebrush, sagebrush/grass, mixed mountain brush, bitterbrush and cliffrose.

The San Pitch Mountains make up the majority of the old South Nebo herd unit (#26). This low mountain range contains all of the summer range on the unit, 40% of the area. The surrounding foothills and western slopes provide winter range which makes up the remaining 60% of the range. The upper limit of the winter range approximately follows the 7,000 foot contour, but extends to 8,000 feet on the south exposure in canyons on the

west side of the unit. Twenty-five percent of the winter range was classified as severe winter range in the 1976 range inventory. The upper limit of severe winter range is 6,000 feet, while the lower limit (5,200 feet) of the winter range is restricted by highways, reservoirs, agriculture, and small communities.

In 1983, four of the permanent range trend studies were established on severe winter range. Their elevation ranged from 5,520 to 6,000 feet. Two chained areas were also sampled. One study is in a cliffrose type, the other in a mixed mountain brush community. These studies were initially read in mid-August 1983. They were reread in mid-July 1989, then again in late May and early June of 1997. Three new trend studies were established in 1989 and reread in 1997.

The Division has acquired several parcels of land, totaling 7,200 acres or 5% of the winter range. Further habitat acquisition and rehabilitation are necessary to adequately maintain the winter range. This unit has been put on the list of most important deer herd units for future winter range land purchases.

Trend Study 16A-1-97

Study site name: Strawberry Highline Canal .

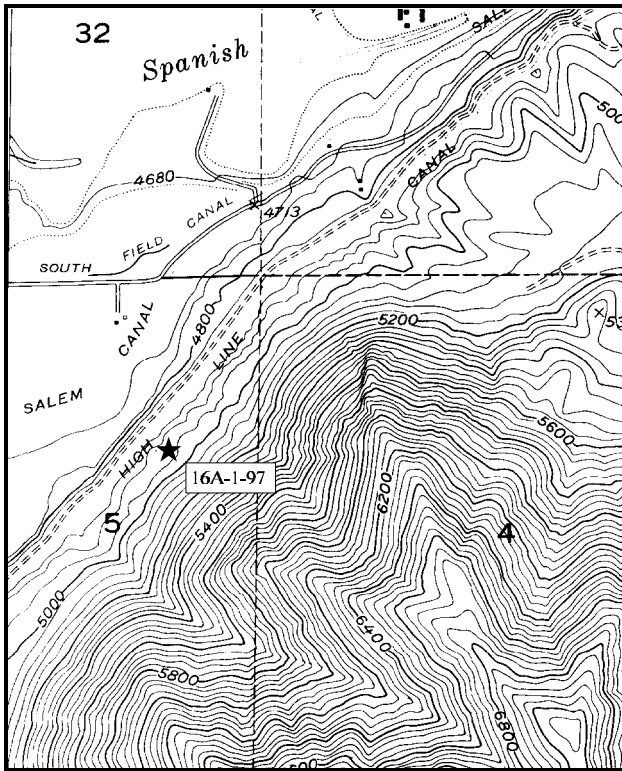
Range type: Mixed Oak - Sage

Compass bearing: frequency baseline 180 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11,34,59,71 & 95ft).

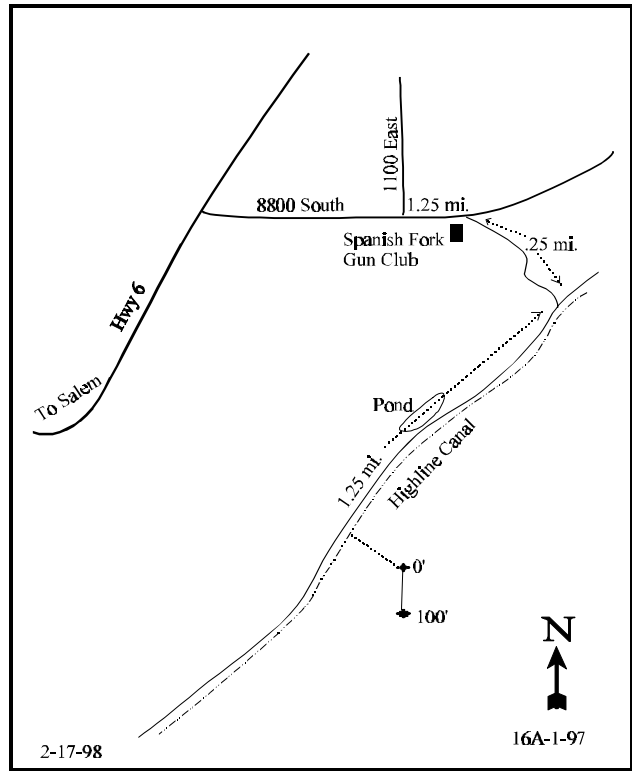
LOCATION DESCRIPTION

Beginning at the intersection of 8800 South and 1150 East (north of Salem), proceed east on 8800 South for 1.25 miles to an intersection near the Spanish Fork Gun Club. Turn right (i.e., south) at the intersection and proceed 0.25 miles to the High Line Canal Road. Turn right onto the High Line Canal Road and proceed southwest for 1.25 miles. From the road, walk 54 paces at an azimuth of 114 degrees true, to the O-foot baseline stake. You must cross the canal at this point. This azimuth is from the northernmost tower in the orchard located immediately to the west. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Spanish Fork Peak, Utah .

Township 9 S , Range 3 E , Section 5



Diagrammatic Sketch

UTM 4435113.234 N, 447136.964 E

DISCUSSION

Trend Study No. 16A-1 (25-1)

The Strawberry Highline Canal study is located within critical deer winter range just above the canal, approximately 2½ miles southwest of Spanish Fork Canyon. The area sampled is a mixed Gambel oak and mountain big sagebrush community with a sparse grass-forb understory. The herbaceous understory makes up only 29% of the total vegetative cover. The study site is located on the upper Lake Bonneville terrace at an elevation of approximately 5,000 feet. Slope is about 10% to 15%. Judging from the levels of use of the principle browse and the number of pellet groups observed in 1983 and 1989, the area received limited deer use. During the 1997 reading, only one deer pellet group was encountered and use of the sagebrush was light. Oak clones are becoming more dense and reducing the size of the sagebrush openings. Due to a lack of sagebrush openings to sample, all five belts were left on the original baseline instead of lengthening the baseline to 400 feet (see methods). This appears to be a poor site that will likely be dropped from the list in the future.

Soil at the site is deep and well drained with an effective rooting depth (see methods) estimated at 21 inches. It is derived from lacustrine deposits from Lake Bonneville. Small sized gravel pavement is common on the soil surface and throughout the profile. Soil texture is a loam with a neutral pH of 6.9. Although the slope is relatively gentle, the erosion hazard is severe. During the 1983 reading, there was abundant evidence of ongoing soil loss at the site. Soil pedestalling was common that year and erosion channels and gullies were present. Currently, soil erosion does not seem serious with little bare soil (8%). However, herbaceous cover is limited with grasses and forbs combining to produce only 12% cover.

Browse composition is dominated by Gambel oak, interspersed with numerous small mountain big sagebrush openings. Gambel oak dominates the site by providing 71% of the browse cover. It appears to be an expanding population with high numbers of sprouts and young plants. Its density has steadily increased from 3,299 stems/acre in 1983, to 4,432 in 1989, and 6,120 by 1996. Oak appears not to be utilized and in good vigor. Insect infestations reduced the vigor on 59% of the oak in 1983. The more preferred mountain big sagebrush has remained at a fairly constant density of around 2,000 plants/acre despite high numbers of seedling and young plants. Utilization is light and vigor normal on most plants. Percent decadency has declined from a high of 35% in 1989 to 17% in 1996. However, 76% of the decadent plants sampled in 1996, were classified as dying. Young plants are abundant enough to replace decadent, dying plants.

Broom snakeweed is also found on the site in moderate numbers. The population density peaked in 1989 when the population was estimated at 5,332 plants/acre. It has since declined by 50% to 2,640 plants/acre. Age class analysis indicates a dynamic population with an extraordinary number of seedlings (5,840 seedlings/acre) and a high proportion of young plants (36%).

The herbaceous understory is somewhat depleted, especially in the sagebrush openings. These areas are dominated by bluebunch wheatgrass, Kentucky bluegrass and Beckwith milkvetch. Annual grasses are also fairly common. The understory plants associated with Gambel oak are generally of better quality and more numerous.

1983 APPARENT TREND ASSESSMENT

Soil is stable to declining. Ground cover is highly variable and noticeable erosion is occurring. This is especially evident in the big sagebrush openings where annual grasses are more prevalent. Indicators of vegetative trend suggest that Gambel oak is slowly thickening and probably encroaching into openings. This trend, if it continues, will gradually eliminate the mosaic-like nature of the area resulting in detrimental effects

on big game habitat. Management objectives should encourage development and maintenance of healthy big sagebrush-grass forb communities in the oak openings.

1989 TREND ASSESSMENT

The soil trend appears stable with similar ground cover characteristics. There is little evidence of current soil erosion, although the erosion hazard is severe on this soil type. Trend for sagebrush is currently stable. Photo and data comparisons indicate improved production and recruitment in the big sagebrush component. However, population density remained similar with percent decadency increasing from 29% to 35%. Hedging remains light to moderate and canopy cover averages 8%. Gambel oak has increased 26% while broom snakeweed increased 76%. The understory in the sagebrush openings remains in a depleted condition, but there was less cheatgrass and a few more perennial grasses and forbs observed in 1989 indicating a slightly improving trend.

TREND ASSESSMENT

soil - stable

browse - stable, but density of broom snakeweed should be closely watched

herbaceous understory - up slightly, but still poor

1997 TREND ASSESSMENT

The soil trend appears stable with a slight decline in percent bare soil as well as a minor decline in percent litter cover. Erosion is limited by the gentle terrain and the thick oak clones. Trend for sagebrush is also stable with a similar population density compared to the 1989 estimate. Percent decadence declined from 35% to 17% with 76% of these appearing to be dying. Use remains light. Oak continues to increase, while the density of broom snakeweed declined by 50%. Trend for the herbaceous understory is stable. Annual grasses are common accounting for 31% of the grass cover.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - stable, but still poor

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 1

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	a ₆₄	b ₁₁₀	b ₉₇	25	42	36	2.60
G	Bromus spp. (a)	-	-	55	-	-	16	.62
G	Bromus tectorum (a)	-	-	91	-	-	27	.88
G	Festuca myuros (a)	-	-	29	-	-	13	.06
G	Koeleria cristata	-	-	3	-	-	1	.03
G	Poa bulbosa	a ⁻	a ⁻	b ₁₅	-	-	8	.31
G	Poa pratensis	a ₁₆	a ₃	b ₃₉	5	2	11	2.20
G	Poa secunda	b ₆₆	b ₅₉	a ₃₁	27	24	13	.36

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Unknown grass - annual (a)	-	-	173	-	-	54	1.53
Total for Grasses		146	172	478	57	68	163	8.00
F	Agoseris glauca	1	-	3	1	-	1	.00
F	Alyssum alyssoides (a)	-	-	79	-	-	29	.27
F	Allium spp.	2	-	-	2	-	-	-
F	Arabis spp.	1	1	2	1	1	1	.00
F	Astragalus beckwithii	a-	a-	b10	-	-	5	1.35
F	Aster chilensis	5	8	8	2	4	3	.44
F	Balsamorhiza sagittata	-	-	5	-	-	3	.43
F	Calochortus nuttallii	-	3	2	-	1	1	.00
F	Comandra pallida	3	-	-	1	-	-	-
F	Draba spp. (a)	-	-	8	-	-	3	.01
F	Epilobium paniculatum (a)	-	-	54	-	-	19	.09
F	Erigeron divergens	1	-	-	1	-	-	-
F	Eriogonum umbellatum	18	30	21	8	13	9	.20
F	Galium aparine (a)	-	-	39	-	-	18	.23
F	Gilia spp. (a)	-	-	2	-	-	1	.00
F	Hedysarum boreale	ab12	b14	a3	6	6	1	.15
F	Lactuca serriola	-	3	5	-	1	3	.01
F	Lygodesmia grandiflora	-	-	3	-	-	1	.03
F	Phlox longifolia	a-	b20	b30	-	10	12	.13
F	Polygonum douglasii (a)	-	-	12	-	-	5	.02
F	Ranunculus testiculatus (a)	-	-	32	-	-	11	.51
F	Sphaeralcea coccinea	13	18	24	5	6	10	.22
F	Stephanomeria exigua	1	-	-	1	-	-	-
F	Tragopogon dubius	a3	a-	b8	1	-	6	.08
F	Unknown forb-perennial	-	1	3	-	1	1	.00
F	Wyethia amplexicaulis	a3	b11	a-	2	4	-	-
F	Zigadenus paniculatus	a-	b8	b16	-	4	7	.06
Total for Forbs		63	117	369	31	51	150	4.31

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 1

Type	Species	Strip Frequency '97	Average Cover % '97
B	Acer grandidentatum	3	.56
B	Artemisia tridentata vaseyana	48	5.82
B	Gutierrezia sarothrae	36	2.38
B	Quercus gambelii	54	21.22
Total for Browse		141	30.00

BASIC COVER --

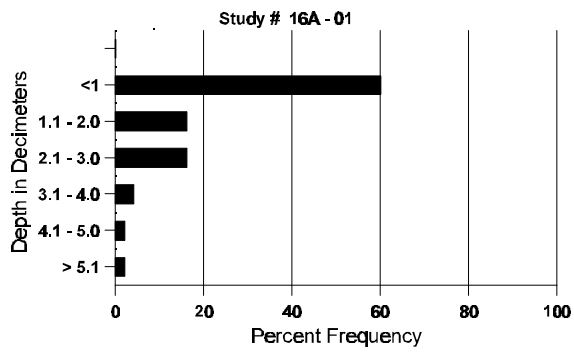
Herd unit 16A , Study no: 1

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	328	1.75	4.50	40.80
Rock	98	2.50	1.75	2.99
Pavement	160	14.50	17.75	13.00
Litter	399	68.00	65.75	63.84
Cryptogams	22	3.50	0	.10
Bare Ground	145	9.75	10.25	7.99

SOIL ANALYSIS DATA --
 Herd Unit 16A, Study no: 01

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
21.0	51.5 (17.7)	6.9	48.4	29.1	22.6	1.5	11.4	105.6	.6

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16A , Study no: 1

Type	Quadrat Frequency '97
Rabbit	1
Deer	1

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 1

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Acer grandidentatum																		
S	83	4	-	-	-	-	-	-	-	-	-	4	-	-	133		4	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	-	-	1	-	-	5	-	-	-	8	-	-	266		8	
	97	-	-	-	1	-	-	2	-	-	-	3	-	-	60		3	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	1	-	-	-	-	-	1	-	-	20	87	63	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Appeared							
'89		00%			00%			00%			-70%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	266		-				
											'97	80		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total									
		1	2	3	4												
Artemisia tridentata vaseyana																	
S	83	1	-	-	-	-	-	-	1	-	-	-	33		1		
	89	122	-	-	25	-	-	15	-	-	-	-	5400		162		
	97	7	-	-	-	-	-	-	-	-	-	-	140		7		
Y	83	11	-	-	-	-	-	-	-	-	-	-	366		11		
	89	14	-	-	1	-	-	1	-	-	-	-	533		16		
	97	26	-	-	1	-	-	-	-	-	-	-	540		27		
M	83	22	10	-	-	-	-	-	-	-	-	-	1066	14 25	32		
	89	24	3	-	1	-	-	-	-	-	-	-	933	21 35	28		
	97	51	5	-	-	-	-	-	-	-	-	-	1120	24 34	56		
D	83	12	6	-	-	-	-	-	-	-	-	-	600		18		
	89	16	2	-	3	-	-	3	-	-	-	-	800		24		
	97	14	1	-	1	-	-	-	1	-	-	-	340		17		
X	83	-	-	-	-	-	-	-	-	-	-	-	0		0		
	89	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	380		19		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>				<u>%Change</u>							
'83		26%		00%		05%				+10%							
'89		07%		00%		04%				-12%							
'97		06%		00%		13%											
Total Plants/Acre (excluding Dead & Seedlings)										'83		2032		Dec:		30%	
										'89		2266				35%	
										'97		2000				17%	

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
<i>Gutierrezia sarothrae</i>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	5	-	-	-	-	-	-	-	-	-	-	-	-	166		5
	97	292	-	-	-	-	-	-	-	-	-	-	-	-	5840		292
Y	83	1	-	-	-	-	-	-	-	-	-	-	-	-	33		1
	89	37	-	-	2	-	-	2	-	-	-	-	-	-	1366		41
	97	48	-	-	-	-	-	-	-	-	-	-	-	-	960		48
M	83	36	-	-	-	-	-	-	-	-	-	-	-	-	1200	12 11	36
	89	99	-	-	2	-	-	-	-	-	-	-	-	-	3366	9 10	101
	97	83	-	-	-	-	-	-	-	-	-	-	-	-	1660	7 7	83
D	83	1	-	-	-	-	-	-	-	-	-	-	-	-	33		1
	89	17	1	-	-	-	-	-	-	-	-	-	-	-	600		18
	97	1	-	-	-	-	-	-	-	-	-	-	-	-	20		1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+76%						
'89		.62%			00%			00%			-50%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	1266	Dec:	3%			
											'89	5332		11%			
											'97	2640		1%			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4	5	6	7	8	9	1	2	3	4						
Quercus gambelii																				
S	83	11	-	-	-	-	-	-	-	-	6	5	-	-	366		11			
	89	-	-	-	4	-	-	-	-	-	4	-	-	-	133		4			
	97	7	-	-	3	-	-	-	-	-	10	-	-	-	200		10			
Y	83	32	-	-	-	-	-	-	-	-	7	25	-	-	1066		32			
	89	52	6	-	16	-	-	26	-	-	100	-	-	-	3333		100			
	97	74	-	-	3	-	-	-	7	-	84	-	-	-	1680		84			
M	83	45	-	-	18	-	-	-	-	-	32	31	-	-	2100	43 27	63			
	89	16	-	-	7	-	-	9	-	-	32	-	-	-	1066	71 41	32			
	97	206	-	-	12	-	-	3	-	-	221	-	-	-	4420	53 36	221			
D	83	4	-	-	-	-	-	-	-	-	-	4	-	-	133		4			
	89	-	-	-	-	-	-	1	-	-	1	-	-	-	33		1			
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1			
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	260		13			
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>						
		'83			00%			00%			00%			+26%						
		'89			05%			00%			00%			+28%						
		'97			00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)													'83		3299		Dec:		4%	
													'89		4432				1%	
													'97		6120				0%	

Trend Study 16A-2-97

Study site name: Santaquin Bench .

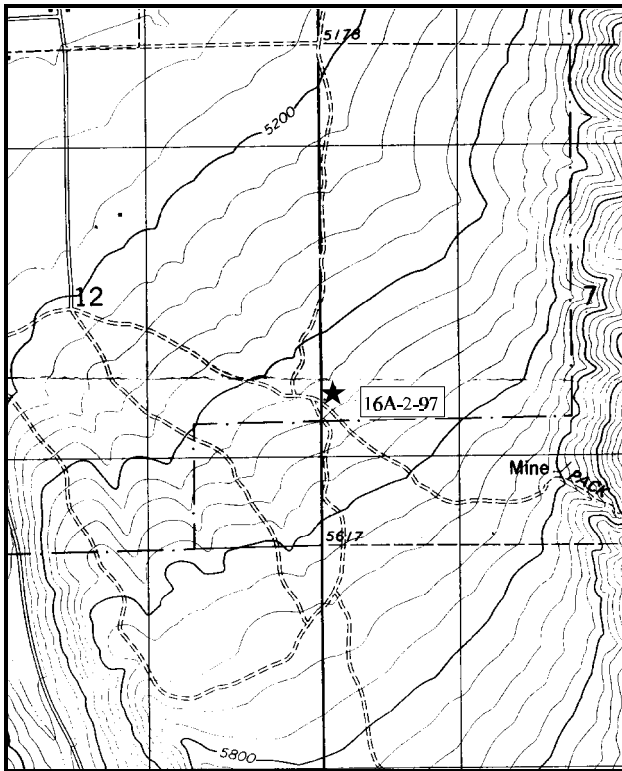
Range Type: Mixed oak-sage

Compass bearing: frequency baseline 28 degrees. (Lines 2-3 290°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 59 & 95ft), line 2 (71ft), line 3 (34ft).

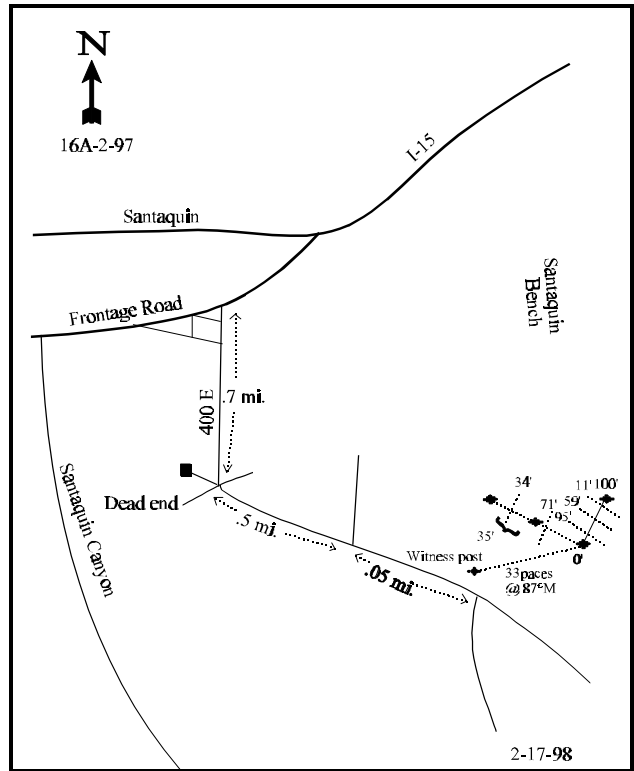
LOCATION DESCRIPTION

From the freeway (I-15) interchange on the east side of Santaquin, proceed southwest on the frontage road (Highland drive) for a short distance to where there are several forks. Turn left on 400 East that turns due south and passes through some orchards and home sites. Travel 0.7 miles to where the road forks at the end of a maintained road. Turn immediately to the left(east) and travel 0.50 miles to a fork in the road. Stop at the witness post on the left. The 0-foot baseline stake is located 33 paces from the witness post at an azimuth of 87°M. The study markers are green steel fenceposts approximately 12 to 18 inches in height. The 0-foot baseline stake is marked by browse tag #3929.



Map Name: Santaquin, Utah .

Township 10S, Range 2E, Section 7



Diagrammatic Sketch

UTM 4423178.704 N, 434580.327 E

DISCUSSION

Trend Study No. 16A-2 (25-2)

This study is located on deer and elk winter range on the Santaquin Bench within the Uinta National Forest. Physically the site is nearly level, having a slight west aspect and an elevation of approximately 5,480 feet. Closely intermixed patches of Gambel oak and mountain big sagebrush make up the dominant overstory. Stansbury cliffrose, antelope bitterbrush, and Utah juniper are occasionally abundant. Surrounding oak clones are thick and appear to be becoming increasingly dense, leaving smaller openings for sagebrush. Deer and elk pellet groups were common in 1983, but currently few deer and elk pellet groups can be found. This site offers good escape and thermal cover. However, better winter range can be found on nearby west facing slopes.

Soil is derived from sedimentary alluvial deposits. Texture is described as a “cobbly loam” in the surface horizons. Color is dark brown on the surface becoming more reddish with increasing depth. Surface soil is slightly acidic. The subsoil tends to be more alkaline and strongly calcareous (USDA-SCS 1972). Soil at the site is relatively deep with an effective rooting depth (see methods) of almost 14 inches. Parent material is limestone. Texture is a loam with a moderately acid pH of 6.0. Large cobble can be found on the surface and throughout the profile. The soil surface is well protected by grass and litter cover in the openings and by abundant litter under the oak clones.

The key browse species include Gambel oak and mountain big sagebrush. These occur as interspersed patches. Oak accounts for half of the shrub cover and forms relatively dense clumps of variable height. Overhead canopy cover of oak is estimated at 24%. Some oak forage is physically unavailable due to either excessive height or density. Age structure is indicative of an expanding population with many young plants, especially near the edges of the clones. Utilization is mostly light. Vigor has been depressed in the past due to “crank worm” infestations which severely defoliated the oak in 1997. Forty-one percent of the oak sampled in 1997 were impacted by the insects.

When the baseline was lengthened (sample size was increased) in 1997, the extended baseline was placed in more open areas to better sample the preferred mountain big sagebrush. As a result, density estimates are significantly larger compared to the 1983 and 1989 data. Currently, there are about 2,520 sagebrush plants/acre which account for 47% of the shrub cover on the site. Between 1983 and 1989, density declined 37% from 1,266 plants/acre to only 799. Percent decadence also increased from 26% to 41%. Recruitment was limited with few seedlings and young encountered during either year. Use remained mostly light during these years so the decline is most likely due to oak competition combined with prolonged drought. Presently, 74% of the population is mature and percent decadence has declined to 15%. No seedlings were found in 1997, with only 10% of the population consisting of young plants. In addition, 70% of the decadent sagebrush sampled were classified as dying. The only other shrub found on the site is a small number of broom snakeweed.

This site possesses a better herbaceous understory than site #16A-1 with a total grass cover value of nearly 20%. Abundance and composition vary greatly between the oakbrush and the sagebrush dominated openings. Under the oak canopy, Kentucky bluegrass is perhaps the most important herbaceous plant. In contrast, it is rare within the sagebrush openings. In these areas, bluebunch wheatgrass and Sandberg bluegrass dominate. Annual grasses occur at the site, but at relatively low densities. Forbs are moderately diverse with few species being abundant. Two species, annual bedstraw and peavine, account for 81% of the forb cover. Use of the grasses and forbs appears light.

1983 APPARENT TREND ASSESSMENT

Soil trend appears stable. The area has very little slope and vegetative cover is adequate to prevent erosion. Vegetative condition is fair with a stable to slightly declining trend. The most disturbing possibility is the potential decline or loss of mountain big sagebrush due to encroachment of Gambel oak. Understory cover, composition, and density is poor to fair and not improving. The abundance of annual grasses poses a distinct fire hazard, especially in late summer when they have fully cured.

1989 TREND ASSESSMENT

The soil trend is down slightly due to an increase in percent bare ground cover and a decline in litter cover. Litter cover decreased due to less annual grass production in 1989. Density of Gambel oak increased on the density plots due to the number of young sprouts encountered. The sagebrush openings appear to becoming smaller and sagebrush on the edges are declining in vigor due to shading and competition. Sagebrush vigor is generally normal concerning growth and seed production, but there is an increased level of decadence to 41% of the population. The sagebrush still displays light hedging. The data show some increases in the herbaceous understory. Bluebunch wheatgrass increased in frequency in the sagebrush openings, while Kentucky bluegrass remains dense in association with the oakbrush. Peavine is common, otherwise forbs are rather insignificant.

TREND ASSESSMENT

soil - down slightly

browse - down

herbaceous understory - up

1997 TREND ASSESSMENT

The soil trend has bounced back from the dry years since 1985. Percent bare ground cover has declined from 7% to only 2%. Litter cover declined with some of the difference being attributed to the larger sample which includes more sagebrush openings and less oak with its associated litter. Soil trend is up slightly. The browse trend for sagebrush is currently stable. The much larger sample used in 1997 is partly responsible for the change in density. Percent decadency declined from 41% to 15% and vigor is slightly improved. Recruitment is still limited. Density of oak is similar to 1983 estimates and appears stable. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency of perennial grasses and forbs. Both bluebunch wheatgrass and Kentucky bluegrass increased in nested frequency values.

TREND ASSESSMENT

soil - up slightly

browse - stable

herbaceous understory - up slightly

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 2

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	a ⁸⁹	b ¹²⁶	b ¹³⁶	35	45	48	6.75
G	Bromus tectorum (a)	-	-	50	-	-	16	.30
G	Festuca myuros (a)	-	-	3	-	-	1	.00
G	Poa bulbosa	a ⁻	a ⁻	b ³⁰	-	-	10	.96
G	Poa fendleriana	-	-	6	-	-	2	.18
G	Poa pratensis	a ⁵²	b ¹²⁴	c ²⁰²	17	43	58	10.03
G	Poa secunda	c ¹⁶⁷	b ¹²⁷	a ⁶³	65	46	27	1.23
G	Sitanion hystrix	b ²⁶	b ²⁴	a ⁻	13	10	-	-
G	Unknown grass - annual (a)	-	-	47	-	-	19	.39
Total for Grasses		334	401	537	130	144	181	19.86
F	Alyssum alyssoides (a)	-	-	46	-	-	19	.12
F	Allium spp.	a ²²	a ⁴⁶	b ⁸¹	13	23	36	.30
F	Antennaria spp.	-	3	2	-	1	1	.00
F	Arabis spp.	-	-	4	-	-	2	.01
F	Aster spp.	-	-	4	-	-	2	.01
F	Astragalus spp.	-	-	6	-	-	3	.07
F	Cirsium spp.	1	2	8	1	1	4	.23
F	Collomia linearis (a)	4	-	-	2	-	-	-
F	Collinsia parviflora (a)	-	-	103	-	-	41	.35
F	Descurainia pinnata (a)	-	-	3	-	-	1	.00
F	Draba spp. (a)	-	-	16	-	-	6	.03
F	Epilobium paniculatum (a)	-	-	84	-	-	36	.30
F	Eriogonum racemosum	ab ¹⁵	b ²⁰	a ⁶	9	12	3	.01
F	Eriogonum umbellatum	b ²²	a ²	a ⁸	10	2	4	.04
F	Galium aparine (a)	a ⁻	a ⁻	b ¹⁹²	-	-	66	5.72
F	Geranium spp.	-	-	2	-	-	1	.00
F	Holosteum umbellatum (a)	-	-	7	-	-	4	.02
F	Hydrophyllum capitatum	-	1	-	-	1	-	-
F	Lathyrus brachycalyx	a ⁴³	b ¹⁵⁷	b ¹⁵³	17	57	55	7.55
F	Lactuca serriola	-	-	3	-	-	1	.00
F	Lomatium grayi	a ⁷	a ⁵	b ³⁰	2	3	14	.12

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Microsteris gracilis (a)	-	-	29	-	-	12	.11
F	Phlox longifolia	_a 9	_{ab} 19	_b 25	4	9	12	.13
F	Polygonum douglasii (a)	-	-	18	-	-	6	.03
F	Ranunculus testiculatus (a)	-	-	56	-	-	19	.19
F	Tragopogon dubius	-	3	12	-	2	5	.67
F	Unknown forb-annual	-	-	63	-	-	28	.31
F	Zigadenus paniculatus	2	4	5	1	2	2	.06
Total for Forbs		125	262	971	59	113	385	16.52

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 2

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	71	10.86
B	Gutierrezia sarothrae	3	.56
B	Quercus gambelii	48	11.56
Total for Browse		122	22.99

BASIC COVER --

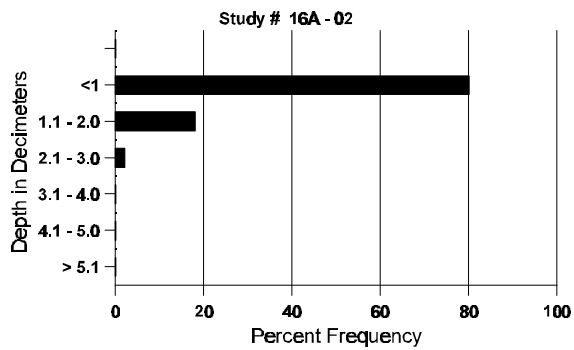
Herd unit 16A , Study no: 2

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	385	1.25	3.25	54.34
Rock	74	2.25	3.75	3.68
Pavement	87	.25	2.00	1.83
Litter	398	91.75	81.75	67.93
Cryptogams	42	.25	2.25	.23
Bare Ground	111	4.25	7.00	2.00

SOIL ANALYSIS DATA --
 Herd Unit 16A, Study no: 02

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.5	46.5 (16.7)	6.0	46.4	29.1	24.6	3.9	20.2	211.2	.7

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16A , Study no: 2

Type	Quadrat Frequency '97
Elk	1
Deer	7

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 2

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Artemisia tridentata vaseyana																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	12	-	1	-	-	-	-	-	-	13	-	-	-	260		13
M	83	7	4	1	-	-	-	-	-	-	12	-	-	-	800	21 21	12
	89	6	1	-	-	-	-	-	-	-	7	-	-	-	466	22 28	7
	97	62	27	3	-	-	-	-	-	-	92	-	-	-	1860	27 39	93
D	83	4	1	-	-	-	-	-	-	-	1	-	4	-	333		5
	89	5	-	-	-	-	-	-	-	-	3	-	-	2	333		5
	97	11	8	1	-	-	-	-	-	-	6	-	-	14	400		20
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	860		43
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		26%			05%			21%			-37%						
'89		08%			00%			17%			+68%						
'97		28%			04%			11%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	1266	Dec:	26%		
												'89	799		42%		
												'97	2520		16%		

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	2	-	-	-	-	-	-	-	-	-	-	-	133	7	9	2
	97	2	-	-	-	-	-	-	-	-	-	-	-	40	9	12	2
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	1	-	20			1
<u>% Plants Showing</u>		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			Appeared						
'89		00%			00%			00%			-40%						
'97		00%			00%			25%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%		
												'89	133		0%		
												'97	80		25%		
Quercus gambelii																	
S	83	28	-	-	-	-	-	-	-	-	-	-	28				28
	89	17	-	-	4	-	-	1	-	-	-	-	13	9	-	-	22
	97	1	-	-	13	-	-	-	-	-	-	-	13	1	-	-	14
Y	83	27	-	-	-	-	-	-	-	-	-	-	27				27
	89	121	-	-	11	-	-	-	-	-	-	-	95	37	-	-	132
	97	82	1	-	-	-	-	-	-	-	-	-	36	47	-	-	83
M	83	23	2	-	4	-	-	-	16	-	-	-	45	-	-	39	45
	89	4	-	-	-	-	-	-	36	-	-	-	38	2	-	39	40
	97	157	9	4	-	-	-	-	-	-	-	-	108	62	-	46	170
D	83	1	-	-	-	-	-	-	-	-	-	-	-	66			1
	89	2	-	-	2	-	-	-	1	-	-	-	4	-	-	1	5
	97	-	2	-	-	-	-	-	-	-	-	-	-	2	-	-	2
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	520			26
<u>% Plants Showing</u>		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		03%			00%			01%			+59%						
'89		00%			00%			.56%			-57%						
'97		05%			02%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	4866	Dec:	1%		
												'89	11799		3%		
												'97	5100		1%		

Trend Study 16A-3-97

Study site name: Santaquin Hill .

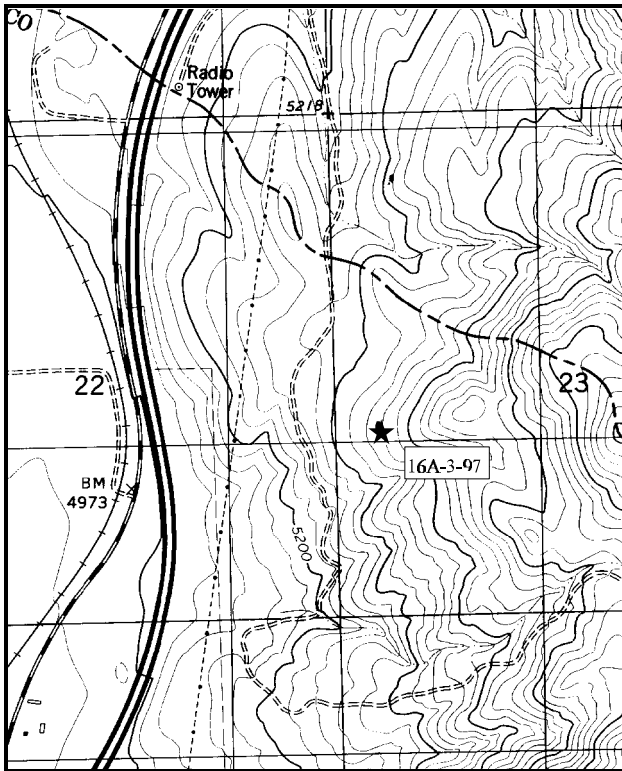
Range Type: Mixed oak-sage

Compass bearing: frequency baseline 350M degrees. (Lines 2-4 143°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11& 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

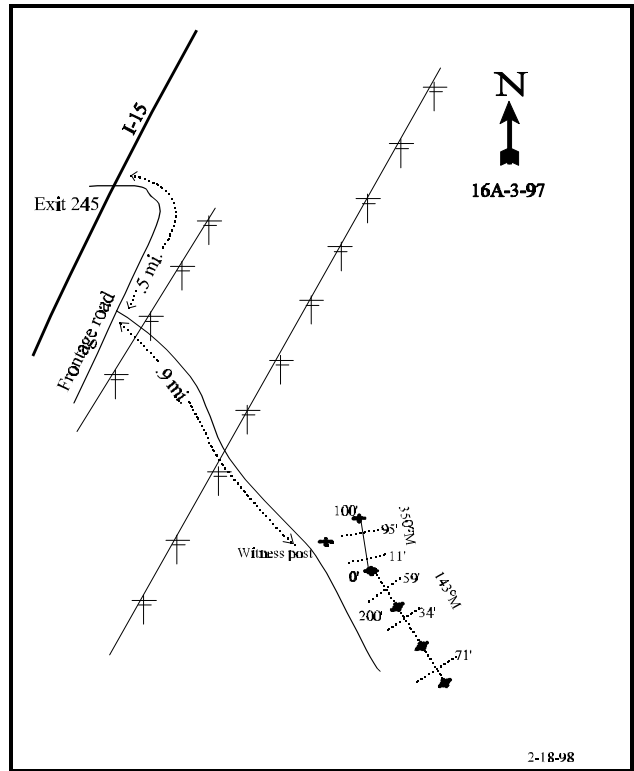
LOCATION DESCRIPTION

From the south Santaquin exit on I-15, proceed easterly under the overpass and then southerly onto the frontage road for 0.70 miles to an intersection. Turn left (east) at the intersection and proceed for 0.9 miles, passing under powerlines, (stay right at all forks). At 0.9 miles, stop at a green fence post on the left (east) side of the road. From the witness post the 0-foot baseline stake is 20 feet south. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3967, is attached to the 0-foot baseline stake.



Map Name: Santaquin, Utah .

Township 10S , Range 1E , Section 22



Diagrammatic Sketch

UTM 4420039.937 N, 431486.357 E

DISCUSSION

Trend Study No. 16A-3 (25-3)

The Santaquin Hill site is located on critical deer and elk winter range on Division property. The area straddles the Juab county line near the top of Santaquin Hill. The study is on a broad ridge which slopes (14%) to the west and has an elevation of approximately 5,360 feet. It is a big sagebrush-grass community which contains large numbers of low-growing Gambel oak. Higher up on the hill, Gambel oak becomes increasingly more dominant and taller. Considerable evidence of deer and elk use in the form of pellet groups, antler drops, and forage use was apparent in 1983. Pellet group data from 1997 indicate an elk pellet group quadrat frequency of only 2%, while deer had a much higher frequency of 22%.

Soil at the study site is shallow and exceptionally rocky (26% cover). The soil survey classifies this soil as an "extremely stony loam" with a 2 to 8 inch deep surface horizon. A typical profile of the surface layer is grey-brown in color, slightly calcareous, and mildly alkaline. The soil also possesses a thick lime hardpan beginning about 13 inches below the surface. Root penetration through the hardpan is very difficult (USDA-SCS, 1972). Soil at the site is relatively deep with an effective rooting depth (see methods) of 15 inches. Texture is a clay loam with a neutral pH of 6.8. Protective ground cover appears adequate to prevent serious erosion.

Browse on the site consists of mountain big sagebrush and low growing Gambel oak. Sagebrush accounts for 51% of the shrub cover with a current population density of 2,780 plants/acre in 1997. Density has been relatively stable since 1983 even though 1,140 dead plants/acre were counted in 1997, accounting for almost 30% of the population. This data would suggest a relatively rapid turnover or die-off for sagebrush on this site. Use was moderate to heavy in 1983 with lighter use in 1989. Current use is moderate with heavy use reported on 12% of the sagebrush. Percent decadency was high in 1989 at 63%, but has since declined to 27% in 1997. However, 68% of these plants were classified as dying. Poor vigor was expressed on 23% of the mature and decadent sagebrush in 1989. Currently vigor is normal on all plants except decadent individuals. Recruitment appears to be adequate with a biotic potential of 4% (proportion of seedlings to the population) and young plants composing 19% of the population.

Gambel oak provides 42% of the browse cover on the site. The original baseline had a higher density of oak than the new extended baseline (see methods). As a result, the sampled population density declined from 9,332 plants/acre in 1989 to 3,140 in 1997. Oak on the site is low growing and averages only 30 inches in height. Use has previously been light to moderate, but was reported moderate to heavy in 1997 when nearly half (43%) of the oak was classified as heavily hedged. Oak is often difficult to classify with regard to the degree of hedging. Because of the low density of big game pellet groups, some of the increase in use may be due to observer differences combined with the stunted growth habit of the oak on this site. Overall, the oak is healthy and vigorous with good vigor and low rate of decadency.

The herbaceous understory is relatively depleted. Bluebunch wheatgrass is abundant providing 75% of the grass cover. Sandberg bluegrass is also numerous, but does not produce much forage. The annual grasses, cheatgrass and Japanese brome, are also common. Forbs are diverse yet totally dominated by annuals which account for 83% of the forb cover. Common species include pale alyssum, annual bedstraw, and bur buttercup. Perennial forbs are rare.

1983 APPARENT TREND ASSESSMENT

Soil trend appears stable to declining. Aerial cover from shrubs, rock cover, and a limited amount of litter help prevented serious erosion. However, the lack of a strong perennial understory has allowed moderate soil

movement to continue. No improvement appears to be coming in the near future. Vegetative trend seems stable. Among potential changes, the most probable is a gradual increase in Gambel oak density.

1989 TREND ASSESSMENT

The soil trend appears to have improved due to a decline in percent bare ground from 18% to only 7%. In addition, ground cover estimates show an increase in the percentage of basal vegetative cover to almost 8%. Although not in direct competition with oakbrush in most places and generally only lightly hedged (78% in form class 1), the mountain big sagebrush on this site is declining. In 1989, the population was classified as 63% decadent, with few young shrubs. Sagebrush decreased slightly in density from 3,199 plants/acre in 1983 to 2,732. Sagebrush cover on the site averages about 8%, ranging from 2% to 16%. The density of young oak increased, but some of the increase may be do to classification problems between observers caused by the low growth habit of the oak. Trend for the herbaceous understory is up due to a significant increase in the sum of nested frequency of bluebunch wheatgrass and Sandberg bluegrass. Nested frequency of perennial forbs also increased. The most common forb species remain longleaf phlox, sego lily, and Astragalus, yet total forb cover is low.

TREND ASSESSMENT

soil - up

browse - down slightly

herbaceous understory - up

1997 TREND ASSESSMENT

Soil trend is stable. Ground cover characteristics are similar to 1989 measurements. Trend for mountain big sagebrush is now stable. Population density is similar to 1989 and percent decadency has declined from 63% to 27%. Dead plants are abundant (ratio of 1:2.4) and most of the decadent plants sampled (68%) were classified as dying. However, the constant density and good recruitment would indicate a relatively rapid turn over for sagebrush on this site. Population of Gambel oak declined 66% primarily due to the much larger sample size used (see methods). Oak is healthy and vigorous and appears stable. Trend for the herbaceous understory is down slightly due to a decline in the sum of nested frequency of perennial grasses. Nested frequency of bluebunch wheatgrass and Sandberg bluegrass both declined. Perennial forbs are still rare with sum of nested frequency remaining similar to that in 1989.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - down slightly (mostly due to losses in the grasses)

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 3

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	_a 181	_b 246	_b 230	76	86	82	10.56
G	Bromus japonicus (a)	-	-	129	-	-	43	1.89
G	Bromus tectorum (a)	-	-	117	-	-	49	.76

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	<i>Poa pratensis</i>	_b 8	_{ab} 7	_a -	4	3	-	-
G	<i>Poa secunda</i>	_a 74	_b 153	_a 102	35	66	40	.85
Total for Grasses		263	406	578	115	155	214	14.09
F	<i>Alyssum alyssoides</i> (a)	-	-	293	-	-	92	2.36
F	<i>Antennaria rosea</i>	-	-	1	-	-	1	.00
F	<i>Arabis</i> spp.	2	10	7	2	7	4	.02
F	<i>Astragalus beckwithii</i>	-	-	2	-	-	2	.05
F	<i>Astragalus cibarius</i>	11	5	11	6	3	6	.21
F	<i>Astragalus mollissimus</i>	1	3	-	1	2	-	-
F	<i>Calochortus nuttallii</i>	5	23	12	5	10	7	.03
F	<i>Castilleja</i> spp.	-	-	-	-	-	-	.00
F	<i>Chaenactis douglasii</i>	6	5	7	4	3	3	.04
F	<i>Collinsia parviflora</i> (a)	-	-	21	-	-	10	.05
F	<i>Crepis acuminata</i>	-	2	4	-	2	1	.00
F	<i>Draba</i> spp. (a)	-	-	3	-	-	1	.00
F	<i>Epilobium paniculatum</i> (a)	-	-	36	-	-	16	.08
F	<i>Erigeron pumilus</i>	-	-	1	-	-	1	.00
F	<i>Galium aparine</i> (a)	_a -	_a -	_b 43	-	-	19	.48
F	<i>Helianthus annuus</i> (a)	-	-	3	-	-	1	.00
F	<i>Holosteum umbellatum</i> (a)	-	-	5	-	-	2	.01
F	<i>Lactuca serriola</i>	-	-	9	-	-	4	.02
F	<i>Microsteris gracilis</i> (a)	-	-	30	-	-	12	.06
F	<i>Petradoria pumila</i>	-	-	1	-	-	1	.03
F	<i>Phlox longifolia</i>	_a 8	_b 30	_{ab} 28	6	18	11	.05
F	<i>Ranunculus testiculatus</i> (a)	-	-	50	-	-	16	.13
F	<i>Streptanthus cordatus</i>	1	3	-	1	1	-	-
F	<i>Tragopogon dubius</i>	8	-	2	4	-	1	.03
Total for Forbs		42	81	569	29	46	211	3.71

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 3

Type	Species	Strip	Average
		Frequency '97	Cover % '97
B	Artemisia tridentata vaseyana	70	10.42
B	Chrysothamnus nauseosus albicaulis	7	.66
B	Gutierrezia sarothrae	23	.81
B	Quercus gambelii	30	8.67
Total for Browse		130	20.58

BASIC COVER --

Herd unit 16A , Study no: 3

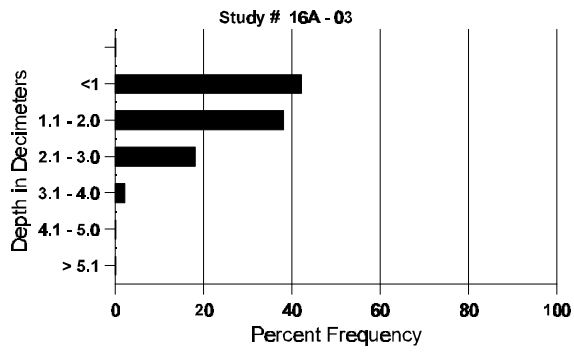
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	357	0	7.50	35.97
Rock	281	17.00	15.00	23.06
Pavement	157	4.00	14.00	3.11
Litter	393	61.50	55.25	47.94
Cryptogams	92	0	1.25	.57
Bare Ground	211	17.50	7.00	7.12

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 03

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.3	54.8 (16.0)	6.8	40.4	29.1	30.6	3.2	16.3	204.8	.6

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 16A , Study no: 3

Type	Quadrat Frequency '97
Rabbit	11
Elk	2
Deer	20

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 3

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total										
		1	2	3	4		1	2											
<i>Artemisia tridentata vaseyana</i>																			
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	5	-	-	-	-	-	-	-	5	-	-	-	100		5			
Y	83	2	-	-	-	-	-	-	-	2	-	-	-	133		2			
	89	2	-	-	-	-	-	-	-	2	-	-	-	133		2			
	97	26	-	-	-	-	-	-	-	26	-	-	-	520		26			
M	83	6	24	4	-	-	-	-	-	34	-	-	-	2266	18	21	34		
	89	9	3	-	1	-	-	-	-	10	-	3	-	866	17	22	13		
	97	31	41	2	-	1	-	-	-	75	-	-	-	1500	17	25	75		
D	83	1	10	1	-	-	-	-	-	12	-	-	-	800		12			
	89	21	5	-	-	-	-	-	-	20	1	3	2	1733		26			
	97	5	18	13	-	-	2	-	-	12	-	-	26	760		38			
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	-	-	-	-	-	-	-	-	-	-	-	-	1140		57			
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		71%		10%		00%		-15%											
'89		20%		00%		20%		+ 2%											
'97		43%		12%		19%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	3199	Dec:	25%						
										'89	2732		63%						
										'97	2780		27%						
<i>Chrysothamnus nauseosus albicaulis</i>																			
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	97	5	1	-	-	-	1	-	-	7	-	-	-	140	27	35	7		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>											
'83		00%		00%		00%		None											
'89		00%		00%		00%		Appeared											
'97		14%		14%		00%													
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-						
										'89	0		-						
										'97	140		-						

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	12	-	-	-	-	-	-	-	-	12	-	-	-	800		12	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	83	8	-	-	-	-	-	-	-	-	8	-	-	-	533	16 10	8	
	89	24	-	-	-	-	-	-	-	-	24	-	-	-	1600	9 12	24	
	97	33	-	-	-	-	-	-	-	-	33	-	-	-	660	8 7	33	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266		4	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+80%							
'89		00%			00%			00%			-72%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	533	Dec:	0%			
												'89	2666		10%			
												'97	740		3%			

AGE	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Quercus gambelii																	
S	83	11	-	-	-	-	-	-	-	-	11	-	-	-	733		11
	89	-	-	-	-	-	-	19	-	-	19	-	-	-	1266		19
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5
Y	83	16	12	-	-	-	-	-	-	-	28	-	-	-	1866		28
	89	78	24	-	24	-	-	-	-	-	126	-	-	-	8400		126
	97	35	7	-	-	-	-	-	-	-	42	-	-	-	840		42
M	83	-	75	-	-	-	-	-	-	-	75	-	-	-	5000	27 18	75
	89	4	8	-	1	-	-	-	-	-	13	-	-	-	866	33 21	13
	97	13	9	62	-	25	2	-	-	-	111	-	-	-	2220	30 29	111
D	83	-	4	-	-	-	-	-	-	-	4	-	-	-	266		4
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	-	-	2	-	-	2	-	-	-	3	-	-	1	80		4
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		85%			00%			00%			+24%						
'89		23%			00%			00%			-66%						
'97		26%			43%			.63%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	7132	Dec:	4%			
											'89	9332		1%			
											'97	3140		3%			

Trend Study 16A-4-97

Study site name: Wash Canyon .

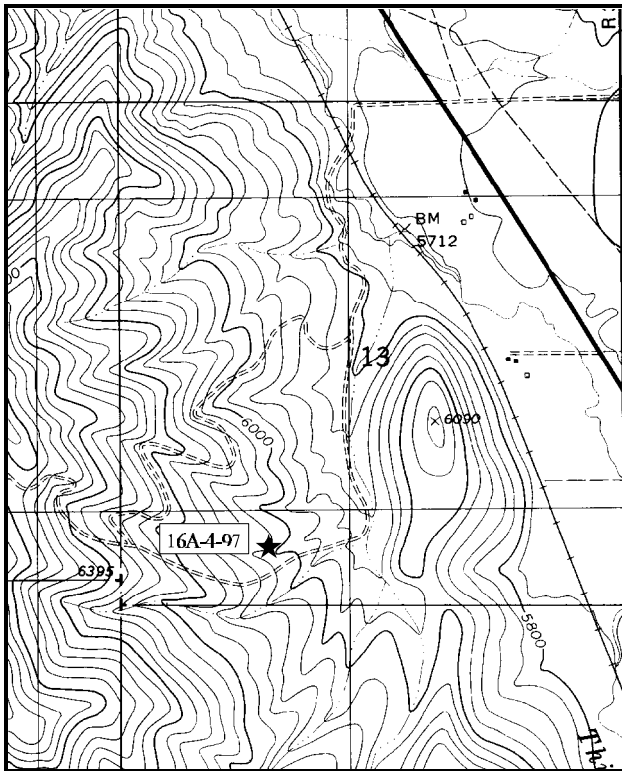
Range Type: Mixed mountain brush

Compass bearing: frequency baseline 315M degrees. (lines 3-4 49°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

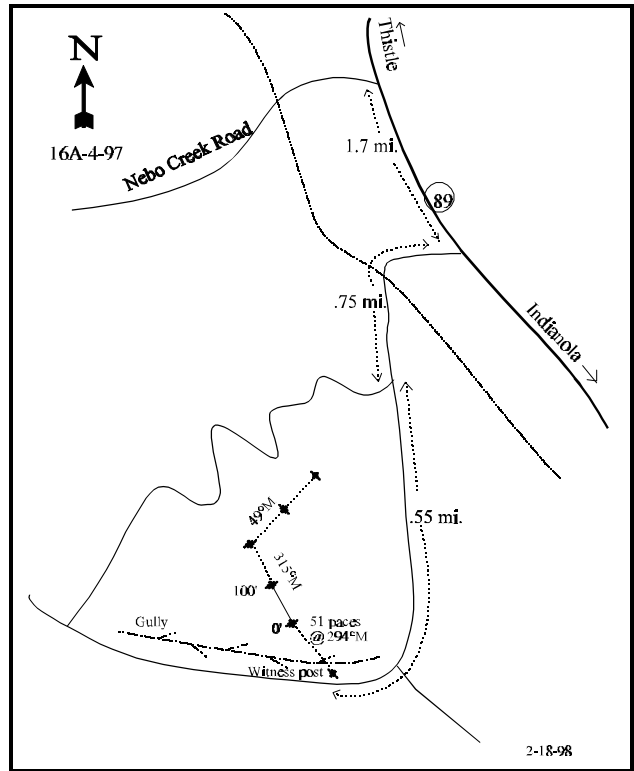
LOCATION DESCRIPTION

From the intersection of the Nebo Creek Road and U.S. 89, proceed south on U.S. 89 for 1.7 miles (0.5 miles from mile marker 269) to a road to the west. Turn right and proceed westerly for 0.75 miles, crossing a stream at 0.25 miles and an old railroad bed at 0.30 miles in route to a faint fork in the road. Take the left fork and proceed 0.55 miles to a witness post on the north side of the road. From the witness post walk 51 paces at an azimuth of 290 degrees M to the 0-foot baseline stake (the baseline stake is 17 paces away from lone juniper at an azimuth of 56 degree TRUE). The 0-baseline stake is a green post located just north of a clump of oak.



Map Name: Spencer Canyon, Utah

Township 11S, Range 3E, Section 13



Diagrammatic Sketch

UTM 4411894.446 N, 453770.082 E

DISCUSSION

Trend Study No. 16A-4 (25-4)

The Wash Bench study samples deer winter range located in Lower Wash Canyon. The study is on privately owned land located immediately adjacent to a large block of Division property. Elevation of the site is approximately 6,000 feet. Slope is a gentle 12% with a northeast aspect. Deer and elk pellet groups are abundant with quadrat frequencies of 58% and 21% respectively in 1997. Cattle use and sign were evident in 1997. Antler drops and winter killed deer were encountered during the initial 1983 reading. The area is a mixed mountain brush site that currently supports a moderately low density of mountain big sagebrush associated with smaller numbers of more desirable species.

Soil on the site is deep with an effective rooting depth (see methods) of nearly 16 inches. Soil texture is a loam with a neutral pH of 6.8. Parent material appears to be limestone. Ground cover is highly variable. Many areas of bare soil and pavement are subject to erosion.

Browse composition is diverse, but only mountain big sagebrush is abundant enough to provide much forage. Invasion by large numbers of stickyleaf low rabbitbrush and broom snakeweed appears to have displaced some of the original browse population. The mountain big sagebrush, which was previously classified as basin big sagebrush (*Artemisia tridentata tridentata*), has characteristics more common with mountain big sagebrush (*A. tridentata vaseyana*). There is some hybridizing between the two subspecies. For this report, all big sagebrush will be classified as mountain big sagebrush. Its density is currently estimated at 1,800 plants/acre. Use was light in 1983, but more moderate to heavy in 1989. Currently, use appears mostly light but percent decadence has increased from 4% in 1983 to 28% in 1997. Presently, 60% of the decadent sagebrush appear to be dying.

Several other preferred browse species occur in small numbers. These include: serviceberry, true mountain mahogany, and antelope bitterbrush. Use of these species is currently moderate to heavy. The undesirable increasers, stickyleaf low rabbitbrush and broom snakeweed, are abundant and originally increased in density between 1983 and 1989. Numbers have since declined slightly and age class composition indicates mostly mature populations.

The herbaceous understory is diverse yet not particularly abundant. Cheatgrass is the most abundant grass providing 41% of the total grass cover. Abundant perennial species include: bluebunch wheatgrass, Indian ricegrass and Kentucky bluegrass. Forbs are abundant with 33 species of annual and perennial species encountered in 1997. Most species occur only occasionally with a few important species like Lewis flax and scarlet globemallow being fairly abundant.

1983 APPARENT TREND ASSESSMENT

Soil trend is stable to declining. The dispersion of effective ground cover is highly variable and has allowed an excessive rate of soil erosion to continue. Vegetative trend is also declining. The most palatable browse species appear to be declining and are gradually being replaced by broom snakeweed and stickyleaf low rabbitbrush. Herbaceous composition and density is fair but include few desirable, succulent or highly productive species.

1989 TREND ASSESSMENT

Soil trend appears stable. Percent bare ground and litter declined. Rock and pavement cover increased from 14% to 24%. Low rabbitbrush and snakeweed still have the highest densities and have increased greatly. They remain mainly mature populations, with approximately 20% young plants. Young sagebrush are common and

they comprise 57% of the sagebrush population. The mature sagebrush are moderately to heavily hedged. The number of mature shrubs declined to 733 plants/acre due to an increase in the number of sagebrush classified as decadent. Sagebrush cover averages about 8%. Except for a slightly increased number of bitterbrush counted, other browse species were not well sampled on the density plots. They are all heavily hedged and display poor vigor. Plant numbers and species composition have improved slightly within the herbaceous community. Blue bunch wheatgrass, Needle-and-thread, and Kentucky bluegrass increased in sum of nested frequency. There is a high diversity of forbs. Composition is unchanged and there was a slight increase in the sum of nested frequency for forbs.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - up slightly

1997 TREND ASSESSMENT

Trend for soil is up with a decline in percent bare ground from 30% to 14% between 1989 and 1997. Litter cover increased slightly while rock & pavement cover declined. Sum of nested frequency for grasses increased slightly. Density of the increasers, stickyleaf low rabbitbrush and broom snakeweed, has declined 32% and 15% respectively, however they are still abundant. Mountain big sagebrush shows slightly higher decadence (14% to 28%) even with lighter use. It would appear that with 60% of the decadent plants being classified as dying, that there will continue to be some losses to the sagebrush population. Trend for key browse (which makes up 37% of the browse cover) is slightly down. Trend for the herbaceous understory is stable for grasses but down for forbs. Sum of nested frequency of forbs declined 36% likely due to the extended drought. Because grasses comprise 79% of the herbaceous cover, overall trend is considered stable.

TREND ASSESSMENT

soil - up

browse - slightly down for key browse, but still moderately high densities for undesirable increasers

herbaceous understory - stable for grasses, but down for forbs, overall trend is stable

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 4

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	a19	a31	b76	8	13	26	2.19
G	Bromus tectorum (a)	-	-	270	-	-	86	6.14
G	Dactylis glomerata	-	-	1	-	-	1	.00
G	Oryzopsis hymenoides	b145	ab128	a86	51	53	37	1.75
G	Poa fendleriana	-	-	4	-	-	1	.15
G	Poa pratensis	a43	b74	b77	17	27	25	3.04
G	Poa secunda	a3	a3	b47	1	1	20	.86
G	Sitanion hystrix	b35	a4	b49	17	2	19	.58
G	Stipa comata	a19	b75	a25	8	35	9	.61
Total for Grasses		264	315	635	102	131	224	15.34
F	Agoseris glauca	-	-	4	-	-	2	.01
F	Alyssum alyssoides (a)	-	-	107	-	-	44	.29
F	Allium spp.	ab6	a1	b13	4	1	7	.03
F	Antennaria rosea	-	-	1	-	-	1	.03
F	Astragalus convallarius	b30	b35	a9	16	17	5	.07
F	Aster spp.	-	-	1	-	-	1	.00
F	Astragalus utahensis	-	-	1	-	-	1	.03
F	Castilleja chromosa	5	-	-	2	-	-	-
F	Calochortus nuttallii	4	1	5	1	1	3	.01
F	Chaenactis douglasii	b29	a4	a1	14	2	1	.00
F	Chenopodium spp.	-	-	3	-	-	1	.00
F	Cirsium spp.	c84	b56	a18	40	28	11	.17
F	Collomia linearis (a)	-	-	9	-	-	4	.02
F	Comandra pallida	3	3	2	3	2	1	.00
F	Collinsia parviflora (a)	-	-	3	-	-	1	.00
F	Crepis acuminata	2	4	3	1	2	1	.00
F	Cryptantha spp.	12	28	13	8	11	6	.10
F	Descurainia spp. (a)	-	-	39	-	-	17	.11
F	Epilobium paniculatum (a)	-	-	11	-	-	5	.05
F	Erigeron divergens	-	5	-	-	3	-	-
F	Erigeron spp	-	-	1	-	-	1	.00

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Erigeron pumilus	6	-	-	2	-	-	-
F	Eriogonum racemosum	-	-	-	-	-	-	.00
F	Eriogonum umbellatum	_b 9	_b 14	_a 2	5	7	2	.03
F	Hackelia patens	36	21	37	17	11	17	.36
F	Lathyrus brachycalyx	_a 21	_b 55	_a 3	9	23	2	.01
F	Lappula occidentalis (a)	-	-	5	-	-	2	.01
F	Linum lewisii	_b 125	_a 98	_a 81	58	44	37	.72
F	Lithospermum ruderales	_a 1	_b 10	_a -	1	5	-	-
F	Lithophragma	-	-	6	-	-	2	.30
F	Lomatium spp.	-	4	-	-	3	-	-
F	Machaeranthera canescens	3	-	3	2	-	1	.00
F	Oenothera spp.	2	-	2	1	-	1	.03
F	Orobanche fasciculata	-	-	3	-	-	1	.00
F	Phlox longifolia	_a 6	_b 67	_a 3	3	34	1	.00
F	Polygonum douglasii (a)	-	-	19	-	-	8	.06
F	Senecio multilobatus	-	2	-	-	2	-	-
F	Sphaeralcea coccinea	_b 137	_b 168	_a 88	58	68	40	1.04
F	Taraxacum officinale	2	-	1	1	-	1	.00
F	Tragopogon dubius	_{ab} 49	_a 28	_b 67	25	16	32	.44
Total for Forbs		572	604	564	271	280	260	4.03

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 4

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier utahensis	2	-
B	Artemisia tridentata vaseyana	56	7.28
B	Cercocarpus montanus	2	.15
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	90	8.12
B	Gutierrezia sarothrae	71	2.68
B	Opuntia spp.	27	.73
B	Pinus edulis	1	-
B	Purshia tridentata	7	.56
B	Quercus gambelii	3	1.00
B	Ribes spp.	1	-
Total for Browse		261	20.54

BASIC COVER --

Herd unit 16A , Study no: 4

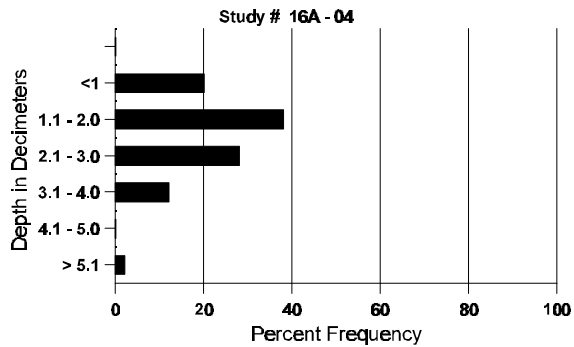
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	363	4.25	8.75	44.12
Rock	208	4.00	8.25	5.81
Pavement	320	8.00	15.50	9.30
Litter	399	45.25	37.75	40.90
Cryptogams	39	0	.25	.38
Bare Ground	295	38.50	29.50	14.36

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 04

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.4	58.2 (16.6)	6.8	35.0	31.2	33.8	3.4	13.5	99.2	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 4

Type	Quadrat Frequency '97
Rabbit	2
Elk	21
Deer	58
Cattle	2

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 4

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total									
		1	2	3	4												
Amelanchier utahensis																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	1	-	-	-	1	-	-	-	20	-	-	1
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	1	-	-	-	-	-	-	-	1	20			1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%		None									
'89		00%		00%		00%		Appeared									
'97		00%		50%		50%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%				
										'89	0		0%				
										'97	40		50%				

AGE	Y	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.		
<i>Artemisia tridentata vaseyana</i>																		
Y	83	16	-	-	-	-	-	-	-	-	16	-	-	-	533		16	
	89	24	17	-	1	-	-	-	-	-	38	2	2	-	1400		42	
	97	18	-	-	-	-	-	-	-	-	18	-	-	-	360		18	
M	83	32	-	-	-	-	-	-	-	-	30	2	-	-	1066	27 24	32	
	89	3	10	9	-	-	-	-	-	-	20	1	1	-	733	29 32	22	
	97	37	10	-	-	-	-	-	-	-	47	-	-	-	940	26 35	47	
D	83	2	-	-	-	-	-	-	-	-	1	-	1	-	66		2	
	89	2	2	5	1	-	-	-	-	-	7	-	3	-	333		10	
	97	20	3	-	2	-	-	-	-	-	10	-	-	15	500		25	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	400		20	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			02%			+32%							
'89		39%			19%			08%			-27%							
'97		14%			00%			17%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1665	Dec:	4%				
											'89	2466		14%				
											'97	1800		28%				
<i>Cercocarpus montanus</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	-	-	-	-	-	1	-	-	-	1	-	-	-	20	21 30	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			50%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	40		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4				
Chrysothamnus nauseosus albicaulis									
M	'83	-	-	-	-	-	-	0	
	'89	-	-	-	-	-	-	0	
	'97	1	-	-	-	-	-	20	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
'83		00%		00%		00%		None	
'89		00%		00%		00%		Appeared	
'97		00%		00%		00%			
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-
						'89	0		-
						'97	20		-
Chrysothamnus viscidiflorus viscidiflorus									
Y	'83	-	-	-	-	-	-	0	
	'89	52	-	-	1	-	-	1766	
	'97	46	-	-	-	-	-	920	
M	'83	126	-	-	-	-	-	4200	
	'89	205	-	-	13	-	-	7266	
	'97	297	-	-	-	-	-	5940	
D	'83	3	-	-	-	-	-	100	
	'89	47	-	-	1	-	-	1600	
	'97	21	-	-	-	-	-	420	
X	'83	-	-	-	-	-	-	0	
	'89	-	-	-	-	-	-	0	
	'97	-	-	-	-	-	-	40	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
'83		00%		00%		00%		+60%	
'89		00%		00%		27%		-32%	
'97		00%		00%		02%			
Total Plants/Acre (excluding Dead & Seedlings)						'83	4300	Dec:	2%
						'89	10632		15%
						'97	7280		6%

AGE	Y	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	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	18	-	-	-	-	-	-	-	-	18	-	-	-	360		18	
Y	83	12	-	-	-	-	-	-	-	-	12	-	-	-	400		12	
	89	50	-	-	-	-	-	-	-	-	50	-	-	-	1666		50	
	97	45	-	-	2	-	-	-	-	-	46	-	-	1	940		47	
M	83	68	-	-	-	-	-	-	-	-	68	-	-	-	2266	13 12	68	
	89	161	-	-	-	-	-	-	-	-	159	-	2	-	5366	11 12	161	
	97	272	-	-	-	-	-	-	-	-	272	-	-	-	5440	11 12	272	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	15	-	-	-	-	-	-	-	-	13	-	-	2	500		15	
	97	2	-	-	-	-	-	-	-	-	1	-	-	1	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+65%							
'89		00%			00%			02%			-15%							
'97		00%			00%			.62%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	2666	Dec:	0%			
												'89	7532		7%			
												'97	6420		1%			
Juniperus osteosperma																		
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	47 30	1	
	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33	71 35	1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		00%			50%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	-			
												'89	66		-			
												'97	0		-			

AGE	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Opuntia spp.																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	8	-	-	1	-	-	-	-	-	9	-	-	-	300		9
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5
M	83	14	-	-	-	-	-	-	-	-	11	3	-	-	466	8 17	14
	89	47	-	-	-	-	-	-	-	-	47	-	-	-	1566	8 10	47
	97	36	-	-	-	-	-	4	-	-	40	-	-	-	800	6 13	40
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+75%						
'89		00%			00%			00%			-51%						
'97		00%			00%			02%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	466	Dec:	0%			
											'89	1866		0%			
											'97	920		2%			
Pinus edulis																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-			
											'89	0		-			
											'97	20		-			

AGE	Y	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.		
Purshia tridentata																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	1	-	1	-	-	1	-	-	-	3	-	-	-	100		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	4	-	-	-	-	-	-	-	-	4	-	133	23 37	4	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	-	3	-	-	2	1	-	-	1	7	-	-	-	140	8 27	7	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	1	3	-	-	-	-	-	-	3	-	-	1	133		4	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			80%			80%			+29%							
'89		14%			71%			14%			-40%							
'97		71%			29%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	166	Dec:	0%			
												'89	233		57%			
												'97	140		0%			
Quercus gambelii																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	2	-	-	-	-	-	2	-	-	-	40		2	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	- -	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		33%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	60		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Ribes spp.																	
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'97	2	-	-	-	-	-	-	-	-	-	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>					
	'83	00%			00%			00%				None					
	'89	00%			00%			00%				Appeared					
	'97	00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	40		-		

Trend Study 16A-5-97

Study site name: Nebo Creek .

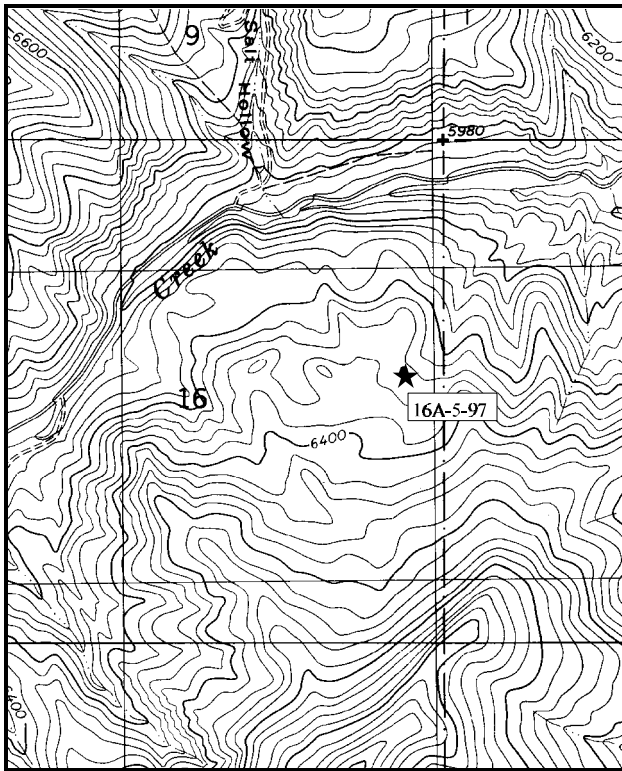
Range Type: Mixed oak-sage

Compass bearing: frequency baseline 226M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

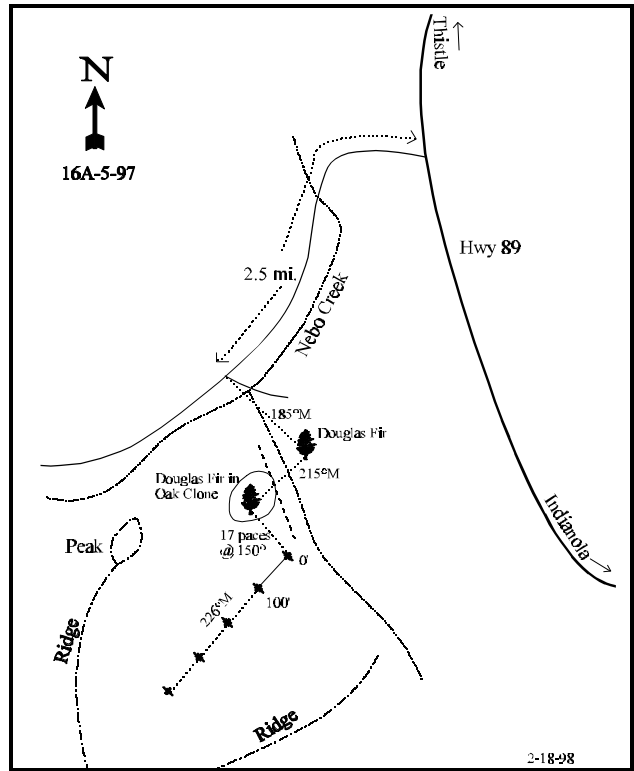
LOCATION DESCRIPTION

Beginning at the intersection of Highway US-89 and the Nebo Creek Road, proceed 2.5 miles westerly up Nebo Creek to where a faint road runs down toward Nebo Creek. From the intersection of the two roads, take an azimuth of 185 degrees M to the top of a lone Douglas fir. Proceed across Nebo Creek and uphill to the Douglas fir tree. From here walk at an azimuth of 215 degrees M up a drainage to a fence-line. From the fence-line, walk 124 paces at the same azimuth to a second but smaller Douglas fir within a clump of oak-brush. From this tree, the 0-foot baseline stake is 17 paces away at an azimuth of 150 degree TRUE. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Spencer Canyon

Township 11S , Range 3E , Section 16



Diagrammatic sketch

UTM 4412674.960 N , 449920.783 E

DISCUSSION

Trend Study No. 16A-5 (25-5)

The Nebo Creek study is located on National Forest land at an elevation of 6,320 feet in the Nebo Creek drainage. It is an area which has high winter or spring-fall use for both deer and elk. Domestic cattle use the area in summer. During severe or even moderate winters, accumulations of snow probably force animals to the lower elevations. Slope on the site is gentle (10%) with an east, southeast aspect. Our observations suggest that spring through fall use is common. During the 1983 reading, numerous fresh deer and elk pellet groups as well as three live deer were observed. In addition, carcasses of two deer and one elk were observed, along with two separate antler drops. Pellet group quadrat frequency in 1997 indicates equally light use of the area by deer, elk and domestic livestock.

Soils in this area are characterized as stony loams. These are calcareous alkaline soils derived from sedimentary alluvium composed primarily of limestone, sandstone or shale. Soil texture is coarse and drainage is rapid with a root zone at least 60 inches deep. Erosion hazard is slight (USDA-SCS 1981). Soil at the site is moderately deep with an effective rooting depth (see methods) estimated at just over 15 inches. Soil texture is a clay loam with a moderately acidic pH of 6.0. Soil temperature was relatively low averaging only 41° F at a depth of 16 inches. There is some large rock cobble found on the surface and throughout the profile. Vegetative and litter cover are abundant and signs of erosion is minimal.

The original study sampled an oak clone in the middle of a sagebrush-grass basin. Oak is also found on some of the slopes surrounding the basin. In 1997, the baseline was lengthened and moved entirely into the sagebrush-grass type. As a result, density of some of the species differs, especially oak. The key browse on the old baseline was Gambel oak. It was a mixed age stand that varied in height from a few inches to a treelike 12 to 15 feet in height. Age structure suggests a stable population. The degree of hedging in 1983 was variable with young plants showing only light use, while available portions of mature individuals were heavily utilized. Presumably, the smaller plants were covered by snow in winter. Use of the oak in 1989 was light. The stand is vigorous with a high (69%) proportion of the population consisting of young plants. With the change in the baseline in 1997, little oak is now sampled.

The area is characterized by a sagebrush-grass type with a mixture of basin big sagebrush (*Artemisia tridentata tridentata*) and mountain big sagebrush (*A. tridentata vaseyana*). Basin big sagebrush is more abundant with an estimated density of 1,080 plants/acre. Mature plants are large and average 40 inches in height. Vigor is normal with no decadent individuals. Mountain big sagebrush numbers just 400 plants/acre. Use of both species is mostly light.

The most common shrub on the site consists of stickyleaf low rabbitbrush which makes up 53% of the shrub cover with a density of 3,540 plants/acre in 1997. The population is nearly all mature (98%), in good vigor, and unutilized. Other shrubs found on the site include a few threadleaf rubber rabbitbrush, prickly pear cactus, and a few heavily hedged serviceberry.

Grasses and forbs are abundant and provide a total of 57% cover. In 1997, nine perennial grasses were encountered providing 25% cover. The most common of these was Kentucky bluegrass and Sandberg bluegrass. Forbs are very abundant and diverse. Thirty-four species were encountered in 1997. These combine to provide 31% total cover. Common species include: peavine, American vetch, blue-eyed Mary, Beckwith milkvetch, stickseed, pacific aster and lambstongue groundsel. These and other species on the site provide important succulent forage.

1983 APPARENT TREND ASSESSMENT

This site appears relatively stable. Ground cover is good, soil erosion is minimal, and vegetative composition is generally favorable. No changes are readily apparent.

1989 TREND ASSESSMENT

The soil trend is up slightly due to an increase in basal vegetative cover and a decline in percent bare ground. Sagebrush in the 1983 report was not divided into basin big sagebrush and mountain big sagebrush. Combined, big sagebrush remained at similar densities. They are lightly to moderately hedged and have normal vigor. The population has a high percentage of decadence, but there is a fair number of seedling and young plants. Sagebrush canopy cover averages 10%. On the density plots, a higher density and larger size of oakbrush was measured in 1989. Low rabbitbrush increased only slightly, and many display very poor vigor. Under the oakbrush, there is a low density of grass. Forbs are limited mainly to a rhizomatous aster. On the frequency lines, an improved diversity of forbs and grasses was sampled. There was a significant increase in the frequency of perennial grasses and forbs, possibly related to the lower amount of cheatgrass in 1989 compared to 1983 and/or no recent livestock use.

TREND ASSESSMENT

soil - up slightly

browse - stable

herbaceous understory - up

1997 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics. The decline in litter cover is related mostly to moving the baseline out of the oak and into the sagebrush-grass type. Trend for sagebrush appears stable with light use, good vigor, and low decadence. There is a large population of the increaser, stickyleaf low rabbitbrush, which is composed almost completely of mature plants which would indicate a stable or possibly a future declining trend. The herbaceous understory is abundant and diverse with many useful species. However, the composition is dominated by weedy species that occur in high densities under heavy grazing pressure. Currently, the grass component is dominated by Kentucky bluegrass, a sod forming increaser. Several species of weedy forbs are also abundant. Data from the previous baseline cannot be used to determine a trend due to the difference in the herbaceous understory composition that is in association with the sagebrush-grass community.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - appears stable, but dominated by weedy increasers

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 5

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	-	-	2	-	-	1	.15
G	Agropyron spicatum	a9	b36	c78	5	15	27	3.05
G	Bromus marginatus	c16	b27	a-	6	10	-	-
G	Bromus tectorum (a)	-	-	131	-	-	48	2.50
G	Elymus cinereus	1	-	5	1	-	2	.97
G	Melica bulbosa	a10	a3	b78	4	1	33	2.05
G	Oryzopsis hymenoides	-	-	1	-	-	1	.03
G	Poa fendleriana	b22	c57	a-	9	26	-	-
G	Poa pratensis	a6	b56	c173	4	22	56	8.10
G	Poa secunda	a34	a26	b154	11	13	52	8.42
G	Sitanion hystrix	-	1	-	-	1	-	-
G	Stipa columbiana	-	-	5	-	-	2	.01
G	Stipa lettermani	-	-	4	-	-	1	.03
Total for Grasses		98	206	634	40	88	224	25.49
F	Achillea millefolium	21	20	17	8	7	7	.88
F	Agoseris glauca	b10	a-	c67	4	-	32	.84
F	Alyssum alyssoides (a)	-	-	6	-	-	3	.04
F	Allium campanulatum	a8	b47	b62	6	20	31	.33
F	Arabis spp.	-	3	-	-	1	-	-
F	Artemisia ludoviciana	7	7	3	2	2	1	.15
F	Astragalus beckwithii	a-	a-	b49	-	-	21	1.82
F	Aster chilensis	a35	ab43	b76	15	15	28	1.86
F	Balsamorhiza sagittata	6	7	8	3	4	4	.73
F	Camelina microcarpa (a)	-	-	36	-	-	17	.13
F	Carduus nutans (a)	-	-	6	-	-	2	.01
F	Chenopodium album (a)	-	-	3	-	-	1	.00
F	Cirsium spp.	a-	b14	b13	-	8	5	.07
F	Collomia linearis (a)	-	-	119	-	-	56	.68
F	Comandra pallida	b37	a-	a-	15	-	-	-
F	Collinsia parviflora (a)	-	-	258	-	-	88	3.96
F	Crepis acuminata	a3	a16	b56	1	8	21	.82

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Cymopterus longipes</i>	3	7	7	1	4	3	.04
F	<i>Cynoglossum officinale</i>	a-	ab6	b12	-	3	5	.17
F	<i>Delphinium bicolor</i>	a-	a-	b5	-	-	4	.04
F	<i>Descurainia pinnata</i> (a)	-	-	10	-	-	5	.06
F	<i>Epilobium paniculatum</i> (a)	-	-	16	-	-	7	.11
F	<i>Eriogonum racemosum</i>	6	1	3	3	1	1	.03
F	<i>Hackelia patens</i>	a16	a41	b72	7	16	28	2.07
F	<i>Hymenoxys acaulis</i>	-	-	2	-	-	1	.30
F	<i>Lathyrus brachycalyx</i>	b97	a54	c172	42	25	57	9.14
F	<i>Lactuca serriola</i>	a-	b13	b18	-	6	8	.38
F	<i>Lithospermum ruderales</i>	1	6	10	1	3	4	.48
F	<i>Lupinus caudatus</i>	8	5	4	4	2	2	.06
F	<i>Machaeranthera canescens</i>	-	2	-	-	1	-	-
F	<i>Phlox longifolia</i>	a-	c88	b17	-	44	6	.08
F	<i>Polygonum douglasii</i> (a)	-	-	17	-	-	7	.06
F	<i>Ranunculus testiculatus</i> (a)	-	-	28	-	-	10	.15
F	<i>Senecio integerrimus</i>	a-	a1	b36	-	1	17	1.08
F	<i>Sphaeralcea coccinea</i>	-	3	-	-	1	-	-
F	<i>Taraxacum officinale</i>	a12	b40	b46	7	22	23	.38
F	<i>Tragopogon dubius</i>	26	14	16	14	9	10	.15
F	<i>Veronica biloba</i> (a)	-	-	17	-	-	6	.27
F	<i>Vicia americana</i>	a10	b52	c106	6	22	38	3.71
F	<i>Viguiera multiflora</i>	-	3	-	-	1	-	.03
Total for Forbs		306	493	1390	139	226	558	31.03

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 5

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	1	.03
B	Artemisia tridentata tridentata	37	3.98
B	Artemisia tridentata vaseyana	15	2.98
B	Chrysothamnus nauseosus consimilis	1	.15
B	Chrysothamnus viscidiflorus viscidiflorus	72	8.75
B	Gutierrezia sarothrae	0	.00
B	Opuntia spp.	3	.06
B	Quercus gambelii	1	.63
Total for Browse		130	16.59

BASIC COVER --

Herd unit 16A , Study no: 5

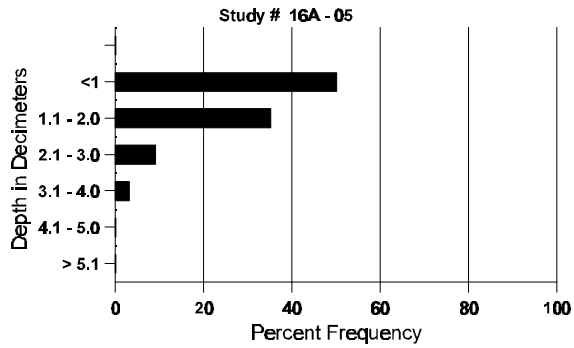
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	385	0	3.00	61.17
Rock	84	.50	1.50	1.88
Pavement	156	.25	2.00	1.65
Litter	396	88.00	84.75	55.32
Cryptogams	56	0	.25	.54
Bare Ground	209	11.25	8.50	8.40

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 05

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.2	41.0 (13.3)	6.0	34.7	34.7	30.6	3.5	39.6	320.0	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 5

Type	Quadrat Frequency '97
Elk	4
Deer	7
Cattle	5

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 5

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4								
Amelanchier alnifolia													
M	83	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	1	-	-	-	-	-	20	29	43	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		00%		00%		00%		None					
'89		00%		00%		00%		Appeared					
'97		00%		100%		00%							
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-				
						'89	0		-				
						'97	20		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total										
		1	2	3	4		1	2											
Artemisia tridentata tridentata																			
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	2	-	-	-	-	-	-	-	2	-	-	-	133		2			
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1			
Y	83	1	-	-	-	-	-	-	-	1	-	-	-	66		1			
	89	3	-	-	2	-	-	-	-	5	-	-	-	333		5			
	97	9	-	-	-	-	-	-	-	9	-	-	-	180		9			
M	83	14	5	-	-	-	-	-	-	19	-	-	-	1266	28 38	19			
	89	-	1	-	-	-	-	-	-	1	-	-	-	66	22 21	1			
	97	44	-	-	1	-	-	-	-	45	-	-	-	900	40 47	45			
D	83	6	3	-	-	-	-	-	-	9	-	-	-	600		9			
	89	4	2	1	-	-	-	-	-	5	-	1	1	466		7			
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	-	-	-	-	-	-	-	-	-	-	-	-	480		24			
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>						<u>%Change</u>							
'83		28%		00%		00%						-55%							
'89		23%		08%		15%						+20%							
'97		00%		00%		00%													
Total Plants/Acre (excluding Dead & Seedlings)												'83		1932		Dec:		31%	
												'89		865				54%	
												'97		1080				0%	

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	-	-	-	-	-	-	-	-	-	-	-	200			3
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	1	-	-	-	-	-	-	-	-	-	-	66			1
	97	5	-	-	-	-	-	-	-	-	-	-	-	100			5
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	3	1	-	1	-	-	-	-	-	-	-	-	333	49	34	5
	97	11	1	-	1	-	-	-	-	-	-	-	-	260	27	39	13
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	3	3	-	-	-	-	-	-	-	-	-	-	400			6
	97	2	-	-	-	-	-	-	-	-	-	-	-	40			2
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	100			5
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>				<u>%Change</u>							
'83		00%		00%		00%				Appeared							
'89		42%		00%		00%				-50%							
'97		05%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83		0		Dec:		0%	
										'89		799				50%	
										'97		400				10%	
<i>Chrysothamnus nauseosus consimilis</i>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20	37	41	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>				<u>%Change</u>							
'83		00%		00%		00%				None							
'89		00%		00%		00%				Appeared							
'97		00%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83		0		Dec:		-	
										'89		0				-	
										'97		20				-	

AGE	Y	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																		
Y	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	'89	3	-	-	1	-	-	-	-	-	2	-	2	-	266			4
	'97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	'83	24	-	-	-	-	-	-	-	-	24	-	-	-	1600	16	18	24
	'89	15	-	-	2	-	-	1	-	-	15	-	3	-	1200	15	19	18
	'97	173	-	-	-	-	-	-	-	-	173	-	-	-	3460	17	23	173
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	7	-	-	-	-	-	-	-	-	-	-	6	1	466			7
	'97	3	-	-	-	-	-	-	-	-	-	-	-	3	60			3
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+14%							
'89		00%			00%			41%			+45%							
'97		00%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1666	Dec:	0%			
												'89	1932		24%			
												'97	3540		2%			
Juniperus osteosperma																		
M	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	67	79	1
	'89	-	-	1	-	-	-	-	-	-	1	-	-	-	66	128	87	1
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		00%			100%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	-			
												'89	66		-			
												'97	0		-			

A G R E	Y E A R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	8	-	-	-	-	-	-	-	-	8	-	-	-	533		8	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	8	-	-	-	-	-	-	-	-	8	-	-	-	533	6	6	8
	89	8	-	-	2	-	-	-	-	-	10	-	-	-	666	5	8	10
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	5	12	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+56%							
'89		00%			00%			00%			-93%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	533	Dec:	-			
												'89	1199		-			
												'97	80		-			
Quercus gambelii																		
S	83	7	-	-	-	-	-	-	-	-	7	-	-	-	466		7	
	89	8	-	-	-	-	-	-	-	-	8	-	-	-	533		8	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	23	-	-	-	-	-	-	-	-	23	-	-	-	1533		23	
	89	70	5	-	8	-	-	9	-	-	91	1	-	-	6133		92	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	9	57	-	9	3	-	-	-	78	-	-	-	5200	43	18	78
	89	25	13	-	-	-	-	-	-	-	38	-	-	-	2533	85	36	38
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	21	12	3
D	83	-	-	1	-	-	-	-	-	-	1	-	-	-	66		1	
	89	1	2	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		18%			60%			00%			+23%							
'89		15%			00%			00%			-99%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	6799	Dec:	1%			
												'89	8866		2%			
												'97	60		0%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Symphoricarpos oreophilus																	
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	1	-	-	-	-	-	-	-	-	-	-	-	66		1	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>					
	'83	00%			00%			00%				None					
	'89	00%			00%			00%				None					
	'97	00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	0		-		

Trend Study 16A-6-97

Study site name: Hop Creek Browse Transect .

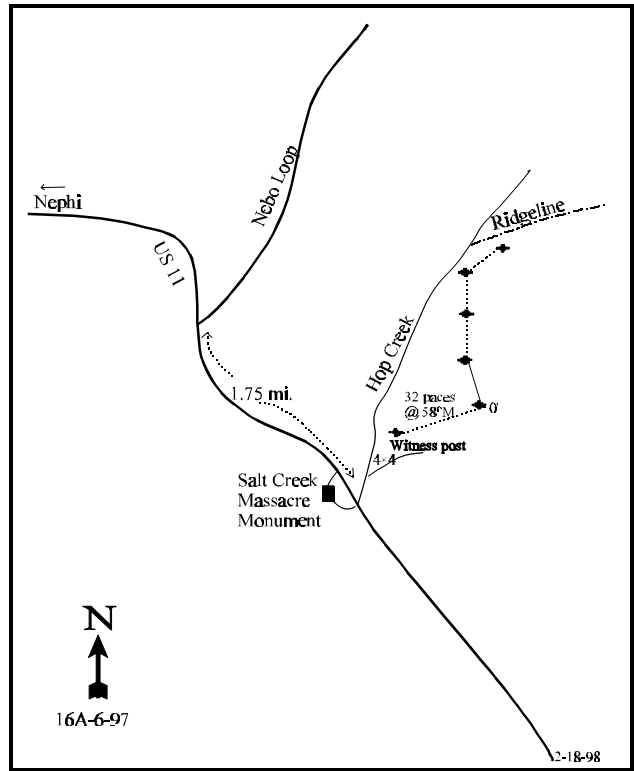
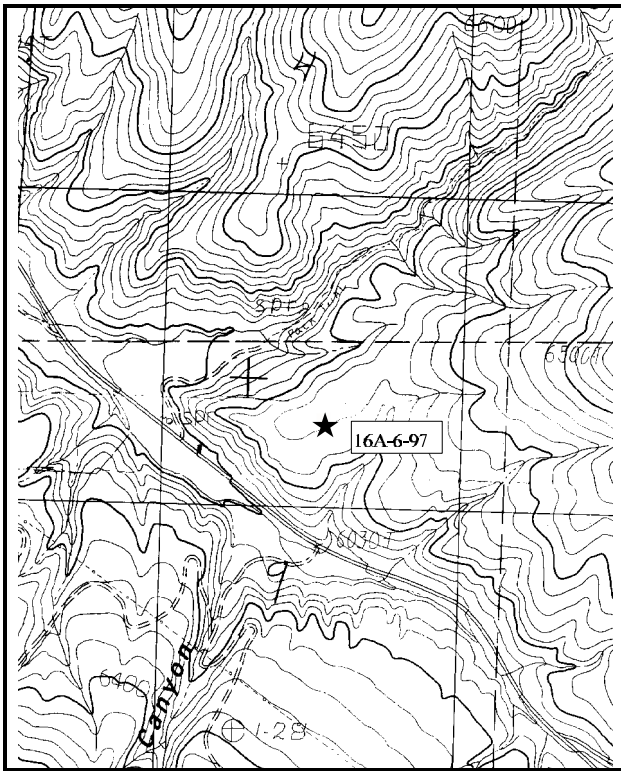
Range type: Antelope Bitterbrush.

Compass bearing: frequency baseline 163 M degrees. (Line 2-3 1°M, line 4 45°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of Highway 132 and the Nebo Loop Road proceed south on Highway 132 for 1.75 miles. Stop at a turnoff on the north side of the road, just past the Salt Creek Massacre Monument. Drive up the left fork of a four-wheel drive road 0.28 miles to a witness post. From the witness post walk 32 paces at 58°M to the 0-foot stake. The 0-foot baseline stake is located 2 paces to the east of an Antelope bitterbrush with a browse tag, number E1318, attached. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Fountain Green North, Utah .

Diagrammatic Sketch

Township 13 S , Range 2 E , Section 9

UTM 4395285.211 N , 439551.351 E

DISCUSSION

Trend Study No. 16A-6 (25-6)

The Hop Creek Browse study is located adjacent to the Hop Creek browse (i.e., bitterbrush) transect on the broad ridge top. This area is an important wintering area for both deer and elk. Abundant evidence (pellet groups, antler drops, etc.) of big game was found in 1983. Quadrat frequency from 1997 indicate moderate amounts of both deer and elk pellet groups at 34% and 24% respectively. The area has a gentle slope (3% to 5%) to the south, southeast and an elevation of 6,300 feet. Vegetative composition is dominated by a mixed stand of mountain big sagebrush and antelope bitterbrush in association with a moderately diverse and vigorous herbaceous understory.

Soil is alluvial, very rocky, and appears well drained. Parent material is sedimentary rock, principally limestone. Effective rooting depth (see methods) is estimated at just over 20 inches. Soil texture is a clay loam with a neutral pH of 6.9. Percent organic matter is adequate, but phosphorus may be a limiting factor at only 9.6 ppm. A caliche layer was found about 10 to 12 inches in depth. However, the abundance of deeper rooted bitterbrush would suggest that the layer is relatively permeable. Rocks and pavement are uncommon on the surface. There are localized areas of bare ground which show signs of some soil movement. However, protective ground cover appears to be sufficient to prevent most erosion.

The browse composition consists chiefly of mountain big sagebrush which currently accounts for 68% of the browse cover. The more preferred antelope bitterbrush occurs in much smaller numbers and is more heavily utilized. The sagebrush population currently numbers approximately 2,380 plants/acre. Plants are relatively large and vigorous with low percent decadence and light to moderate use. Recruitment is good with 32% of the population consisting of young plants. Bitterbrush has a population density of only 540 plants/acre yet produces 22% of the browse cover. Its density has remained similar to the initial 1983 estimates (533 plants/acre). Bitterbrush on the site are large, erect, and vigorous with a low percent decadency of 7%. Use has typically been heavy with 100% of the plants sampled in 1983 displaying heavy use. Currently, 70% of the bitterbrush are classified as heavily browsed. Recruitment is poor with no seedlings or young sampled prior to 1997, but they are a relatively long-lived species compared to sagebrush.

The herbaceous understory is diverse and productive. Seven perennial grass species combine to produce just under 20% cover. Of these, Kentucky bluegrass and bluebunch wheatgrass are the most common. Western wheatgrass, mutton bluegrass, Sandberg bluegrass, and needle-and-thread grass are also fairly common. Forbs are diverse yet not particularly abundant. Common perennial species include pacific aster, bastard toadflax, Indian paintbrush, tapertip hawksbeard, and blue flax.

1983 APPARENT TREND ASSESSMENT

Soil trend appears stable on the ridge top, but is declining where the slope becomes steeper. On this soil type, a dense and uniform ground cover is necessary to prevent erosion. Given the dry character of this site, a dense herbaceous understory may not be possible. Vegetative trend is stable to declining. Mountain big sagebrush and western wheatgrass (a sod former) are both increasing while antelope bitterbrush is stable or even declining. Lack of reproduction may be the problem. Spring or early summer livestock grazing to reduce grass vigor might be an advisable management practice on this site.

1989 TREND ASSESSMENT

Soil trend appears slightly up. There was an increase in basal vegetative cover detected, and a corresponding

decrease in the percentage of bare soil. The stand of large and generally vigorous mountain big sagebrush shows a decline of 17% in density. Fewer mature sagebrush were counted in 1989, while there was an increase in the percentage of decadence from 12% to 33%. Hedging is mostly light. The less common bitterbrush tends to be heavily hedged. There were fewer bitterbrush counted in 1989, but heavy use declined from 100% in 1983 to 50% in 1989. Vigor also improved dramatically. Nested frequency of western wheatgrass increased while nested frequency of bluebunch wheatgrass and Kentucky bluegrass declined. Fewer sego lily and toadflax were counted, otherwise composition is similar and the data show slight declines in total forb frequency in 1989.

TREND ASSESSMENT

soil - up slightly

browse - stable

herbaceous understory - stable

1997 TREND ASSESSMENT

The soil trend appears stable with similar amounts of bare ground encountered. Litter cover declined while sum of nested frequency of perennial herbaceous plants increased. Trend for browse is also stable. Density of big sagebrush has remained similar to 1989 estimates. Use is mostly light, vigor good, and percent decadence moderately low at only 15%. Bitterbrush also displays a stable trend. Density is similar to 1983 estimates and percent decadence has declined from a high of 33% in 1989 to only 7% currently. The shrubs are still heavily hedged with 70% of the bitterbrush sampled displaying a heavily hedged growth form. A few seedlings and young were encountered this year. Trend for the herbaceous understory is up with an increase in the sum of nested frequency for perennial grasses and forbs. Nested frequency of Kentucky bluegrass and bluebunch wheatgrass increased significantly while nested frequency of western wheatgrass declined. Nearly all of the perennial forbs encountered in 1989 show increased frequencies.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - up

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 6

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron smithii	b ₁₉₄	b ₂₀₅	a ₁₂₃	75	73	45	1.57
G	Agropyron spicatum	a ₁₃₅	a ₉₂	b ₁₇₃	53	33	59	5.03
G	Bromus tectorum (a)	-	-	65	-	-	24	.67
G	Festuca ovina	-	-	1	-	-	1	.03
G	Melica bulbosa	a ₁₅	b ₃₆	a ₉	6	13	3	.21
G	Poa fendleriana	a ₅₀	b ₉₄	ab ₇₁	22	40	30	1.61
G	Poa pratensis	a ₇₄	a ₅₀	b ₁₇₂	23	15	55	7.65
G	Poa secunda	a ₃₅	a ₃₉	b ₈₄	16	22	31	2.47
G	Stipa comata	ab ₅₉	b ₅₃	a ₃₆	24	25	16	1.04

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
	Total for Grasses	562	569	734	219	221	264	20.32
F	<i>Achillea millefolium</i>	-	1	-	-	1	-	-
F	<i>Agoseris glauca</i>	a-	a-	b22	-	-	9	.11
F	<i>Alyssum alyssoides</i> (a)	-	-	120	-	-	42	.51
F	<i>Allium</i> spp.	-	2	-	-	1	-	.00
F	<i>Antennaria rosea</i>	1	7	5	1	2	2	.03
F	<i>Arabis</i> spp.	-	-	1	-	-	1	.00
F	<i>Aster chilensis</i>	a2	ab13	b25	2	6	8	1.18
F	<i>Astragalus convallarius</i>	a23	b55	a9	10	25	5	.10
F	<i>Astragalus</i> spp.	-	-	1	-	-	1	.03
F	<i>Castilleja linariaefolia</i>	a4	a-	b31	2	-	14	.56
F	<i>Camelina microcarpa</i> (a)	-	-	8	-	-	4	.02
F	<i>Calochortus nuttallii</i>	b35	a3	a10	20	1	6	.03
F	<i>Chaenactis douglasii</i>	-	-	2	-	-	2	.01
F	<i>Cirsium undulatum</i>	a3	a3	b18	2	3	8	.23
F	<i>Collomia linearis</i> (a)	-	-	45	-	-	20	.12
F	<i>Conringia orientalis</i> (a)	1	-	-	1	-	-	-
F	<i>Comandra pallida</i>	b123	a51	b91	56	25	44	.91
F	<i>Collinsia parviflora</i> (a)	-	-	171	-	-	62	1.26
F	<i>Crepis acuminata</i>	a1	a5	b45	1	4	27	.48
F	<i>Cymopterus longipes</i>	a-	a6	b50	-	3	26	.35
F	<i>Descurainia pinnata</i> (a)	-	-	3	-	-	1	.00
F	<i>Draba</i> spp. (a)	-	-	3	-	-	1	.00
F	<i>Epilobium paniculatum</i> (a)	-	-	38	-	-	15	.07
F	<i>Eriogonum racemosum</i>	5	3	1	3	1	1	.00
F	<i>Eriogonum umbellatum</i>	-	3	3	-	2	2	.06
F	<i>Erysimum</i> spp.	-	-	1	-	-	1	.00
F	<i>Lactuca serriola</i>	-	4	3	-	3	1	.00
F	<i>Linum lewisii</i>	a25	a3	b91	11	2	38	.62
F	<i>Lupinus</i> spp.	-	-	2	-	-	1	.38
F	<i>Microsteris gracilis</i> (a)	-	-	8	-	-	3	.01
F	<i>Phlox longifolia</i>	a-	b11	c38	-	5	15	.07
F	<i>Polygonum douglasii</i> (a)	-	-	3	-	-	2	.01

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Ranunculus testiculatus (a)	-	-	74	-	-	26	.52
F	Sphaeralcea coccinea	-	7	3	-	2	1	.00
F	Tragopogon dubius	13	10	16	7	4	10	.10
F	Zigadenus paniculatus	_a 5	_a -	_b 24	2	-	10	.22
Total for Forbs		241	187	965	118	90	409	8.13

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

BROWSE TRENDS --

Herd unit 16A , Study no: 6

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	4	.15
B	Artemisia tridentata vaseyana	55	9.17
B	Chrysothamnus viscidiflorus viscidiflorus	10	.18
B	Gutierrezia sarothrae	14	.07
B	Juniperus osteosperma	0	.85
B	Purshia tridentata	22	2.97
B	Tetradymia canescens	3	.03
Total for Browse		108	13.44

BASIC COVER --

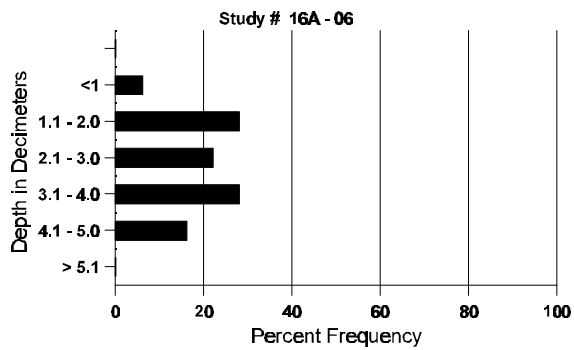
Herd unit 16A , Study no: 6

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	379	4.75	11.75	44.00
Rock	31	.25	.25	.19
Pavement	154	.50	0	1.93
Litter	399	71.25	69.75	51.30
Cryptogams	111	1.25	1.50	4.62
Bare Ground	235	22.00	16.75	17.71

SOIL ANALYSIS DATA --
 Herd Unit 16A, Study no: 06

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
20.2	44.0 (17.6)	6.9	42.4	27.1	30.6	3.2	9.6	67.2	.6

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16A , Study no: 6

Type	Quadrat Frequency '97
Rabbit	4
Elk	24
Deer	34

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 6

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Amelanchier alnifolia																	
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	'97	-	3	-	-	-	-	-	-	-	3	-	-	-	60	30 31	3
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'97	-	1	-	-	-	-	-	-	-	-	-	-	1	20		1
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			Appeared						
'97		80%			00%			20%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%		
												'89	0		0%		
												'97	100		20%		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Artemisia tridentata vaseyana</i>												
S	83	3	-	-	-	-	-	-	3	200		3
	89	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	2	40		2
Y	83	9	1	-	-	-	-	-	10	666		10
	89	8	-	-	2	-	-	-	10	666		10
	97	38	-	-	-	-	-	-	38	760		38
M	83	29	2	-	-	-	-	-	31	2066	31 36	31
	89	11	4	1	-	-	-	-	13	1066	29 33	16
	97	32	28	3	-	-	-	-	63	1260	33 45	63
D	83	4	2	-	-	-	-	-	5	400		6
	89	7	5	1	-	-	-	-	11	866		13
	97	6	5	2	-	-	-	-	4	360		18
X	83	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	620		31
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>				<u>%Change</u>				
'83		11%	00%	00%				-17%				
'89		23%	05%	08%				- 8%				
'97		28%	04%	07%								
Total Plants/Acre (excluding Dead & Seedlings)								'83	3132	Dec:	13%	
								'89	2598		33%	
								'97	2380		15%	
<i>Chrysothamnus nauseosus consimilis</i>												
Y	83	1	-	-	-	-	-	-	1	66		1
	89	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>				<u>%Change</u>				
'83		00%	00%	00%				Died out				
'89		00%	00%	00%				None				
'97		00%	00%	00%								
Total Plants/Acre (excluding Dead & Seedlings)								'83	66	Dec:	-	
								'89	0		-	
								'97	0		-	

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	8	10	1
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	10	14	1
	'97	15	-	-	-	-	-	-	-	-	15	-	-	-	300	13	22	15
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'83	00%			00%			00%			+ 0%							
	'89	00%			00%			00%			+78%							
	'97	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	66	Dec:	-				
											'89	66		-				
											'97	300		-				
<i>Gutierrezia sarothrae</i>																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	'97	15	-	-	-	-	-	-	-	-	15	-	-	-	300			15
M	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	11	19	1
	'89	9	-	-	-	-	-	-	-	-	9	-	-	-	600	8	6	9
	'97	25	-	-	-	-	-	-	-	-	25	-	-	-	500	7	7	25
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	'97	2	-	-	-	-	-	-	-	-	-	-	2	40			2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'83	00%			00%			00%			+92%							
	'89	00%			00%			00%			- 3%							
	'97	00%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	66	Dec:	0%				
											'89	866		8%				
											'97	840		5%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Purshia tridentata</i>												
S	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	40		2	
Y	83	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	0		0	
	97	-	1	-	-	-	-	-	20		1	
M	83	-	-	6	-	-	-	-	400	44	38	6
	89	-	3	1	-	-	-	-	266	38	44	4
	97	4	3	14	-	-	3	-	480	38	54	24
D	83	-	-	2	-	-	-	-	133			2
	89	-	-	2	-	-	-	-	133			2
	97	-	-	1	-	-	1	-	40			2
X	83	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	0			0
	97	-	-	2	-	-	-	-	80			4
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		100%		88%		-25%				
'89		50%		50%		00%		+26%				
'97		15%		70%		11%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	533	Dec:	25%			
						'89	399		33%			
						'97	540		7%			
<i>Tetradymia canescens</i>												
Y	83	-	-	-	-	-	-	-	0		0	
	89	2	-	-	-	-	-	-	133		2	
	97	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	80	14	11	4
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		Appeared				
'89		00%		00%		00%		-40%				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-			
						'89	133		-			
						'97	80		-			

Trend Study 16A-7-97

Study site name: Willow Creek .

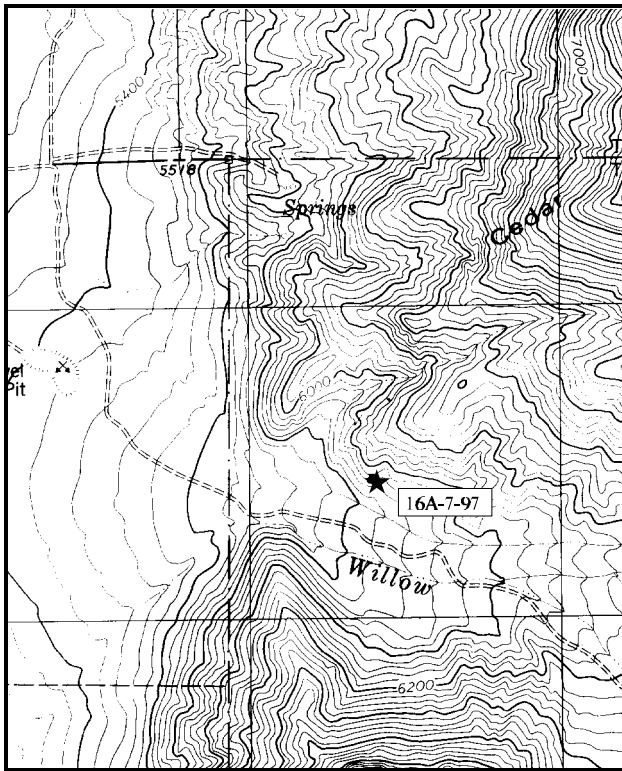
Range type: Stansbury Cliffrose

Compass bearing: frequency baseline 0 degrees.

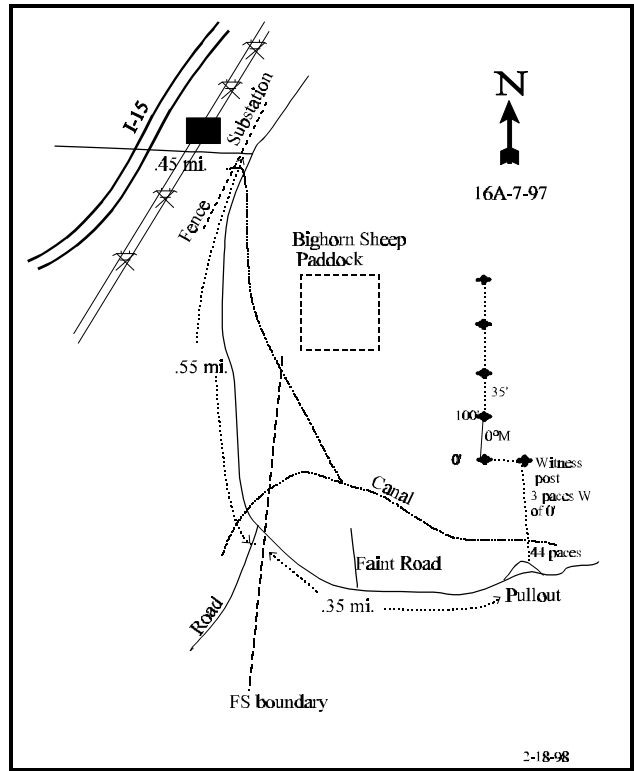
First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Beginning at the east side of the underpass where Cemetery Road passes over I-15 southeast of Mona, proceed east for 0.45 miles to an intersection. Take the right fork and proceed 0.65 miles to another intersection. Take the left fork 0.35 miles and stop. From this point, walk 30 paces north to an irrigation canal. Cross the canal and walk 44 paces to a witness post. The O-foot baseline stake is 3 paces west of the witness post. It is a green fencepost with a red browse tag, number 3958, attached. The baseline runs at an azimuth of 0 degrees magnetic.



Map Name: Mona, Utah .



Diagrammatic Sketch

Township 12 S , Range 1 E , Section 3

DISCUSSION

Trend Study No. 16A-7 (25-7)

The Willow Creek study is located on a steep (30%-40%) south facing slope at the mouth of Willow Creek, an area considered critical deer and elk winter range. The study area is within the Uinta National Forest, however, unfenced private land lies immediately to the west. Elevation is approximately 5,880 feet. The range type is Stansbury cliffrose. Quadrat frequency of elk pellet groups was moderately high at 32% with deer somewhat lower at only 11% in 1997.

Soils on the site are very rocky and loose. Parent material is limestone. The soil surface appeared highly eroded with abundant bare ground (21%) and pavement (12%) in 1983 when the study was established. Currently, percent bare ground is 12% with pavement increasing to 16%. Soil pedestalling is common, but erosion appears localized. Effective rooting depth (see methods) is estimated at approximately 17 inches. Soil texture is a sandy loam with a neutral pH of 7.0. Organic matter is limited at only 1.8%. Phosphorus may also be a limiting factor to plant growth with a value of only 6.4 ppm. Anything less than 10 ppm can be limiting to plant development.

Stansbury cliffrose is the key browse species with a population density estimated at 1,900 plants/acre in 1997 providing 88% of the total browse cover. The population is mature and relatively tall, averaging over 4 feet in height. Recruitment is poor and currently 99% of the population consists of mature plants. Decadency is low at only 1%; however, this species is long lived making recruitment not as critical as it would be for sagebrush. Use has been moderate to heavy. Percentage of plants showing heavy use has declined through the years from 38% initially, to where it is currently at 22%.

Other preferred shrubs found on the site include small numbers of mountain big sagebrush, fourwing saltbush, white rubber rabbitbrush, and bitterbrush. Broom snakeweed, an undesirable increaser, is abundant and currently appears to be increasing with half of the population consisting of young plants.

The herbaceous understory is dominated by cheatgrass which accounts for 62% of herbaceous cover. A wildfire in this plant community would cause the loss of the cliffrose, the key browse for the site. Perennial forbs are rare. The only common perennial grass is bluebunch wheatgrass which only makes up 15% of the herbaceous cover.

1983 APPARENT TREND ASSESSMENT

Soil condition is poor and trend is declining. The relatively high rate of erosion is a fundamental problem on this site. Vegetative trend appears stable, at least for the short term. However, if cliffrose is unable to reproduce satisfactorily, a slow decline in density could occur. Herbaceous composition and density are poor. Cheatgrass is overabundant and constitutes a potential fire hazard. Bluebunch wheatgrass production could be considerably better.

1989 TREND ASSESSMENT

Ground cover data noted an increase in the percentage of basal vegetative cover and less bare soil in 1989. However, litter cover declined and pavement cover increased to 30%. Trend is considered stable yet condition is poor with a high erosion hazard due to the steep, rocky slope. While broom snakeweed was the most abundant browse species, the key forage species is cliffrose which increased slightly in number on the density plots. However, more of the shrubs were classified as decadent in 1989 and there were actually fewer mature cliffrose

per acre estimated. The cliffrose show moderate to heavy use, yet they have good vigor. Ten percent of the population was classified as young. Populations of the other, less common, browse species are stable. There were no significant changes in the composition or frequency of the herbaceous understory. A few different species of grasses and forbs were identified in 1989, but the major species remain bluebunch wheatgrass, low fleabane, and scarlet globemallow.

TREND ASSESSMENT

- soil - stable
- browse - stable
- herbaceous understory - stable

1997 TREND ASSESSMENT

Trend for soil is stable with a slight increase in percent bare ground (to only 12%) and a decline in pavement cover. Some erosion is still occurring. Trend for cliffrose is stable. The increase in density from 1,035 plants/acre in 1989 to 1,900 in 1997 is due to the much larger sample used that year which gives better estimates for shrubs that have discontinuous distributions. Use is moderate to heavy, while vigor is normal and percent decadency low at only 1%. The undesirable broom snakeweed appears to be increasing. Trend for the herbaceous understory is down slightly due to a decline in the nested frequency of bluebunch wheatgrass which is the most numerous preferred perennial grass found on the site. Perennial forbs are rare.

TREND ASSESSMENT

- soil - stable, but poor condition
- browse - stable for cliffrose, the key browse species
- herbaceous understory - down slightly, poor condition with the majority of the cover contributed by cheatgrass

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 7

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	_b 198	_b 191	_a 132	71	76	54	4.17
G	Bromus tectorum (a)	-	-	354	-	-	98	17.42
G	Festuca myuros (a)	-	-	6	-	-	2	.03
G	Poa bulbosa	_a -	_b 10	_c 32	-	5	11	1.23
G	Poa secunda	_a -	_b 12	_c 27	-	5	11	.13
Total for Grasses		198	213	551	71	86	176	22.99
F	Alyssum alyssoides (a)	-	-	291	-	-	90	3.07
F	Artemisia ludoviciana	5	6	6	2	3	2	.06
F	Astragalus utahensis	2	5	11	2	5	5	.24
F	Camelina microcarpa (a)	-	-	3	-	-	1	.00
F	Calochortus nuttallii	1	-	-	1	-	-	-
F	Cerastium spp.	-	3	-	-	1	-	-

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Cirsium vulgare</i>	1	6	-	1	3	-	-
F	<i>Cryptantha</i> spp.	4	2	-	2	1	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	8	-	-	5	.03
F	<i>Eriogonum brevicaule</i>	3	4	7	1	2	3	.06
F	<i>Erodium cicutarium</i> (a)	-	-	35	-	-	21	.18
F	<i>Erigeron pumilus</i>	_b 34	_b 47	_a -	16	19	-	-
F	<i>Galium aparine</i> (a)	-	-	8	-	-	3	.01
F	<i>Hackelia patens</i>	_a -	_a -	_b 6	-	-	4	.02
F	<i>Lactuca serriola</i>	-	-	1	-	-	1	.00
F	<i>Leucelene ericoides</i>	_a -	_a -	_b 14	-	-	8	.26
F	<i>Lygodesmia grandiflora</i>	_b 9	_a -	_a -	4	-	-	-
F	<i>Oenothera</i> spp.	-	-	1	-	-	1	.03
F	<i>Phlox longifolia</i>	-	4	3	-	3	2	.01
F	<i>Sphaeralcea coccinea</i>	_a 8	_{ab} 14	_b 26	3	5	9	.98
F	<i>Taraxacum officinale</i>	-	-	3	-	-	1	.00
Total for Forbs		67	91	423	32	42	156	4.98

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

BROWSE TRENDS --

Herd unit 16A , Study no: 7

Type	Species	Strip Frequency '97	Average Cover % '97
B	<i>Artemisia tridentata</i> <i>vaseyana</i>	2	.53
B	<i>Chrysothamnus nauseosus</i> <i>albicaulis</i>	13	1.04
B	<i>Cowania mexicana</i> <i>stansburiana</i>	21	14.32
B	<i>Gutierrezia sarothrae</i>	27	.39
Total for Browse		63	16.29

BASIC COVER --

Herd unit 16A , Study no: 7

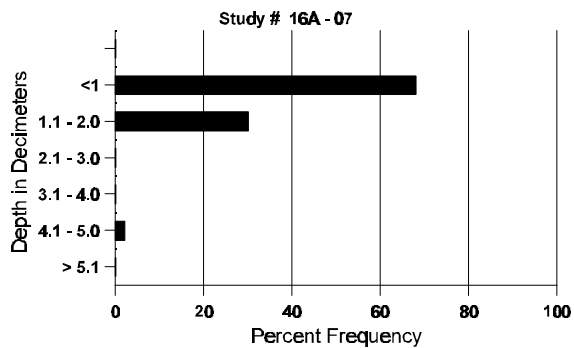
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	378	1.25	8.75	40.62
Rock	240	4.00	8.00	7.40
Pavement	293	11.50	29.75	15.57
Litter	389	62.25	44.75	40.29
Cryptogams	15	0	0	.14
Bare Ground	218	21.00	8.75	12.06

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 07

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.4	54.8 (14.6)	7.0	58.4	25.1	16.6	1.8	6.4	38.4	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 7

Type	Quadrat Frequency '97
Elk	32
Deer	11

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 7

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
<i>Artemisia tridentata vaseyana</i>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	-	-	-	-	-	-	2	-	-	-	40	28	50	2
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	480			24
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%		None									
'89		00%		00%		00%		Appeared									
'97		50%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-				
										'89	0		-				
										'97	40		-				
<i>Atriplex canescens</i>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	1	-	-	-	-	-	-	-	1	-	-	-	33	43	39	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	59	46	0
D	83	1	-	-	-	-	-	-	-	-	-	1	-	33			1
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		100%		+ 0%									
'89		00%		00%		00%		Died out									
'97		00%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	33	Dec:	100%				
										'89	33		0%				
										'97	0		0%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
Brickellia spp.												
Y	83	-	-	-	-	-	-	-	0	-	0	
	89	3	-	-	-	-	-	-	100	-	3	
	97	-	-	-	-	-	-	-	0	-	0	
M	83	-	-	-	-	-	-	-	0	-	0	
	89	17	-	-	-	-	-	-	566	6	5	17
	97	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		Appeared				
'89		00%		00%		00%		Died out				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-			
						'89	666		-			
						'97	0		-			
Chrysothamnus nauseosus												
M	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	-	-	-	-	0	20	35	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		None				
'89		00%		00%		00%		None				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-			
						'89	0		-			
						'97	0		-			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus nauseosus albicaulis																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66	31	51	2
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	41	31	1
	97	4	3	5	-	-	2	-	-	-	14	-	-	-	280	32	56	14
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		00%			00%			00%			+79%							
'97		31%			44%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	66	Dec:	0%				
											'89	66		50%				
											'97	320		0%				
Chrysothamnus viscidiflorus viscidiflorus																		
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	14	17	1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Died out							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	33	Dec:	-				
											'89	0		-				
											'97	0		-				

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Cowania mexicana stansburiana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	-	-	1	-	-	-	-	-	-	1	-	-	-	33		1	
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	8	6	10	-	-	-	-	2	-	26	-	-	-	866	52	53	26
	89	1	6	7	2	-	-	-	-	-	16	-	-	-	533	81	84	16
	97	72	2	15	-	-	5	-	-	-	22	-	-	-	1880	56	66	94
D	83	1	-	-	-	-	-	-	1	-	1	-	1	-	66		2	
	89	2	6	3	1	-	-	-	-	-	12	-	-	-	400		12	
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	100		5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		21%			38%			03%			+ 7%							
'89		39%			32%			00%			+46%							
'97		02%			22%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	965	Dec:	7%			
												'89	1033		39%			
												'97	1900		1%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
<i>Gutierrezia sarothrae</i>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	44	-	-	-	-	-	-	-	44	-	-	-	880		44	
M	83	8	-	-	-	-	-	-	-	8	-	-	-	266	13 14	8	
	89	16	-	-	-	-	-	-	-	15	-	1	-	533	8 10	16	
	97	44	-	-	-	-	-	-	-	44	-	-	-	880	11 11	44	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	-	-	-	1	33		1	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%		+53%									
'89		00%		00%		12%		+68%									
'97		00%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	266	Dec:	0%				
										'89	566		6%				
										'97	1780		1%				
<i>Purshia tridentata</i>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	78 194	0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%		None									
'89		00%		00%		00%		None									
'97		00%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-				
										'89	0		-				
										'97	0		-				

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Quercus gambelii</i>																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	29	45	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
<i>Rhus trilobata trilobata</i>																		
Y	'83	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	'83	2	-	-	-	-	-	-	-	-	2	-	-	-	66	24	24	2
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	28	30	1
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	3	-	-	-	-	-	-	-	-	-	-	3	-	100			3
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-20%							
'89		00%			00%			75%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	166	Dec:	0%			
												'89	133		75%			
												'97	0		0%			

Trend Study 16A-8-97

Study site name: Gardner Canyon .

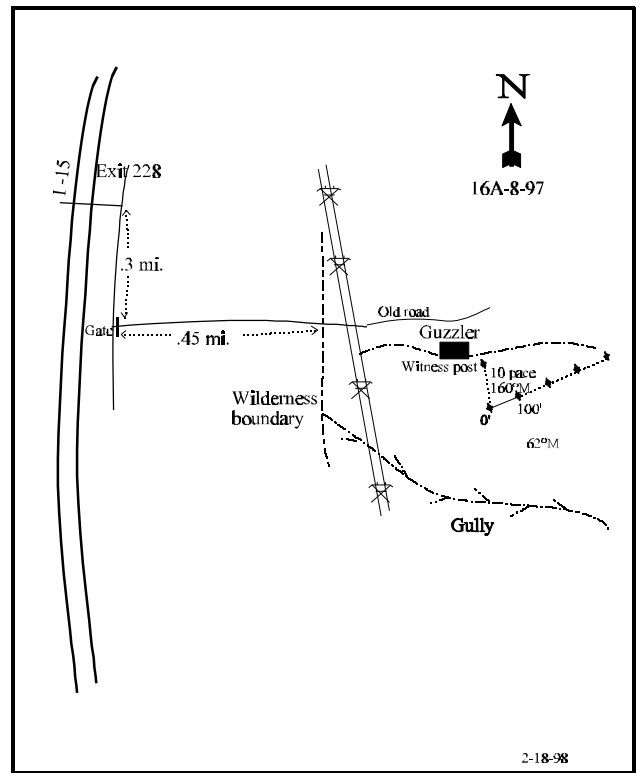
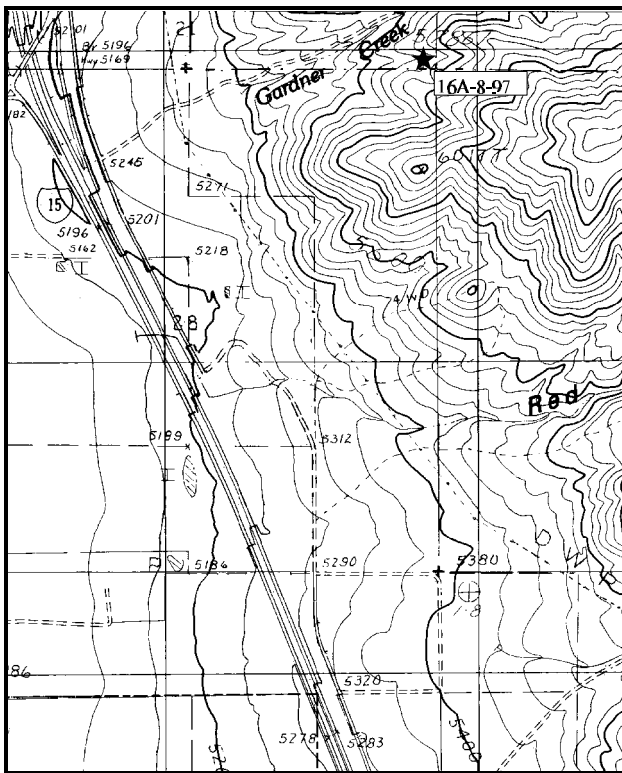
Range type: Stansbury Cliffrose

Compass bearing: frequency baseline 62 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From I-15 exit # 228 turn south on the frontage road and drive 0.3 miles to an intersection with a gate. Turn left at the intersection and drive 0.45 miles to the wilderness boundary fence. Walk up the old road under some powerlines. To the south, perpendicular to the road, is a steep slope characterized by Gambel oak and cliffrose. Walk up the slope to a guzzler on the ridgetop. At the southeastern corner of the guzzler there is a witness post. The 0-foot stake is 10 paces at an azimuth of 160°M. The study is marked by green steel "T" fenceposts 12 to 13 inches in height and the 0-foot stake has a red browse tag, number 3964, attached.



Map Name: Nephi, Utah .

Diagrammatic Sketch

Township 12 S , Range 1 E , Section 28

UTM 4399995.648 N , 429817.960 E

DISCUSSION

Trend Study No. 16A-8 (25-8)

The Gardner Canyon study is one of four located on critical winter range along the west Nebo face. This narrow band of habitat lying between Interstate 15 and the approximately 6,000 foot elevational contour is critically important. The study is on Division land near the guzzler in Gardner Canyon. The study samples a 45% to 50% south facing slope. The foothills between the site and I-15 are heavily used by deer and elk and many deer carcasses were found in the area during the 1989 reading. Deer and elk pellet groups are currently moderately abundant with similar frequencies of 20% and 22% respectively.

Soil at the site is exceptionally rocky and well-drained. Parent material is limestone with an abundance of large and small rock on the surface. Effective rooting depth (see methods) is estimated at only 10 inches. Texture is a loam with a neutral pH of 7.0. Organic matter is limited at only 1.6% and phosphorus, like site #7, may be a limiting factor to plant growth at only 4.4 ppm, where a minimum of 10 ppm is believed necessary for normal plant development. Percent bare ground was excessive in 1983 at 30%; however, percent bare soil declined to 18% by 1997. Rock and pavement cover is abundant. Although erosion is localized and soil pedestalling evident, erosion does not appear to be serious due to the abundant rock and annual grass cover.

The dominant browse on the site consist of large Stansbury cliffrose and true mountain mahogany. Cliffrose produces 54% of the browse cover with a density of 600 plants/acre in 1997. The decline in density from 966 plants/acre in 1989 is partly due to the much larger sample size used in 1997. Average height of mature plants is currently just under 4 feet, making most plants still available for wildlife use. Use has been consistently heavy since 1983. Currently, 80% of the plants sampled are heavily hedged. Most plants display normal vigor with percent decadence estimated at 23%.

True mountain mahogany occurs in small numbers (200 plants/acre) and is also heavily utilized. The larger sample size used in 1997 is responsible for the change in density between 1989 and 1997(466 to 240). The larger sample size gives better estimates for shrub populations that are discontinuous or clumped in their respective distributions. Recruitment is poor and currently 83% of the population consists of mature plants. Decadency has remained low since 1983. Heavy use has increased with each successive reading from 30% in 1983 to 64% in 1989, and 75% in 1997. Vigor has remained normal. Other preferred browse are limited. Undesirable shrubs include narrowleaf low rabbitbrush and broom snakeweed.

Grass and forb composition is dominated by annuals, biennials, and low-value perennials. Cheatgrass produces 60% of the grass cover and constitutes a severe fire hazard to the key browse species, especially the cliffrose which do not resprout after fire. The only perennial grass encountered is bluebunch wheatgrass which makes up the other 40% of the grass cover. Perennial forbs are rare.

1983 APPARENT TREND ASSESSMENT

Soil condition, as elsewhere on the Nebo face, is a definite limiting factor. The ongoing erosion and competition with the annual herbaceous species makes seedling establishment of desirable plants very difficult. Soil trend must be judged down. Vegetative trend also appears down. The key browse species, Stansbury cliffrose, is not adequately reproducing, nor are the important secondary shrubs. Broom snakeweed, cheatgrass brome, and annual forbs comprise far too great a proportion of the total vegetative composition. Wildlife use continues to be heavy with little prospect for range improvements in the future.

1989 TREND ASSESSMENT

Differences in the percentages of vegetative and litter cover are largely related to changes in the prevalence of cheatgrass between years. It was much less abundant in the dry season of 1983. The ground cover data shows significantly more pavement and rock cover in 1989, indicating continued loss of surface soil. Soil trend is considered stable, but in poor condition. The density of the key browse species, cliffrose, is unchanged. However, there were some changes in the age class structure of the population. A few young cliffrose were classified in 1989, but 51% of the population was considered decadent compared to 20% in 1983. The majority of the cliffrose remain severely hedged and generally vigor is only fair. The true mountain mahogany are also heavily hedged. Most of the junipers on the site have an obvious high-line. The few sagebrush sampled are decadent and in poor vigor. The drop in total browse density is due mainly to a decline of broom snakeweed. Browse trend is considered down slightly. There is a low frequency of perennial grasses and forbs. The only perennial grass species encountered in 1989 was bluebunch wheatgrass. The only perennial forbs with any significance are scarlet globemallow and low fleabane. Fewer species were identified in 1989. Trend for the herbaceous understory is stable, but in poor condition.

TREND ASSESSMENT

soil - stable and continued poor condition

browse - down slightly for cliffrose and mahogany

herbaceous understory - stable, but in poor condition

1997 TREND ASSESSMENT

Soil conditions are still poor on the site, however, protective ground cover has increased since 1989. Trend is considered slightly up for soils. Trend for the key browse species, cliffrose and mahogany, is stable. Cliffrose is heavily hedged, although vigor has improved and percent decadency has declined from 51% in 1989 to 23%. Mahogany is also heavily utilized, but vigor is normal and decadency low at only 8%. Trend for the herbaceous understory is stable yet depleted because of the large proportion of annual weeds in the understory. The understory of annuals is a severe fire hazard to the non-sprouting browse species.

TREND ASSESSMENT

soil - up slightly

browse - stable for cliffrose and mahogany

herbaceous understory - stable, but depleted

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 8

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	234	231	227	93	85	80	7.66
G	Bromus tectorum (a)	-	-	344	-	-	99	11.33
G	Festuca myuros (a)	-	-	3	-	-	1	.00
G	Poa bulbosa	-	-	1	-	-	1	.00
G	Poa pratensis	2	-	-	1	-	-	-
G	Poa secunda	1	-	-	1	-	-	-
Total for Grasses		237	231	575	95	85	181	19.01
F	Alyssum alyssoides (a)	-	-	350	-	-	98	5.48
F	Astragalus spp.	-	2	-	-	1	-	-
F	Calochortus nuttallii	3	-	6	2	-	3	.01
F	Cirsium spp.	1	-	-	1	-	-	-
F	Comandra pallida	3	-	-	1	-	-	-
F	Descurainia pinnata (a)	-	-	6	-	-	3	.01
F	Eriogonum brevicaule	3	-	-	1	-	-	-
F	Erodium cicutarium (a)	-	-	12	-	-	5	.05
F	Erigeron pumilus	_b 14	_b 21	_a -	5	9	-	-
F	Galium aparine (a)	-	-	2	-	-	1	.03
F	Hackelia patens	-	-	4	-	-	1	.00
F	Hedysarum boreale	_b 17	_a -	_a -	9	-	-	-
F	Leucelene ericoides	_a -	_a -	_b 15	-	-	6	.27
F	Lygodesmia grandiflora	12	3	5	5	1	2	.03
F	Sphaeralcea coccinea	_a 90	_b 117	_a 80	38	47	35	.50
F	Streptanthus cordatus	8	3	7	3	2	3	.04
F	Tragopogon dubius	4	-	4	2	-	2	.01
F	Trifolium spp.	-	-	1	-	-	1	.00
Total for Forbs		155	146	492	67	60	160	6.46

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

BROWSE TRENDS --

Herd unit 16A , Study no: 8

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	1	-
B	Cercocarpus montanus	11	2.78
B	Chrysothamnus nauseosus albicaulis	1	.38
B	Chrysothamnus viscidiflorus stenophyllus	15	.21
B	Cowania mexicana stansburiana	22	4.65
B	Gutierrezia sarothrae	26	.50
Total for Browse		76	8.54

BASIC COVER --

Herd unit 16A , Study no: 8

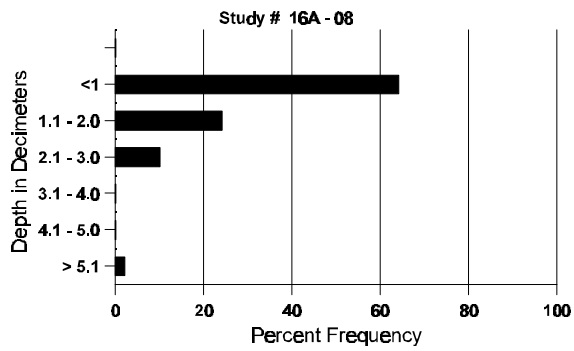
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	380	0	10.25	33.54
Rock	317	17.00	20.00	18.29
Pavement	303	2.00	12.75	7.86
Litter	385	50.50	31.00	30.88
Cryptogams	44	.25	0	.99
Bare Ground	274	30.25	26.00	17.82

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 08

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.1	55.4 (13.8)	7.0	38.7	40.7	20.6	1.6	4.4	57.6	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 8

Type	Quadrat Frequency '97
Rabbit	5
Elk	20
Deer	21

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 8

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total								
		1	2	3	4											
<i>Artemisia tridentata vaseyana</i>																
M	83	-	1	1	-	-	-	-	2	-	-	-	66	25	19	2
	89	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	0	21	35	0
D	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	1	1	-	-	-	-	-	1	-	-	66			2
	97	-	2	-	-	-	-	-	-	-	-	2	40			2
X	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		50%			50%			00%			+ 0%					
'89		50%			50%			50%			-39%					
'97		100%			00%			100%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	66	Dec:	0%			
										'89	66		100%			
										'97	40		100%			
<i>Cercocarpus montanus</i>																
Y	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	2	1	-	-	-	-	-	3	-	-	100			3
	97	-	-	1	-	-	-	-	-	1	-	-	20			1
M	83	-	7	3	-	-	-	-	-	10	-	-	333	52	55	10
	89	-	3	7	-	-	1	-	-	11	-	-	366	62	51	11
	97	-	2	6	-	1	1	-	-	10	-	-	200	63	79	10
D	83	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	1	-	-	-	-	-	1	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		70%			30%			00%			+29%					
'89		36%			64%			00%			-48%					
'97		25%			75%			00%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	333	Dec:	0%			
										'89	466		0%			
										'97	240		8%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus nauseosus albicaulis																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	28	71	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	20		-			
Chrysothamnus viscidiflorus stenophyllus																		
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	89	8	-	-	-	-	-	-	-	-	8	-	-	-	266			8
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	18	-	-	-	-	-	-	-	-	18	-	-	-	600	10	13	18
	89	7	6	-	1	-	-	-	-	-	13	-	-	1	466	10	14	14
	97	20	-	-	-	-	-	-	-	-	20	-	-	-	400	13	25	20
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	1	-	-	-	-	-	-	-	1	-	-	1	66			2
	97	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+21%							
'89		29%			00%			08%			-45%							
'97		00%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	633	Dec:	0%			
												'89	798		8%			
												'97	440		9%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Cowania mexicana stansburiana</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	3	-	-	2	2	-	-	-	7	-	-	-	233		7	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	83	-	11	12	-	-	-	-	-	-	23	-	-	-	766	32 30	23	
	89	-	2	5	-	-	-	-	-	-	7	-	-	-	233	25 29	7	
	97	1	1	15	-	-	3	-	-	-	19	-	-	-	400	46 48	20	
D	83	-	-	6	-	-	-	-	-	-	6	-	-	-	200		6	
	89	-	2	13	-	-	-	-	-	-	8	-	-	7	500		15	
	97	-	-	4	-	-	2	1	-	-	5	-	-	2	140		7	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	180		9	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		38%			62%			00%			+ 0%							
'89		31%			69%			24%			-38%							
'97		03%			80%			07%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	966	Dec:	21%				
											'89	966		52%				
											'97	600		23%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total						
		1	2	3	4										
Gutierrezia sarothrae															
S	83	-	-	-	-	-	-	-	0		0				
	89	-	-	-	-	-	-	-	0		0				
	97	3	-	-	-	-	-	-	2	-	1	60		3	
Y	83	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	1	-	-	33		1	
	97	29	-	-	-	-	-	-	29	-	-	580		29	
M	83	58	-	-	-	-	-	-	58	-	-	1933	11	9	58
	89	8	-	-	-	-	-	-	8	-	-	266	9	8	8
	97	33	-	-	-	-	-	-	33	-	-	660	7	10	33
D	83	-	-	-	-	-	-	-	-	-	-	0		0	
	89	16	-	-	-	-	-	-	8	-	1	533		16	
	97	2	-	-	-	-	-	-	1	-	1	40		2	
X	83	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'83		00%		00%		00%		-57%							
'89		00%		00%		32%		+35%							
'97		00%		00%		02%									
Total Plants/Acre (excluding Dead & Seedlings)						'83		1933		Dec:		0%			
						'89		832				64%			
						'97		1280				3%			
Quercus gambelii															
M	83	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	0	78	81	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'83		00%		00%		00%		None							
'89		00%		00%		00%		None							
'97		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)						'83		0		Dec:		-			
						'89		0				-			
						'97		0				-			

Trend Study 16A-9-97

Study site name: Birch Creek

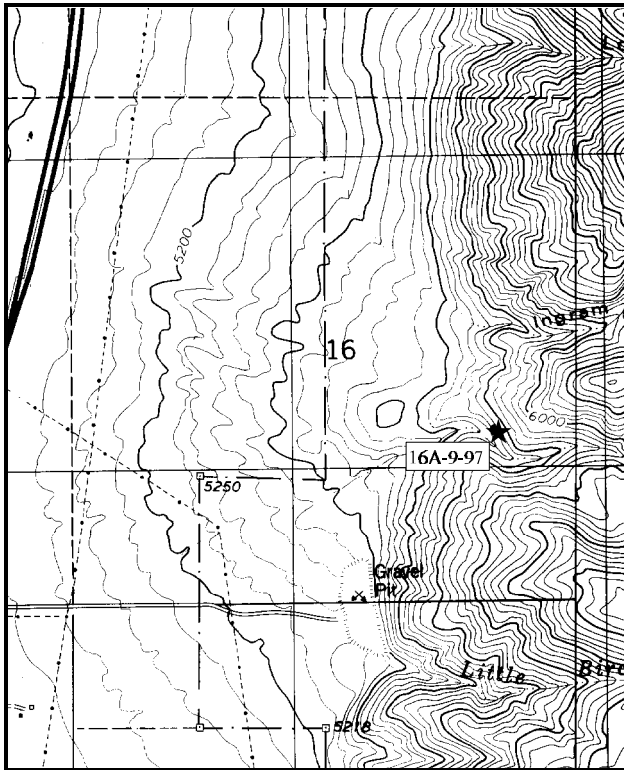
Range Type: Mixed mountain brush

Compass bearing: frequency baseline 35 T degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

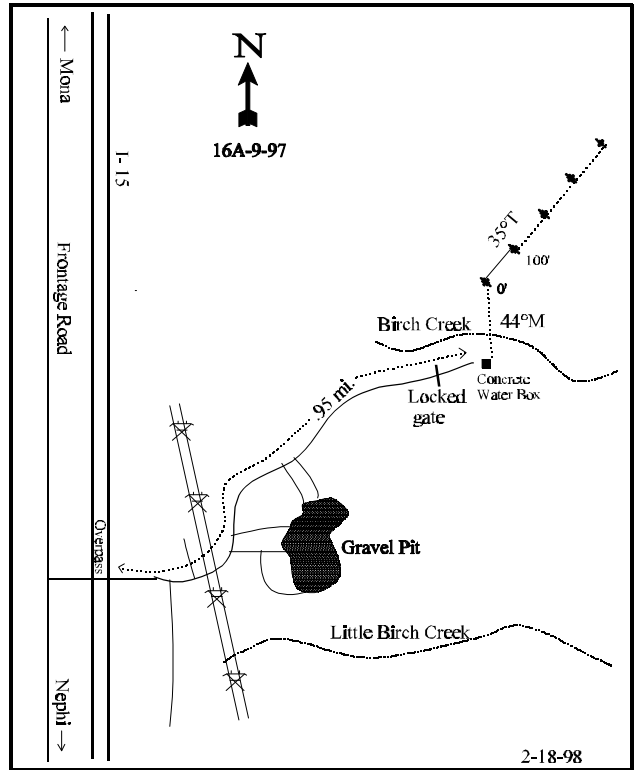
LOCATION DESCRIPTION

Beginning at the overpass where the road to Little Birch Canyon passes over I-15 (north of the north Nephi exit), proceed 0.95 miles east-northeast to where the road dead ends in Birch Creek Canyon (north of the gravel pit). At the end of the road, look for a concrete water box. From this box proceed up the hill at an azimuth of 44 degrees M until you reach the top of a small bench. The 0-foot baseline stake is near a cliffrose bush on a small trail running parallel along the bench. Browse tag #3961 marks the 0-foot baseline stake.



Map Name: Mona, Utah

Township 12S, Range 1E, Section 16



Diagrammatic Sketch

UTM 4402134.139 N, 429656.854 E

DISCUSSION

Trend Study No. 16A-9 (25-9)

The Birch Creek study is located on a steep (70%) south facing slope at the mouth of Little Birch Creek. Elevation is approximately 5,680 feet. The original baseline sampled a more level bench with a slope of about 30%. The lengthened baseline extends up a steeper slope with the same aspect and vegetation type. The area is considered critical deer and elk winter range. The range type is sparse mixture of mountain brush that is seriously depleted of ground cover and forage. Currently, deer and elk pellet groups are common on the site with a quadrat frequency of 30% for elk and 15% for deer. Water is available in Birch Creek about 150 yards down slope from the baseline.

The area possesses a shallow and extremely rocky soil which is eroded to the point where little bare soil remains. Parent material is limestone with numerous rock outcrops on the site. Some steeper areas have a complete cover of rock talus. Even with the rockiness of the soil, effective rooting depth (see methods) is estimated at nearly 14 inches. Texture is a sandy loam with a neutral pH of 7.1. Percent organic matter in the soil is much higher at 3.1% than nearby study site #7 and #8 (1.8% and 1.6% respectively). Phosphorus could be a limiting factor for this site with a value of 9.7 ppm, where values below 10 ppm are thought to limit plant development.

The site supports three key browse species, mountain big sagebrush, serviceberry, and Stansbury cliffrose. Sagebrush occurs in small numbers with an estimated density of only 360 plants/acre comprising 8% of the browse cover in 1997. Utilization of the sagebrush has increased with heavy use reported on 33% of the shrubs sampled in 1997. Vigor is normal on all plants and there are currently no decadent plants. Serviceberry is the most numerous shrub on the site with an estimated density of 640 plants/acre in 1997. Mature shrubs have increased in height with each reading and currently measure over 4 feet. All shrubs sampled are still all available, but with continued growth will become less available. Heavy use of the serviceberry has also increased with each reading. Currently, 34% of the shrubs sampled are classified as heavily hedged. Vigor is normal and percent decadency is low at only 3%. Cliffrose makes up 28% of the browse cover with a small population of only 180 plants/acre. The change in density between 1989 and 1997 is due to the much larger sample used in 1997. Nearly 80% of the population consists of large mature plants which measure, on average, over 5 feet in height. This would make some individuals partly or totally unavailable to browsing. Use was heavy in 1983 and 1997, but more moderate in 1989. Recruitment is poor and percent decadence is currently 22%.

Other preferred browse include black sagebrush, fourwing saltbush, and true mountain mahogany. These species occur in very limited numbers. The increasers, narrowleaf low rabbitbrush and broom snakeweed are found on the site in small numbers. Age class composition indicates stable populations.

The herbaceous understory is depleted with grasses and forbs combining to produce less than 20% cover. Cheatgrass is abundant and accounts for nearly half of the grass cover (46%). Bluebunch wheatgrass is slightly less abundant yet produces a higher proportion of the grass cover (53%). Perennial forbs are lacking. The only common perennial species include shortstem wild buckwheat and northern sweetvetch.

1983 APPARENT TREND ASSESSMENT

A fundamental problem on this site is accelerated erosion and the resultant loss of topsoil. Soil condition is very poor and unlikely to improve without some kind of direct manipulation. Trend is stable, but at a very low level. Vegetative trend appears to be headed toward a relatively barren site populated principally by annual grasses, forbs, and perennial weeds. The most desirable browse plants are heavily utilized and not adequately reproducing.

1989 TREND ASSESSMENT

Ground cover values indicate no significant changes, although the soil remains unstable with an extensive erosion pavement. As with other winter ranges in the area, the site is limited by poor soil conditions on steep slopes and by heavy browse utilization. On the density plots, mountain big sagebrush makes up 1/3 of the browse composition. It decreased 36% in density with half as many mature sagebrush counted in 1989. They have a moderately to heavily hedged growth form from recent use. The current age class structure indicates a stable population for sagebrush. The density data suggests a decline of serviceberry; however, this species is often difficult to count. Comparing other factors, the decline does not appear to be significant. Density data for other browse species on the site show that sumac increased while cliffrose and juniper are unchanged. While the diversity of grasses and forbs remains low, bluebunch wheatgrass increased significantly in frequency and density and the valuable Utah sweetvetch remains the most frequent perennial forb.

TREND ASSESSMENT

soil - stable, but in poor condition

browse - stable for key species, but density relatively low

herbaceous understory - up, but still lacking

1997 TREND ASSESSMENT

Trend for soil is down slightly due to an increase in percent bare ground combined with a decline in sum of nested frequency of perennial herbaceous plants. Rock and pavement cover also increased from 45% to 57%. Some of these differences are likely due to the lengthened baseline which samples a steeper slope. Trend for browse appears stable for the key species, serviceberry, mountain big sagebrush, and cliffrose. Utilization is heavier, but percent decadence lower than that found in 1989 with the increase in precipitation. Density of these preferred shrubs is still low and recruitment is poor. Trend for the herbaceous understory is down slightly due to a decline in the sum of nested frequency of perennial grasses and forbs. Annual grasses and forbs provide 52% of the herbaceous cover. Bluebunch wheatgrass and Sandberg bluegrass declined in their sum of nested frequency values.

TREND ASSESSMENT

soil - down slightly

browse - stable for key species, but densities low

herbaceous understory - down slightly for perennial species

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 9

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	<i>Agropyron spicatum</i>	_a 188	_b 259	_a 215	71	90	84	7.00
G	<i>Bromus tectorum</i> (a)	-	-	292	-	-	93	6.13
G	<i>Poa secunda</i>	_a 4	_b 75	_c 23	2	31	13	.14
Total for Grasses		192	334	530	73	121	190	13.27
F	<i>Alyssum alyssoides</i> (a)	-	-	237	-	-	79	2.66
F	<i>Arabis</i> spp.	-	-	1	-	-	1	.00
F	<i>Artemisia ludoviciana</i>	2	-	3	1	-	1	.03
F	<i>Castilleja linariaefolia</i>	-	-	3	-	-	1	.00
F	<i>Calochortus nuttallii</i>	3	-	2	1	-	1	.00
F	<i>Cirsium</i> spp.	-	-	6	-	-	2	.01
F	<i>Comandra pallida</i>	-	7	-	-	2	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	9	-	-	5	.02
F	<i>Eriogonum brevicaule</i>	_a -	_{ab} 2	_b 8	-	2	5	.73
F	<i>Erodium cicutarium</i> (a)	-	-	23	-	-	8	.09
F	<i>Galium aparine</i> (a)	-	-	57	-	-	26	.83
F	<i>Gilia</i> spp. (a)	-	-	9	-	-	3	.01
F	<i>Hackelia patens</i>	2	6	-	1	2	-	-
F	<i>Hedysarum boreale</i>	27	31	21	13	17	10	.77
F	<i>Lappula occidentalis</i> (a)	-	-	6	-	-	2	.01
F	<i>Lygodesmia grandiflora</i>	_{ab} 7	_b 18	_a -	3	6	-	-
F	<i>Machaeranthera canescens</i>	_a -	_b 9	_b 10	-	4	4	.04
F	<i>Phlox longifolia</i>	_a -	_b 11	_a 2	-	6	1	.00
F	<i>Streptanthus cordatus</i>	-	-	5	-	-	2	.15
F	<i>Tragopogon dubius</i>	2	-	1	1	-	1	.00
F	Unknown forb-annual	-	-	33	-	-	17	.08
Total for Forbs		43	84	436	20	39	169	5.51

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

BROWSE TRENDS --

Herd unit 16A , Study no: 9

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	16	1.91
B	Artemisia nova	5	-
B	Artemisia tridentata vaseyana	15	.89
B	Atriplex canescens	1	-
B	Brickellia californica	2	.85
B	Cercocarpus montanus	2	1.00
B	Chrysothamnus viscidiflorus stenophyllus	3	.00
B	Cowania mexicana stansburiana	8	3.01
B	Gutierrezia sarothrae	7	-
B	Juniperus osteosperma	2	2.89
Total for Browse		61	10.57

BASIC COVER --

Herd unit 16A , Study no: 9

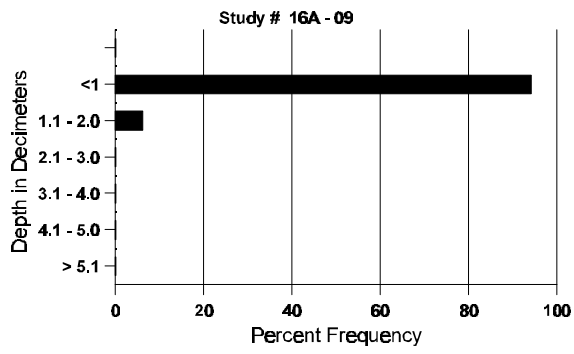
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	333	2.00	8.50	26.68
Rock	357	26.25	41.25	48.14
Pavement	200	25.50	3.25	9.28
Litter	361	44.50	42.25	26.36
Cryptogams	31	.25	1.50	.88
Bare Ground	154	1.50	3.25	7.58

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 09

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.8	55.5 (12.9)	7.1	54.4	30.1	15.6	3.1	9.7	80.0	.7

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 16A , Study no: 9

Type	Quadrat Frequency '97
Elk	30
Deer	15

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 9

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
Amelanchier alnifolia																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	8	-	-	-	-	-	-	-	8	-	-	-	160		8	
Y	83	4	2	-	-	-	-	-	-	6	-	-	-	200		6	
	89	1	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	2	8	-	3	-	-	-	-	13	-	-	-	260		13	
M	83	-	14	-	-	1	-	-	-	13	-	2	-	500	34	37	15
	89	1	4	-	-	-	-	-	-	5	-	-	-	166	46	31	5
	97	-	8	10	-	-	-	-	-	18	-	-	-	360	52	62	18
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	1	1	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		81%		00%		10%		-62%									
'89		63%		13%		00%		+59%									
'97		50%		34%		00%											
Total Plants/Acre (excluding Dead & Seedlings)						'83	700	Dec:	0%								
						'89	265		25%								
						'97	640		3%								
Artemisia nova																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	3	-	-	-	-	-	-	5	-	-	-	100	15	27	5
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	1	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		00%		00%		00%		None									
'89		00%		00%		00%		Appeared									
'97		50%		17%		17%											
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	0%								
						'89	0		0%								
						'97	120		17%								

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
Y	83	2	-	-	-	-	-	-	-	-	1	1	-	-	66			2
	89	3	1	-	-	-	-	-	-	-	4	-	-	-	133			4
	97	1	-	-	2	-	-	-	-	-	3	-	-	-	60			3
M	83	7	5	-	-	-	-	-	-	-	10	2	-	-	400	22	25	12
	89	2	3	1	-	-	-	-	-	-	5	-	1	-	200	17	29	6
	97	-	8	6	-	1	-	-	-	-	15	-	-	-	300	27	47	15
D	83	-	8	-	-	-	-	-	-	-	5	1	2	-	266			8
	89	1	3	-	-	-	-	-	-	-	3	-	-	1	133			4
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		59%			00%			09%			-36%							
'89		50%			07%			14%			-23%							
'97		50%			33%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	732	Dec:	36%				
											'89	466		29%				
											'97	360		0%				
<i>Atriplex canescens</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20	22	37	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	20		-				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Brickellia californica																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	5	-	-	-	-	-	5	-	-	-	100	21	28
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-			
											'89	0		-			
											'97	100		-			
Cercocarpus montanus																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	1	-	-	1	-	-	-	2	-	-	-	40	55	50
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			Appeared						
'97		00%			100%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-			
											'89	0		-			
											'97	40		-			
Chrysothamnus nauseosus albicaulis																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	60	94	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			None						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-			
											'89	0		-			
											'97	0		-			

AGE	Y	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.		
<i>Chrysothamnus viscidiflorus stenophyllus</i>																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	'83	4	-	-	-	-	-	-	-	-	4	-	-	-	133	19 33	4	
	'89	5	-	-	-	-	-	-	-	-	5	-	-	-	166	15 27	5	
	'97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	16 33	3	
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+33%							
'89		00%			00%			00%			-70%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	133	Dec:	0%			
												'89	199		17%			
												'97	60		0%			
<i>Cowania mexicana stansburiana</i>																		
S	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	'83	-	-	-	-	1	1	-	-	-	1	-	1	-	66	67 69	2	
	'89	-	2	-	-	-	-	-	-	-	2	-	-	-	66	75 45	2	
	'97	-	1	3	-	2	-	-	1	-	7	-	-	-	140	65 77	7	
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	1	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'97	-	-	-	-	1	1	-	-	-	1	-	-	1	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		50%			50%			50%			+33%							
'89		100%			00%			00%			+45%							
'97		44%			44%			11%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	0%			
												'89	99		33%			
												'97	180		22%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total																						
		1	2	3	4		1	2																							
Gutierrezia sarothrae																															
S	83	-	-	-	-	-	-	-	0		0																				
	89	-	-	-	-	-	-	-	0		0																				
	97	1	-	-	-	-	-	-	20		1																				
Y	83	-	-	-	-	-	-	-	0		0																				
	89	-	-	-	-	-	-	-	0		0																				
	97	3	-	-	-	-	-	-	60		3																				
M	83	2	-	-	-	-	-	-	66	11 10	2																				
	89	-	-	-	-	-	-	-	0	- -	0																				
	97	5	-	-	-	-	-	-	100	8 12	5																				
D	83	-	-	-	-	-	-	-	0		0																				
	89	1	-	-	-	-	-	-	33		1																				
	97	-	-	-	-	-	-	-	0		0																				
X	83	-	-	-	-	-	-	-	0		0																				
	89	-	-	-	-	-	-	-	0		0																				
	97	-	-	-	-	-	-	-	20		1																				
<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> </tr> <tr> <td>'83</td> <td>00%</td> <td>00%</td> <td>00%</td> <td>-50%</td> </tr> <tr> <td>'89</td> <td>00%</td> <td>00%</td> <td>00%</td> <td>+79%</td> </tr> <tr> <td>'97</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> </table>											% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>	'83	00%	00%	00%	-50%	'89	00%	00%	00%	+79%	'97	00%	00%	00%		
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																											
'83	00%	00%	00%	-50%																											
'89	00%	00%	00%	+79%																											
'97	00%	00%	00%																												
<table border="0" style="width:100%"> <tr> <td>Total Plants/Acre (excluding Dead & Seedlings)</td> <td></td> <td></td> <td>'83</td> <td>66</td> <td>Dec:</td> <td>0%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'89</td> <td>33</td> <td></td> <td>100%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'97</td> <td>160</td> <td></td> <td>0%</td> </tr> </table>											Total Plants/Acre (excluding Dead & Seedlings)			'83	66	Dec:	0%				'89	33		100%				'97	160		0%
Total Plants/Acre (excluding Dead & Seedlings)			'83	66	Dec:	0%																									
			'89	33		100%																									
			'97	160		0%																									
Juniperus osteosperma																															
M	83	-	-	-	1	-	-	-	-	1	-	-	33	67 81	1																
	89	1	-	-	-	-	-	-	-	1	-	-	33	108 79	1																
	97	-	-	-	-	-	-	2	-	2	-	-	40	- -	2																
<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> </tr> <tr> <td>'83</td> <td>00%</td> <td>00%</td> <td>00%</td> <td>+ 0%</td> </tr> <tr> <td>'89</td> <td>00%</td> <td>00%</td> <td>00%</td> <td>+18%</td> </tr> <tr> <td>'97</td> <td>00%</td> <td>00%</td> <td>00%</td> <td></td> </tr> </table>											% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>	'83	00%	00%	00%	+ 0%	'89	00%	00%	00%	+18%	'97	00%	00%	00%		
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																											
'83	00%	00%	00%	+ 0%																											
'89	00%	00%	00%	+18%																											
'97	00%	00%	00%																												
<table border="0" style="width:100%"> <tr> <td>Total Plants/Acre (excluding Dead & Seedlings)</td> <td></td> <td></td> <td>'83</td> <td>33</td> <td>Dec:</td> <td>-</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'89</td> <td>33</td> <td></td> <td>-</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'97</td> <td>40</td> <td></td> <td>-</td> </tr> </table>											Total Plants/Acre (excluding Dead & Seedlings)			'83	33	Dec:	-				'89	33		-				'97	40		-
Total Plants/Acre (excluding Dead & Seedlings)			'83	33	Dec:	-																									
			'89	33		-																									
			'97	40		-																									

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4	5	6	7	8	9	1	2	3	4						
Rhus glabra cismontana																				
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1			
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0			
	89	6	3	-	-	-	-	-	-	-	9	-	-	-	300	39	9			
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	35	0			
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>						
'83		00%			00%			00%						+89%						
'89		33%			00%			00%						Died out						
'97		00%			00%			00%												
Total Plants/Acre (excluding Dead & Seedlings)													'83		33		Dec:		-	
													'89		300				-	
													'97		0				-	

Trend Study 16A-10-97

Study site name: North Canyon .

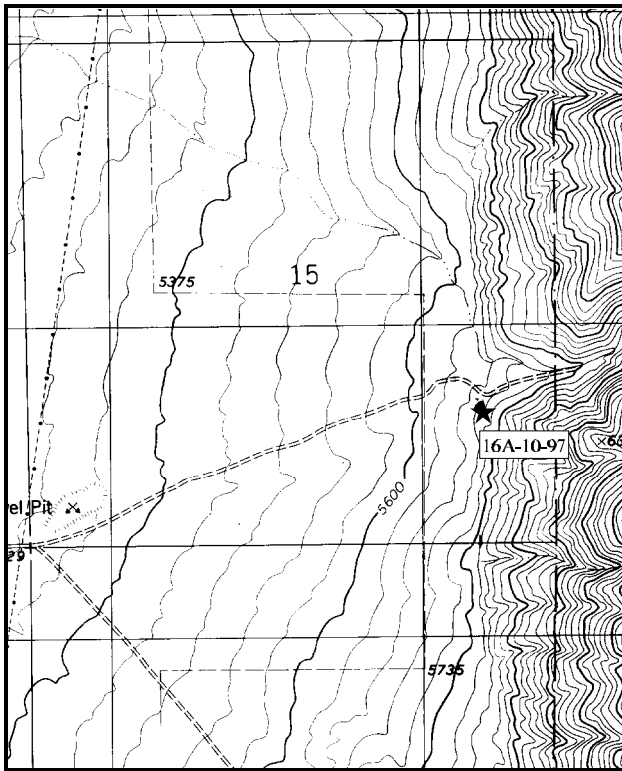
Range type: Big Sagebrush - Grass

Compass bearing: frequency baseline 267M degrees. (Line 2 277°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 71ft), line 2 (41ft), line 3 (34ft centered on 40, & 95ft).

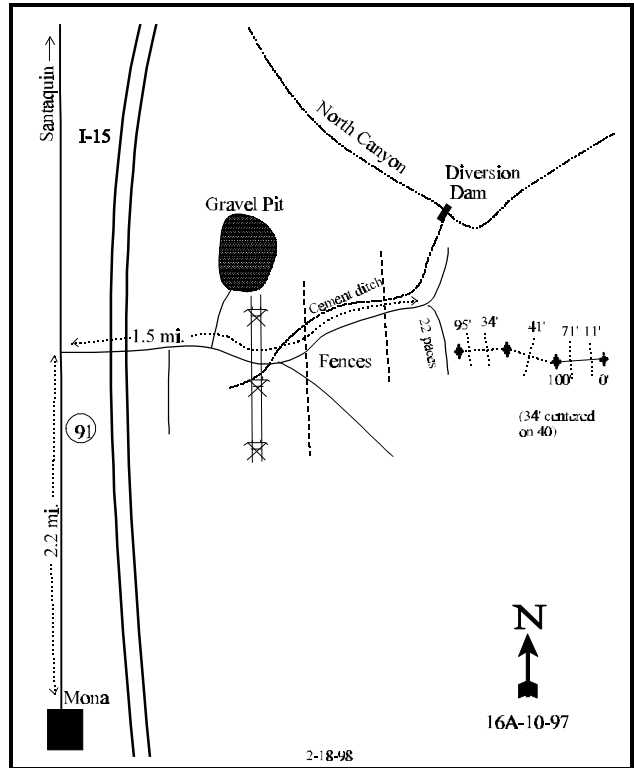
LOCATION DESCRIPTION

Beginning at the intersection of 200 North and Main Street in Mona, go north on Main Street for 2.2 miles to an improved gravel road on the east side. Take this road east for 1.5 miles (passing beneath the freeway) to where the road forks after crossing the irrigation ditch. Stay left at this fork and continue another mile to where the road faintly forks again. From here, walk down the right fork for 22 paces. At this point, the posts are on the left. A red browse tag, number 3957, is attached to the O-foot baseline stake.



Map Name: Mona, Utah

Township 11S , Range 1E , Section 15



Diagrammatic Sketch

UTM 4411769.612 N, 431183.216 E

DISCUSSION

Trend Study No. 16A-10 (25-10)

The North Canyon study is located on Division land near the mouth of North Canyon on an alluvial fan dissected by gullies. The site has a gentle slope of 10% to 12% with a west aspect and elevation of about 5,720 feet. The principal wildlife value for the area is deer winter range. Elk use appears negligible. Few deer pellet groups were found on the site in 1997. The site supports a big sagebrush-grass community interrupted by occasional Gambel oak and skunkbush sumac clones. Water can be found in the nearby creek.

Soil is alluvially deposited from sedimentary limestone and quartzite parent material. The soil is moderately deep, but very rocky and well drained. Effective rooting depth (see methods) is estimated at just over 10 inches. Soil texture is a sandy loam with a neutral pH of 7.1. Phosphorus and potassium may be limiting to vegetation development with only 8.2 ppm (minimum 10 ppm) and 51.2 ppm (minimum 70 ppm) found in the soil respectively. Much of the ground surface is occupied by rocks, some of which are boulder size or even larger. Cobble size rocks and pavement are concentrated on the surface in many areas. The distribution of vegetative and litter cover is uneven. Where adequate cover is found, it is effective at preventing runoff. However, the large areas occupied by rock and erosion pavement result in considerable overland water flow with relatively little soil movement. Deposition of soil from higher slopes is probably more common than is soil loss. The area to the immediate north and west, which is the active flood plain or out wash area from North Creek, appears to be heavily impacted by spring runoff.

The key browse species is mountain big sagebrush which accounts for 80% of the browse cover in 1997. Population density has shown steady declines since 1983. The new, larger sample used in 1997, indicates similar numbers of mature plants, but overall a reduction in plant density. Use has remained moderate to heavy over the years, but vigor has been normal on most plants and percent decadence has remained low ranging from 11% to 26%. The initial density for mountain big sagebrush was probably too high, and with the prolonged drought, there has been a self-thinning of the population. The high percentages of decadent plants that were classified as dying or with poor vigor are indicative of this. Currently, there is a ratio of 1:4.4 for dead to live plants. The only other common browse species is broom snakeweed which has a current density of 2,020 plants/acre with 70% of the population classified as mature. A few scattered curleaf mountain mahogany, white rubber rabbitbrush and Gambel oak occur scattered over the site.

The herbaceous understory is diverse but not very productive. Species composition includes native and exotic species, with the latter presumably the result from a nearby range seeding. Annual cheatgrass is the most abundant species, as it accounts for 57% of the total grass cover. The only common perennial species is Sandberg bluegrass. Forbs are much less abundant than grasses and include several annuals and biennials with a few perennials. Forb composition is dominated by redroot eriogonum which accounts for 55% of the forb cover. All other perennial species occur rarely.

1983 APPARENT TREND ASSESSMENT

Soil trend seems stable even though some disturbance is noticeable. The combination of rock, erosion pavement, vegetation, litter cover, and gentle slope limit the degree of soil erosion. Soil deposition rates probably exceed soil loss. Vegetative trend amongst the browse population also appears stable but could change quickly if disturbed. Herbaceous composition, especially forbs, is somewhat depleted but not showing any obvious further deterioration.

1989 TREND ASSESSMENT

Frequency data comparisons on this site reveal a stable condition. Classifications on the density portion of the study indicate some changes in the population of the key species, mountain big sagebrush. Sagebrush density declined in the young and mature age classes. The study found a higher percentage (40% compared to 24%) of shrubs with a heavily hedged growth form in 1989. Still, the density of mature sagebrush remains satisfactory at close to 3,000 plants per acre and an average cover of 24%. Increases in grass frequency and density were recorded, and the herbaceous component, although depleted, is stable and also possibly slightly improving. There is an extensive rock and pavement cover, but the soil condition appears stable.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - up slightly, but depleted

1997 TREND ASSESSMENT

Soil trend appears stable with similar ground cover characteristics compared to 1989. Trend for mountain big sagebrush also appears relatively stable, after the self-thinning. The number of mature plants has remained similar while the number of young and decadent plants has declined. Utilization remains moderate to heavy, but vigor is normal and percent decadency low at 11%. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency of perennial grasses and forbs. Forbs are still lacking however.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - up slightly, but still depleted with a poor composition of mostly weedy species

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 10

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	8	22	7	4	8	3	.04
G	Agropyron intermedium	40	48	24	16	18	9	.61
G	Aristida longiseta longiseta	8	7	18	3	4	8	.80
G	Bromus marginatus	1	-	-	1	-	-	-
G	Bromus tectorum (a)	-	-	274	-	-	87	5.69
G	Festuca myuros (a)	-	-	29	-	-	11	.30
G	Festuca ovina	-	-	6	-	-	2	.53
G	Hilaria jamesii	_b 15	_a -	_a -	6	-	-	-
G	Poa bulbosa	_a -	_a -	_b 15	-	-	5	.24
G	Poa secunda	_a 75	_b 114	_c 166	38	46	59	1.37
G	Sitanion hystrix	-	-	7	-	-	2	.01

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Sporobolus cryptandrus	a-	a-	b ²⁴	-	-	9	.41
Total for Grasses		147	191	570	68	76	195	10.02
F	Alyssum alyssoides (a)	-	-	86	-	-	34	.27
F	Allium spp.	-	-	8	-	-	3	.01
F	Astragalus utahensis	a-	a-	b ²⁷	-	-	12	.33
F	Calochortus nuttallii	-	-	18	-	-	9	.04
F	Cirsium vulgare	ab ³	a-	b ⁷	1	-	4	.02
F	Collinsia parviflora (a)	-	-	19	-	-	7	.06
F	Cruciferae (a)	-	2	-	-	2	-	-
F	Cryptantha spp.	-	-	4	-	-	2	.03
F	Cynoglossum officinale	-	2	3	-	1	1	.00
F	Epilobium paniculatum (a)	-	-	10	-	-	5	.02
F	Erigeron pumilus	5	2	8	2	1	4	.09
F	Eriogonum racemosum	43	52	73	24	24	29	2.09
F	Galium aparine (a)	-	-	100	-	-	34	.42
F	Helianthus annuus (a)	4	15	-	3	9	-	-
F	Holosteum umbellatum (a)	-	-	29	-	-	11	.05
F	Leucelene ericoides	-	-	6	-	-	2	.03
F	Lithospermum ruderale	-	-	4	-	-	2	.03
F	Machaeranthera canescens	6	3	8	2	1	3	.04
F	Medicago sativa	1	3	2	1	1	1	.03
F	Phlox longifolia	-	-	3	-	-	1	.00
F	Ranunculus testiculatus (a)	-	-	74	-	-	27	.18
F	Unknown forb-annual	-	-	2	-	-	2	.01
F	Unknown forb-perennial	3	-	-	2	-	-	-
F	Zigadenus paniculatus	-	-	4	-	-	2	.01
Total for Forbs		65	79	495	35	39	195	3.82

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 10

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	88	19.99
B	Cercocarpus ledifolius	1	.00
B	Chrysothamnus nauseosus albicaulis	2	1.39
B	Chrysothamnus viscidiflorus viscidiflorus	1	.38
B	Gutierrezia sarothrae	24	2.14
B	Opuntia spp.	3	.00
B	Quercus gambelii	7	1.06
Total for Browse		126	24.98

BASIC COVER --

Herd unit 16A , Study no: 10

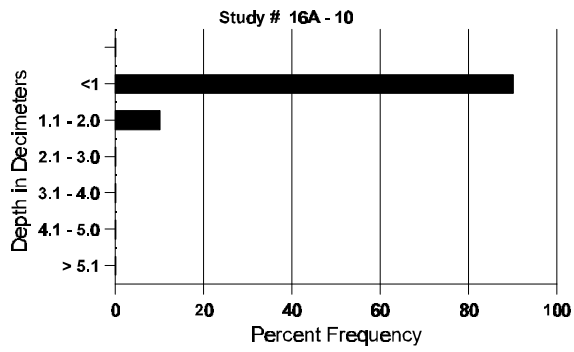
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	368	1.00	3.75	34.09
Rock	279	20.50	25.25	18.35
Pavement	225	7.00	10.00	15.76
Litter	385	66.75	56.75	43.20
Cryptogams	118	0	0	1.19
Bare Ground	134	4.75	4.25	4.25

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 10

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.3	55.5 (14.3)	7.1	56.4	28.1	15.6	3.2	8.2	51.2	.8

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16A , Study no: 10

Type	Quadrat Frequency '97
Deer	6

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 10

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	83	20	-	-	-	-	-	-	-	-	20	-	-	-	1333		20	
	89	3	5	1	1	-	-	-	-	-	10	-	-	-	666		10	
	97	18	1	-	-	-	-	-	-	-	19	-	-	-	380		19	
M	83	35	16	6	-	-	-	-	-	-	56	-	1	-	3800	21 24	57	
	89	4	23	15	-	-	2	-	-	-	44	-	-	-	2933	19 28	44	
	97	35	80	22	8	8	-	-	-	-	153	-	-	-	3060	24 40	153	
D	83	1	-	17	-	-	-	-	-	-	-	-	18	-	1200		18	
	89	-	8	11	-	-	-	-	-	-	14	-	3	2	1266		19	
	97	5	6	11	-	-	-	-	-	-	12	-	-	10	440		22	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	880		44	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		17%			24%			20%			-23%							
'89		49%			40%			07%			-20%							
'97		49%			17%			05%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	6333	Dec:	19%			
												'89	4865		26%			
												'97	3880		11%			
<i>Cercocarpus ledifolius</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	20		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4			
<i>Chrysothamnus nauseosus albicaulis</i>								
M	'83	-	-	-	-	-	-	-
	'89	-	-	-	-	-	-	-
	'97	1	1	-	-	-	-	-
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>
	'83	00%		00%		00%		None
	'89	00%		00%		00%		Appeared
	'97	50%		00%		00%		
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec: -
						'89	0	-
						'97	40	-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>								
M	'83	-	-	-	-	-	-	-
	'89	-	-	-	-	-	-	-
	'97	1	-	-	-	-	-	-
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>
	'83	00%		00%		00%		None
	'89	00%		00%		00%		Appeared
	'97	00%		00%		00%		
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec: -
						'89	0	-
						'97	20	-

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
Y	83	6	-	-	-	-	-	-	-	-	6	-	-	-	400		6	
	89	11	-	-	-	-	-	-	-	-	11	-	-	-	733		11	
	97	28	-	-	-	-	-	-	-	-	28	-	-	-	560		28	
M	83	10	-	-	-	-	-	-	-	-	10	-	-	-	666	9 8	10	
	89	4	-	-	-	-	-	2	-	-	6	-	-	-	400	8 5	6	
	97	71	-	-	-	-	-	-	-	-	71	-	-	-	1420	7 8	71	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	9	-	-	-	-	-	-	-	-	8	-	-	1	600		9	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+38%							
'89		00%			00%			04%			+14%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1066	Dec:	0%			
												'89	1733		35%			
												'97	2020		2%			
Opuntia spp.																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	5 7	4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	80		-			

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	89	-	2	-	-	1	-	-	-	-	3	-	-	-	200		3	
	97	2	-	-	1	-	-	-	-	-	3	-	-	-	60		3	
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	20 31	1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	-	4	-	-	-	-	-	-	-	4	-	-	-	80	65 48	4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 1%							
'89		100%			00%			00%			-30%							
'97		57%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	199	Dec:	-			
												'89	200		-			
												'97	140		-			

Trend Study 16A-11-97

Study site name: Rees Flat .

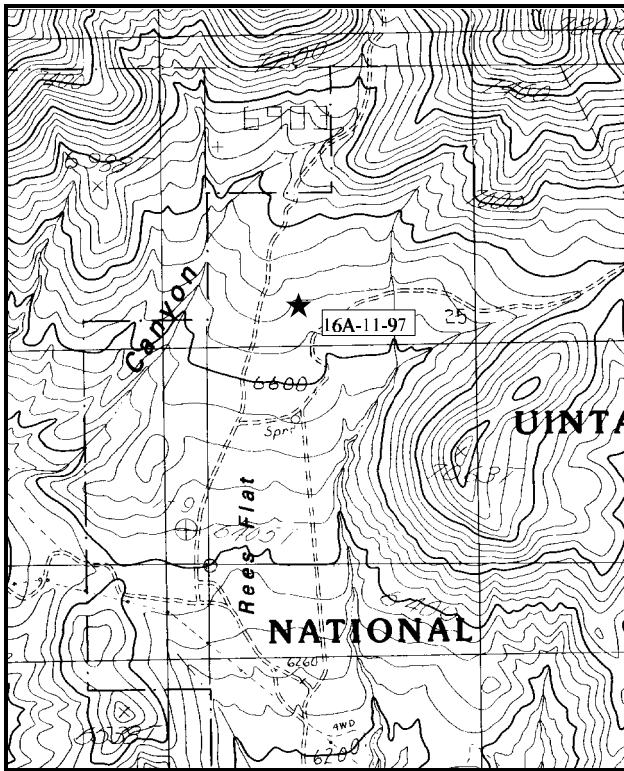
Range Type: Mixed Oak-sage

Compass bearing: frequency baseline 344 degrees. (Lines 2-4 333°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

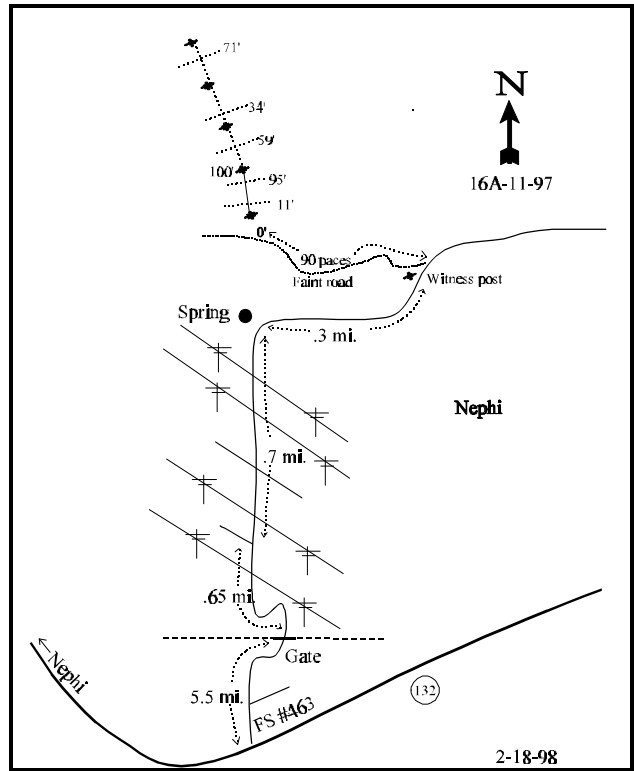
LOCATION DESCRIPTION

Beginning at the overpass where Highway 132 crosses beneath I-15 in Nephi, take Highway 13 east for 2.3 miles. Turn north onto the Forest Service Road #463 and go 0.2 miles to a fork in the road. Stay left and go another 0.35 miles to a gate. Beyond the gate 0.65 miles you'll come to another fork. Stay right on the main road passing through a four way intersection beneath the powerlines and coming to a spring on the left after 0.7 miles. 0.3 miles farther along is a 3-foot tall witness post 6 paces north-west of the road near some oak brush. Stop here and walk 90 paces west on a faint road. The 12-18 inch high red 0-foot baseline stake is 9 paces north of the faint road. It is marked by browse tag #3956.



Map Name: Nephi, Utah .

Township 12S , Range 1E , Section 25



Diagrammatic Sketch

UTM 4399149.916 N, 433453.725 E

DISCUSSION

Trend Study No. 16A-11 (25-11)

The Rees Flat study is located on a burned and seeded, mixed Gambel oak and mountain big sagebrush type. This area is considered a rather high elevation for deer winter range, but elk tend to use it fairly consistently. A moderate number of deer and elk pellet groups as well as two deer antler drops were encountered in 1983 when the site was established. Pellet group quadrat frequency is currently moderately high for elk and deer at 38% and 26% respectively. Cattle and horses graze the area in the summer. The site has a gentle (10%) south aspect and an elevation of approximately 6,440 feet.

Soil on the site is fairly deep with an effective rooting depth (see methods) estimated at a little over 15 inches. Soil texture is a clay loam with a moderately acidic pH (5.9). The extent of rock in the profile varies along the baseline with the highest amount of rock near the surface along the original 100 feet baseline, with noticeably less further down the extended baseline. Litter buildup since the fire has been minimal. Only within oak clones is there a significant amount of litter cover. Vegetative cover is rather thinner in the openings and results primarily from seeded grasses. However, erosion is minimal due to the gentle slope.

The principal browse species are Gambel oak, mountain big sagebrush, and antelope bitterbrush. Gambel oak provides 40% of the browse cover and occurs in scattered clones of various sizes. The average height of oak in 1997 was just over 7 feet. Density was similar between 1983 and 1989, but much lower in 1997 due to the lengthened baseline and larger sample size. Utilization of the oak is light, vigor is good with no decadent individuals sampled in 1997. The larger sample also picked up more mountain big sagebrush which increased from a density of 499 plants/acre along the original baseline to 3,800 plants/acre along the lengthened baseline. Age class composition indicates that 86% of the population consists of young plants. Biotic potential (percentage of seedlings to the population) is also high at 15%. These factors, combined with a low decadency rate and lack of dead plants, suggests an expanding population of big sagebrush. Utilization is currently light to moderate and vigor is normal.

Antelope bitterbrush occurs in small numbers and is more heavily utilized. Density estimates between the new and old samples are similar ranging from 166 to 299 plants/acre. The newer and larger sample sized gives greater accuracy in estimating population densities for clumped or discontinuous populations like bitterbrush and oak. Mature plants average just over 2 feet in height and have grown slightly taller with each reading. Utilization has been mostly moderate since 1983. Vigor has remained normal and no decadent plants have been sampled. Reproduction appears adequate to maintain or even slightly increase the population in the future. The only other common shrub found on the site is broom snakeweed which has a density of 1,500 plants/acre in 1997. The population has remained relatively stable since 1983.

Grasses provide a relatively uniform and moderately dense cover within openings, but are rare within the oak clones. Smooth brome is the only species that is shade tolerant. In 1983, livestock grazing apparently depressed the vigor, height, and production of almost all grass species. Currently, grasses are abundant, but composition is dominated by the less desirable Bulbous bluegrass which provides 73% of the grass cover. Smooth brome and crested wheatgrass are also fairly abundant, together they contribute 20% of the grass cover. Cheatgrass is found in relatively small numbers (6% of grass cover). Forbs are diverse yet combine to produce less than 2% total cover. Common species include longleaf phlox, false dandelion, and milkvetch.

1983 APPARENT TREND ASSESSMENT

This area is still recovering from fire and long term trend is difficult to determine. Soil trend appears stable but

rapid improvement is being handicapped by intense livestock use. From a vegetative standpoint, Gambel oak is currently at an optimum level of availability and abundance. Openings within the oak contain very little browse except for an increasing population of broom snakeweed. Grasses are abundant but have rather poor vigor. Forb composition and density are at less than optimum levels.

1989 TREND ASSESSMENT

There was some increase in the percentage of vegetative basal cover and rock cover, but an abundant amount (23%) of bare soil still remains. Overall, erosion on the site is minimal and trend appears stable. The population of the dominant Gambel oak is relatively stable. Density of mature plants has declined possibly due to observer differences in classification. There is an abundance of young sprouts. The vigorous and moderately hedged bitterbrush exhibits an improving trend. Twenty-two percent of the population are young plants and biotic potential (# of seedlings) is also good at 22%. Although the mountain big sagebrush appears vigorous and productive, the density of mature plants declined to only 100 per acre. Broom snakeweed declined in density, but there are still 1,600 plants/acre, yet they only contribute to 5% of the browse cover. Seeded grass species, namely crested wheatgrass and smooth brome, are found on the site, but bulbous bluegrass dominates the site. Bulbous bluegrass has increased significantly since 1983. Nested frequency of crested wheatgrass shows a decline. Sum of nested frequency of the important grass species is relatively stable. Forb composition is similar between years, however they remain of limited forage value.

TREND ASSESSMENT

soil - stable

browse - stable overall, slightly down for sagebrush

herbaceous understory - down slightly due to an increase in bulbous bluegrass and a decline in the more preferred species

1997 TREND ASSESSMENT

Trend for soil is up slightly. Percent bare ground declined from 23% to 8%, but litter cover declined as well. Some of these changes are due to the larger sample used which sampled less oak and more sagebrush. The browse trend is up. More sagebrush was picked up in the larger sample, however 86% of the sagebrush encountered consisted of young plants. This would demonstrate an expanding population. Bitterbrush and Gambel oak appear to have stable populations. Trend for the herbaceous understory is up slightly, but still dominated by the increaser bulbous bluegrass. Crested wheatgrass continued to decline in its sum of nested frequency value (not shade tolerant) while smooth brome (shade tolerant) continued to increase.

TREND ASSESSMENT

soil - up slightly

browse - up for sagebrush

herbaceous understory - up slightly, but dominated by the increaser bulbous bluegrass

HERBACEOUS TRENDS --
Herd unit 16A , Study no: 11

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	_b 159	_a 117	_a 94	62	44	38	2.14
G	Agropyron spicatum	_b 24	_b 11	_a -	10	5	-	-
G	Bromus inermis	_a 88	_a 118	_b 170	32	40	55	5.09
G	Bromus tectorum (a)	-	-	48	-	-	17	2.26
G	Dactylis glomerata	6	2	-	2	1	-	-
G	Poa bulbosa	_a 3	_b 282	_c 352	1	85	93	26.80
G	Poa fendleriana	-	3	-	-	1	-	-
G	Poa pratensis	_b 14	_b 14	_a -	4	5	-	-
G	Poa secunda	_b 290	_a 18	_a 25	88	6	11	.37
Total for Grasses		584	565	689	199	187	214	36.69
F	Agoseris glauca	_{ab} 3	_a -	_b 7	1	-	4	.19
F	Artemisia ludoviciana	4	3	-	2	1	-	-
F	Aster chilensis	_a -	_b 10	_a -	-	4	-	-
F	Astragalus convallarius	-	-	2	-	-	1	.03
F	Astragalus spp.	_a -	_a -	_b 15	-	-	7	.43
F	Calochortus nuttallii	_{ab} 3	_a -	_b 7	2	-	4	.02
F	Cirsium spp.	5	6	4	3	4	2	.04
F	Collomia spp. (a)	-	-	1	-	-	1	.00
F	Comandra pallida	_{ab} 23	_b 29	_a 10	10	11	4	.48
F	Cymopterus longipes	_b 10	_a 3	_b 14	7	-	3	.04
F	Epilobium paniculatum (a)	-	-	19	-	-	8	.04
F	Erigeron divergens	-	-	2	-	-	1	.15
F	Lathyrus brachycalyx	2	-	-	1	-	-	-
F	Lactuca serriola	-	-	1	-	-	1	.00
F	Machaeranthera canescens	_a -	_b 9	_{ab} 2	-	4	1	.00
F	Phlox longifolia	16	15	26	7	6	11	.05
F	Solidago sparsiflora	2	-	-	2	-	-	-
F	Stellaria spp.	5	-	-	3	-	-	-
F	Tragopogon dubius	14	6	6	9	3	3	.01
F	Unknown forb-annual	-	-	2	-	-	1	.00
F	Viguiera multiflora	_b 9	_a -	_a -	5	-	-	-

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Zigadenus paniculatus	-	-	3	-	-	1	.03
Total for Forbs		96	81	121	52	34	58	1.59

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 11

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	45	4.21
B	Chrysothamnus nauseosus albicaulis	1	.15
B	Gutierrezia sarothrae	18	.52
B	Purshia tridentata	7	1.54
B	Quercus gambelii	14	4.35
Total for Browse		85	10.79

BASIC COVER --

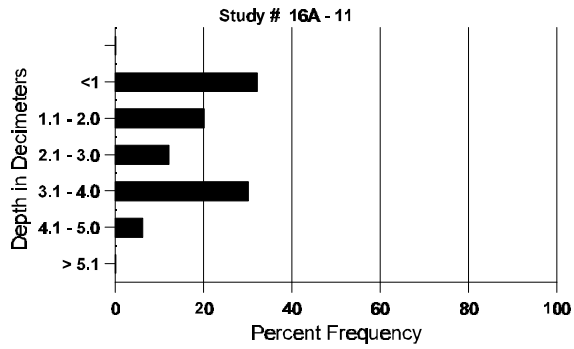
Herd unit 16A , Study no: 11

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	382	.25	8.25	50.06
Rock	95	7.50	7.75	2.80
Pavement	208	3.50	8.25	5.17
Litter	391	54.50	50.00	33.86
Cryptogams	201	.50	3.00	8.60
Bare Ground	190	33.75	22.75	7.52

SOIL ANALYSIS DATA --
 Herd Unit 16A, Study no: 11

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.4	48.0 (17.0)	5.9	40.4	33.1	26.6	2.4	29.8	179.2	.4

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16A , Study no: 11

Type	Quadrat Frequency '97
Rabbit	2
Elk	38
Deer	26
Cattle	2

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 11

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	28	-	-	-	-	-	-	-	-	28	-	-	-	560			28
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	97	162	-	-	-	-	-	-	-	-	162	-	-	-	3260			163
M	83	12	2	-	-	-	-	-	-	-	14	-	-	-	466	18	26	14
	89	2	-	1	-	-	-	-	-	-	3	-	-	-	100	17	13	3
	97	14	6	3	-	-	-	-	-	-	23	-	-	-	480	24	44	24
D	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	89	-	1	-	-	-	-	-	-	-	-	-	1	-	33			1
	97	2	-	1	-	-	-	-	-	-	-	-	-	3	60			3
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	140			7
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		13%			00%			00%			-60%							
'89		17%			17%			17%			+95%							
'97		03%			02%			02%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	499	Dec:	7%				
											'89	199		17%				
											'97	3800		2%				
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	9	13	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	20		-				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
	1	2	3	4	5	6	7	8	9	1	2	3	4						
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																			
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	10	28	0		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>								
'83		00%			00%			00%			None								
'89		00%			00%			00%			None								
'97		00%			00%			00%											
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-				
												'89	0		-				
												'97	0		-				
<i>Gutierrezia sarothrae</i>																			
S	83	22	-	-	-	-	-	-	-	-	-	-	22	-	-	-	733		22
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	19	-	-	-	-	-	-	-	-	-	-	19	-	-	-	380		19
Y	83	44	-	-	-	-	-	-	-	-	-	-	44	-	-	-	1466		44
	89	3	-	-	-	-	-	-	-	-	-	-	3	-	-	-	100		3
	97	25	-	-	-	-	-	-	-	-	-	-	25	-	-	-	500		25
M	83	21	-	-	-	-	-	-	-	-	-	-	21	-	-	-	700	8 6	21
	89	39	-	-	-	-	-	-	-	-	-	-	39	-	-	-	1300	9 7	39
	97	45	-	-	-	-	-	-	-	-	-	-	45	-	-	-	900	5 8	45
D	83	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	89	6	-	-	-	-	-	-	-	-	-	-	6	-	-	-	200		6
	97	5	-	-	-	-	-	-	-	-	-	-	-	-	-	5	100		5
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>								
'83		00%			00%			00%			-27%								
'89		00%			00%			00%			-6%								
'97		00%			00%			07%											
Total Plants/Acre (excluding Dead & Seedlings)												'83	2199	Dec:	2%				
												'89	1600		13%				
												'97	1500		7%				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	2	-	-	-	-	-	66			2
	97	2	-	-	-	-	-	-	-	-	-	-	-	40			2
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	1	-	-	-	-	-	-	-	-	-	66			2
	97	2	-	-	-	-	-	-	-	-	-	-	-	40			2
M	83	1	4	-	-	-	-	-	-	-	-	-	-	166	16	28	5
	89	-	7	-	-	-	-	-	-	-	-	-	-	233	23	39	7
	97	1	6	1	-	-	-	-	-	-	-	-	-	160	27	81	8
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		80%			00%			00%			+44%						
'89		78%			11%			00%			-33%						
'97		60%			10%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	166	Dec:	-		
												'89	299		-		
												'97	200		-		
Quercus gambelii																	
S	83	4	-	-	-	-	-	-	-	-	-	-	-	133			4
	89	18	-	-	11	-	-	2	-	-	-	-	-	1033			31
	97	1	-	-	1	-	-	-	-	-	-	-	-	40			2
Y	83	6	-	-	-	-	-	-	-	-	-	-	-	200			6
	89	29	-	-	8	-	-	-	-	-	-	1	-	1233			37
	97	33	-	-	-	-	-	-	-	-	-	-	-	660			33
M	83	141	-	-	-	-	-	-	-	-	-	-	-	4700	46	24	141
	89	27	-	-	13	-	-	21	-	-	-	-	-	2033	77	36	61
	97	40	1	-	13	-	-	-	-	-	-	-	-	1080	86	76	54
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	20	1	-	-	-	-	-	-	-	-	1	-	700			21
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	120			6
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			-19%						
'89		.84%			00%			03%			-56%						
'97		01%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	4900	Dec:	0%		
												'89	3966		18%		
												'97	1740		0%		

Trend Study 16A-12-97

Study site name: Tithing Mountain .

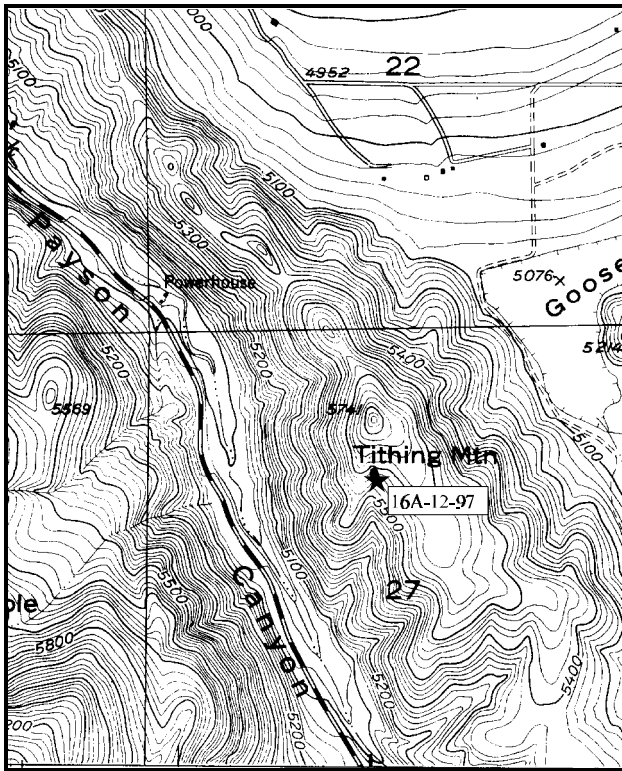
Range Type: Stansbury cliffrose

Compass bearing: frequency baseline 136M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

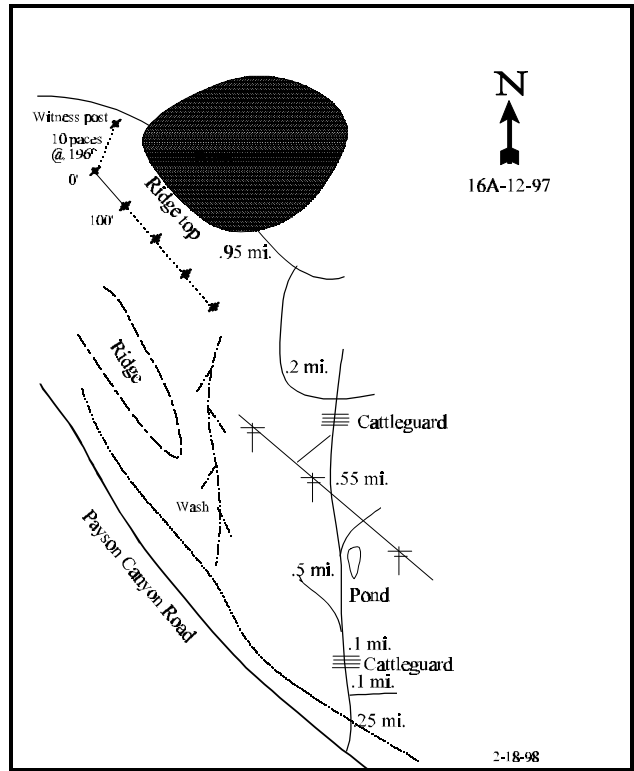
LOCATION DESCRIPTION

From the old Peteetneet school at 100 North and 600 East in Payson, head south on 600 East which turns into the Payson Canyon road. Go 3.1 miles to a flood control basin and a wide spot in the road. Either park here, cross the creek, follow the pipeline south to the first draw, then walk approximately 1/2 mile north-west up this draw to the burn, the road and the transect; OR continue driving up the Payson Canyon road another 1.75 miles to the Forest Service boundary. Go another 0.3 miles and take a rough dirt road on the left (north). Go another 0.25 miles to a side road, stay straight (left) 0.1 miles further you'll cross a cattle guard and 0.1 miles beyond that you'll hit another intersection, go straight. Continue another 0.5 miles passing a pond (where you stay left) and crossing beneath the powerlines to another fork in the road, go straight (north). Go another 0.55 miles to a four-way intersection where you stay left (west). 0.2 miles farther on you'll turn left(west) at a three-way intersection and then go 0.95 miles to a witness post/rock pile on the left side of the road. From here, the 0-foot baseline stake (marked by browse tag #9083) is 10 paces away at 196 degrees M.



Map Name: Spanish Fork .

Township 9S , Range 2E , Section 27



Diagrammatic Sketch

UTM 4428847.627 N, 440143.803 E

DISCUSSION

Trend Study No. 16A-12 (25-12)

The Tithing Mountain study was a new trend site established in 1989 on private land to monitor critical big game winter range in an area southeast of Payson, Utah. The ridge is occupied by a stand of cliffrose with an association of mountain big sagebrush and Gambel oak. The site is located close to a fire line which successfully contained a recent wildfire to the east side of the ridge. Exposure at the site is to the southeast on an 18% slope and an elevation of 5,600 feet. There is no water available on the ridge, however there has been sign in the past of significant winter use by deer and elk. It appears that domestic sheep trail through the area. Currently, there was only sign of light deer use on the area with a pellet group frequency of only 7%.

The stony clay loam soil is well-drained and moderately shallow with an effective rooting depth (see methods) estimated at almost 10 inches. Cobble sized rocks are common in the soil profile. Runoff and erosion are moderate, but there is a fair layer of litter providing protection to the soil. Rocks made up 5% of the ground cover in 1989, but pavement was less than 1%. There was 7% bare soil detected in 1989, which declined to about 3% in 1997. Soil textural analysis shows it to be a clay-loam with a slightly acidic pH of 6.3.

The key browse on the site is Stansbury cliffrose which produces 76% of the browse cover, but browse only makes up 24% of the total vegetative cover. Mountain big sagebrush is of secondary importance providing an additional 14% of the browse cover. Considering the duration of the drought and intensity of utilization, vigor and annual growth are surprisingly good on both the cliffrose and big sagebrush. The dominant cliffrose was infrequently encountered, but a fair sample of the largely mature, partly unavailable cliffrose population was obtained on the density plots in 1989 (466 plants/acre). The population appeared stable with an equal number of young and decadent plants counted that year. The young shrubs averaged 2.5 feet in height. Older cliffrose got up to 8 feet in height and had large branches broken down, possibly due to heavy snow in the past and/or big game browsing. The tall shrubs tended to be moderately to heavily hedged on the available portions. Population density increased by 57% in 1997, mostly due to the much larger, more representative sample used that year. No young plants were sampled. Utilization was heavier with 43% of the cliffrose sampled displaying heavy use. Vigor is good and there are few decadent plants. The big sagebrush was also moderately to heavily hedged in 1989 and 1997. They numbered 667 plants/acre in 1989 and 620 in 1997. Age class structure is balanced and indicative of a stable population.

The herbaceous understory on the site is in poor condition showing similarities to adjacent burned areas where the understory is dominated by annuals and low value weeds. Cheatgrass and Japanese brome comprise 92% of the grass cover on the site which poses a significant fire hazard to the future survival of the non-sprouting key browse species, sagebrush and cliffrose. There is a limited amount of perennial grass cover. Forbs are common, diverse and provide nearly as much cover as the grasses. However, composition is extremely poor with annuals such as storksbill, northern bedstraw, and pale alyssum. Together they provide 49% of the forb cover. The highly undesirable invader, whitetop, is common and has increased significantly in its sum of nested frequency value since 1989. Other common perennial forbs include weedy species such as prickly lettuce and dandelion, both valued species for wildlife.

1989 APPARENT TREND ASSESSMENT

The soil is in a stable condition. There is no evidence of significant erosion at the study site, although steeper slopes are highly eroded. The browse stand currently appears stable. A wildfire has the highest potential of severely disturbing the site. Ubiquitous and undesirable invader herbaceous species take over this range type after a fire. The area provides a limited amount of winter range.

1997 TREND ASSESSMENT

Trend for soil appears stable. Litter cover has declined, but percent bare ground has also decreased. The browse trend is stable. Cliffrose shows moderate to heavy use, but vigor is normal and percent decadence is low at only 9%. Mountain big sagebrush also appears to have a stable population. The herbaceous understory is abundant, although totally dominated by annuals, a very poor composition. Since annuals were not included in the previous reading, no comparisons can be made. Trend for perennial grasses is stable but lacking. Trend for perennial forbs is considered up slightly due to an increase in the sum of nested frequency. However, nested frequency of the noxious weed, whitetop, also increased significantly. The high density of annual grasses makes a wildfire a distinct possibility in the future.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - up slightly, but in poor condition and dominated by annuals and weeds

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 12

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	10	3	3	1	.03
G	Bromus japonicus (a)	-	297	-	86	15.63
G	Bromus tectorum (a)	-	300	-	91	12.92
G	Festuca myuros (a)	-	47	-	16	.18
G	Poa bulbosa	-	*15	-	7	1.45
G	Poa pratensis	5	5	2	2	.03
G	Poa secunda	28	30	11	14	.74
Total for Grasses		43	697	16	217	31.01
F	Alyssum alyssoides (a)	-	98	-	37	.56
F	Allium spp.	6	*-	5	-	-
F	Asclepias asperula	3	-	1	-	-
F	Cardaria draba	49	*112	18	43	4.88
F	Camelina microcarpa (a)	-	9	-	3	.04
F	Calochortus nuttallii	-	-	-	-	.00
F	Cerastium spp.	104	*-	43	-	-
F	Collinsia parviflora (a)	-	61	-	22	.30
F	Cymopterus longipes	7	15	3	8	.11
F	Epilobium paniculatum (a)	-	59	-	26	.91
F	Erodium cicutarium (a)	-	197	-	69	4.78

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Galium aparine (a)	-	140	-	48	6.00
F	Helianthus annuus (a)	9	-	4	-	-
F	Holosteum umbellatum (a)	-	67	-	28	.28
F	Lactuca serriola	148	*204	64	80	5.83
F	Medicago sativa	-	2	-	1	.00
F	Microsteris gracilis (a)	-	9	-	3	.01
F	Phlox longifolia	2	-	1	-	-
F	Polygonum douglasii (a)	-	3	-	1	.00
F	Ranunculus testiculatus (a)	-	22	-	9	.09
F	Taraxacum officinale	3	*39	1	17	1.21
F	Tragopogon dubius	25	*62	15	34	.62
F	Unknown forb-annual	-	19	-	8	.38
F	Unknown forb-perennial	-	4	-	1	.38
F	Veronica persica (a)	-	37	-	12	.57
F	Zigadenus paniculatus	1	3	1	1	.00
Total for Forbs		357	1162	156	451	27.02

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 12

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	28	2.54
B	Cowania mexicana stansburiana	32	13.96
B	Opuntia spp.	0	.03
B	Purshia tridentata	1	-
B	Quercus gambelii	1	1.82
Total for Browse		62	18.37

BASIC COVER --

Herd unit 16A , Study no: 12

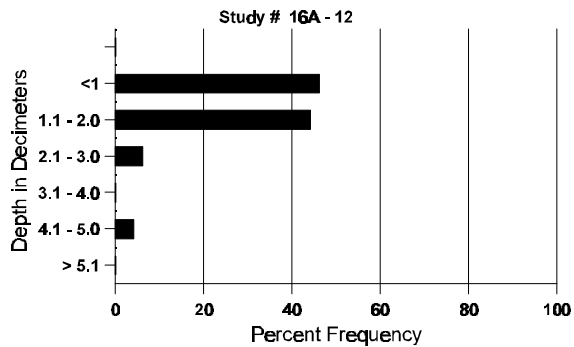
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	390	2.50	59.62
Rock	148	5.25	9.61
Pavement	108	.25	3.13
Litter	400	84.25	61.15
Cryptogams	6	.75	.06
Bare Ground	120	7.00	3.39

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 12

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.4	53.6 (12.4)	6.3	38.4	29.1	32.6	3.4	22.0	92.8	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 12

Type	Quadrat Frequency '97
Deer	7

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 12

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches)		Total	
		1	2	3	4		Ht.	Cr.		
<i>Artemisia tridentata vaseyana</i>										
Y	89	8	-	-	-	-	-	-	8	8
	97	9	-	-	-	-	-	-	9	9
M	89	-	3	3	-	-	-	-	6	20 38
	97	11	1	1	3	-	2	-	18	24 37
D	89	2	3	1	-	-	-	-	3	2
	97	2	-	2	-	-	-	-	3	1
X	89	-	-	-	-	-	-	-	0	0
	97	-	-	-	-	-	-	-	180	9
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>		
'89		30%		20%		15%		- 7%		
'97		03%		16%		03%				
Total Plants/Acre (excluding Dead & Seedlings)						'89	666	Dec:	30%	
						'97	620		13%	
<i>Cowania mexicana stansburiana</i>										
Y	89	1	1	1	-	-	-	-	3	3
	97	-	-	-	-	-	-	-	0	0
M	89	2	2	1	-	2	1	-	8	56 58
	97	19	4	7	-	6	11	2	32	97 105
D	89	-	1	1	-	1	-	-	3	3
	97	-	-	4	-	-	1	-	2	3
X	89	-	-	-	-	-	-	-	0	0
	97	-	-	-	-	-	-	-	80	4
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>		
'89		50%		29%		00%		+57%		
'97		19%		43%		06%				
Total Plants/Acre (excluding Dead & Seedlings)						'89	466	Dec:	21%	
						'97	1080		9%	

A G E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	1	-	-	-	-	-	1	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'89		00%			00%			00%				Appeared						
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
Quercus gambelii																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	4	-	-	-	-	-	-	-	-	-	4	-	-	80	37	39	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'89		00%			00%			00%				Appeared						
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	80		-			

Trend Study 16A-13-97

Study site name: Steele Ranch .

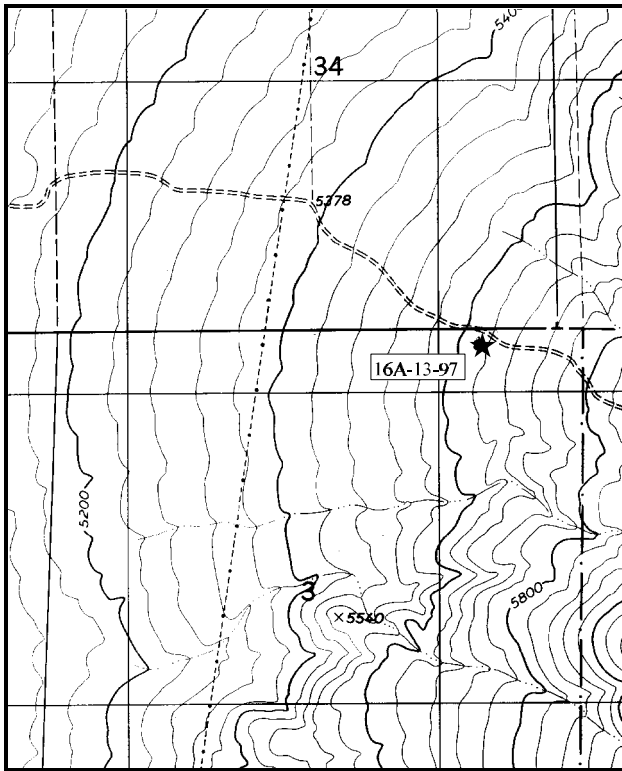
Range Type: Mixed oak-sage

Compass bearing: frequency baseline 185M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

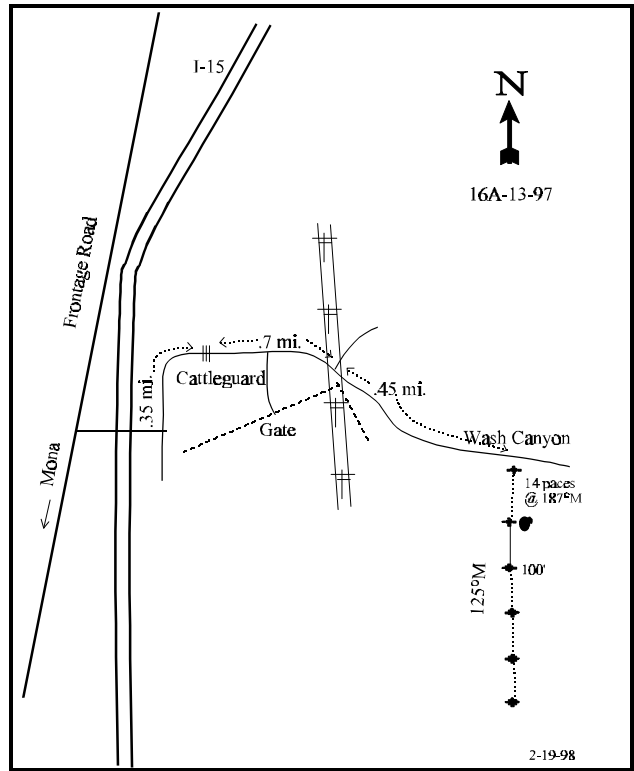
LOCATION DESCRIPTION

From 200 North Main Street in Mona, take the frontage road north towards Santaquin. Go 5.35 miles and turn east onto a gravel road that goes beneath the I-15 overpass. After passing beneath I-15, the road comes to a "T", go left 0.35 miles to a cattle guard. Continue up the road 0.7 miles to a fence corner and a fork in the road. Stay to the right (south) for 0.45 miles where there is a witness post on the south side of the road. From the witness post the 0-foot baseline stake is 14 paces away at 187 degrees M.



Map Name: Santaquin .

Township 11S, Range 1E, Section 3



Diagrammatic Sketch

UTM 4416157.465 N, 431148.838 E

DISCUSSION

Trend Study No. 16A-13 (41-13)

The Steele Ranch study is on Division property and is typical of the mixed oak-big sagebrush type along the foothills of the Wasatch Front. Much of the type has been converted to agriculture or heavily grazed by domestic livestock. This site is representative of what remains of the native winter range along the mountain front. Slope at the site is a gentle 10 to 15% with a west aspect. The site receives moderate to heavy use by deer and light use from elk, use depends on the severity of the winter. With the milder winters, pellet group data from 1997 demonstrates little deer use, with no elk sign noted.

Soil at the site is relatively deep with an effective rooting depth (see methods) estimated at almost 11 inches. Soil texture is a loam with a neutral pH (7.2). Rocks are common on the surface and within the profile. Phosphorus may be limiting to plant growth with only 9.1 ppm found in the soil. Little bare soil is exposed, making the threat of erosion minimal on the site.

Mountain big sagebrush dominates much of the area, although site observations and data from 1989 suggested an expanding oak population, which does not now appear to be so. Mountain big sagebrush currently accounts for 41% of the browse cover. It had a density of 3,132 plants/acre in 1989. Although a few seedling and young sagebrush were encountered, the data indicated the sagebrush stand was over 50% decadent in 1989. Presently, percent decadency is only about 18%. While in some places the decadence may be caused by competition and shading with the oakbrush, this does not appear to be the case over the entire area. Sagebrush density declined to 2,480 plants/acre by 1997, due mostly to decadent plants dying since 1989 (about 460 plants/acre are dead). Currently, 80% of the sagebrush are classified as mature. Recruitment is poor, but percent decadency has declined significantly. Utilization is moderate to heavy.

The oakbrush is very patchy in its clonal distribution, yet produces more cover than sagebrush. The height of the oak is variable with some clones growing to 10 feet, while others are less than two feet. One of the old density plots contained 99% of the oak sampled in 1989. This small sample indicated that there it was a stand of very dense young sprouts. In general, the age class structure was indicative of an increasing population. Twenty-three percent of the available oak had sustained moderate hedging in 1989. With the new much larger sample size used in 1997, population density of oak showed a slight increase to 10,320 stems/acre. Most of the plants were classified as mature (81%), but differentiating young oak from small mature plants is difficult. It is likely that many short mature plants were classified as young in 1989. The extended baseline samples a rocky area which supports some low growing mature oak. Young plants are still common making up 16% of the population. Combined with the lack of dead plants and low decadence (2%), oak appears to be slowly increasing. The oak population sampled in 1997 was all available with light utilization.

The herbaceous understory is functionally limited to Sandberg bluegrass which provides 88% of the grass cover. It has a fairly high density, but produces little forage compared to other native bunch grasses. Forbs are diverse but not abundant. Twenty-three species of annual and perennial forbs found in 1997 combine to produce only about 3% cover. The herbaceous species only contribute to about 17% of the total vegetative cover.

1989 APPARENT TREND ASSESSMENT

The soil trend appears stable. Little change would be expected to occur with the pavement dominated surface. There are two notable indicators of downward trend presently apparent on the site: the expanding, highly competitive oakbrush and the high level of decadence in the mountain big sagebrush population. Vigor is good and utilization is sustainable on this key browse species. The herbaceous understory is depleted and basically nonproductive.

1997 TREND ASSESSMENT

The soil trend is currently stable. Ground cover characteristics have remained similar to the 1989 observations. The browse trend for sagebrush is stable. Some of the change in density may be due to the much larger sample which gives more accurate estimates of shrub densities. However, it is apparent that some of the decadent plants sampled in 1989 have died. Currently, percent decadence has declined from 55% to only 18%. Use is mostly light to moderate and vigor normal on most plants. Oak has a similar population density compared to 1989. The proportion of young plants has changed drastically, although some of the change may be due to classification errors and larger sample size. Recruitment is still good and combined with the lack of dead plants, low decadence, and good vigor; the population appears to be increasing. Overall browse trend is considered stable. The herbaceous understory is insufficient. Sum of nested frequency for grasses has remained similar to 1989, while sum of nested frequency for forbs has increased slightly. Trend overall is considered stable.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - stable, but insufficient

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 13

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Bromus tectorum (a)	-	100	-	34	.29
G	Festuca myuros (a)	-	30	-	12	.06
G	Poa fendleriana	1	16	1	5	.08
G	Poa secunda	235	233	83	80	3.29
Total for Grasses		236	379	84	131	3.73
F	Agoseris glauca	-	*8	-	4	.02
F	Alyssum alyssoides (a)	-	234	-	68	.51
F	Allium spp.	-	2	-	1	.00
F	Arabis spp.	5	1	2	1	.00
F	Astragalus beckwithii	3	*11	1	6	.08
F	Astragalus utahensis	-	2	-	2	.03
F	Castilleja linariaefolia	-	6	-	3	.04
F	Calochortus nuttallii	21	34	12	16	.08
F	Castilleja spp.	6	3	4	2	.01
F	Collinsia parviflora (a)	-	6	-	3	.01
F	Cryptantha spp.	-	3	-	1	.00
F	Epilobium paniculatum (a)	-	12	-	6	.03

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Eriogonum racemosum	3	2	1	1	.00
F	Galium aparine (a)	-	77	-	26	.96
F	Holosteum umbellatum (a)	-	51	-	17	.13
F	Lomatium spp.	5	*33	4	14	.48
F	Petroradia pumila	3	-	1	-	-
F	Phlox longifolia	20	*35	8	16	.10
F	Ranunculus testiculatus (a)	-	116	-	37	.47
F	Tragopogon dubius	3	4	1	2	.01
F	Unknown forb-annual	-	6	-	3	.01
F	Veronica biloba (a)	-	2	-	1	.00
F	Viola spp.	-	3	-	2	.01
F	Zigadenus paniculatus	-	-	-	-	.01
Total for Forbs		69	651	34	232	3.07

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

BROWSE TRENDS --

Herd unit 16A , Study no: 13

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Artemisia tridentata vaseyana	75	13.34
B	Gutierrezia sarothrae	2	.06
B	Quercus gambelii	55	18.79
Total for Browse		132	32.20

BASIC COVER --

Herd unit 16A , Study no: 13

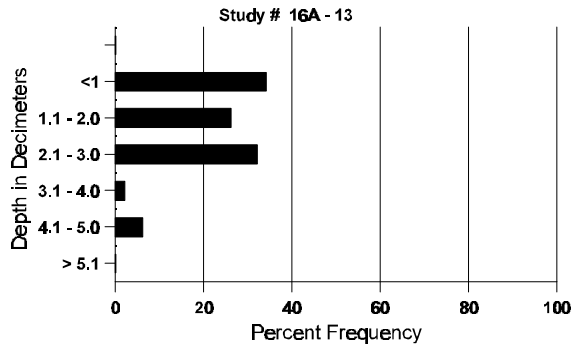
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	367	3.00	38.51
Rock	166	3.75	5.61
Pavement	172	26.75	9.78
Litter	397	56.75	58.58
Cryptogams	161	5.75	3.87
Bare Ground	150	4.00	4.83

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 13

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.6	47.6 (13.1)	7.2	37.1	41.1	21.8	4.0	9.1	86.4	.7

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 13

Type	Quadrat Frequency '97
Rabbit	5
Deer	7

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 13

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
Artemisia tridentata vaseyana																
S	89	1	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	4	-	-	-	-	-	-	-	4	-	-	-	80		4
Y	89	4	1	-	-	-	-	-	-	5	-	-	-	333		5
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1
M	89	8	7	-	1	-	-	-	-	16	-	-	-	1066	22 23	16
	97	34	43	19	2	2	-	-	-	100	-	-	-	2000	26 40	100
D	89	8	18	-	-	-	-	-	-	22	-	4	-	1733		26
	97	5	10	8	-	-	-	-	-	14	-	-	9	460		23
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	460		23
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'89		55%		00%		09%		-21%								
'97		44%		22%		07%										
Total Plants/Acre (excluding Dead & Seedlings)										'89	3132	Dec:	55%			
										'97	2480		19%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	6	-	-	-	-	-	-	-	-	6	-	-	-	400		6	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	4	2	1
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	6	9	4
D	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-85%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	532	Dec:	12%				
											'97	80		0%				
Quercus gambelii																		
S	89	6	-	-	-	-	-	5	-	-	11	-	-	-	733		11	
	97	13	-	-	-	-	-	-	-	-	13	-	-	-	260		13	
Y	89	85	18	1	4	-	-	-	-	-	108	-	-	-	7200		108	
	97	85	-	-	-	-	-	-	-	-	85	-	-	-	1700		85	
M	89	10	9	-	-	-	-	-	-	-	19	-	-	-	1266	33	24	19
	97	419	-	-	-	-	-	-	-	-	419	-	-	-	8380	54	40	419
D	89	12	4	-	-	-	-	-	-	-	15	-	1	-	1066		16	
	97	12	-	-	-	-	-	-	-	-	11	-	-	1	240		12	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	920		46	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		22%			.69%			.69%			+ 8%							
'97		00%			00%			.19%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	9532	Dec:	11%				
											'97	10320		2%				

Trend Study 16A-14-97

Study site name: Big Hollow .

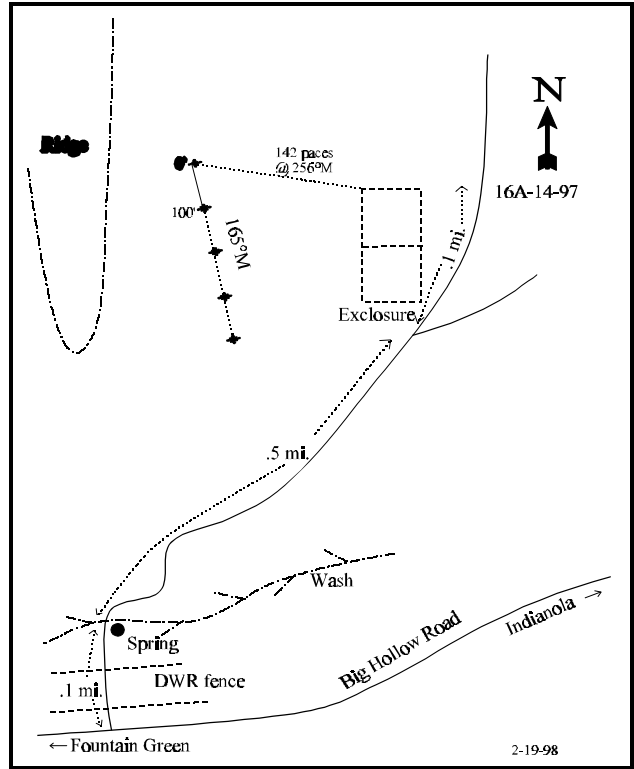
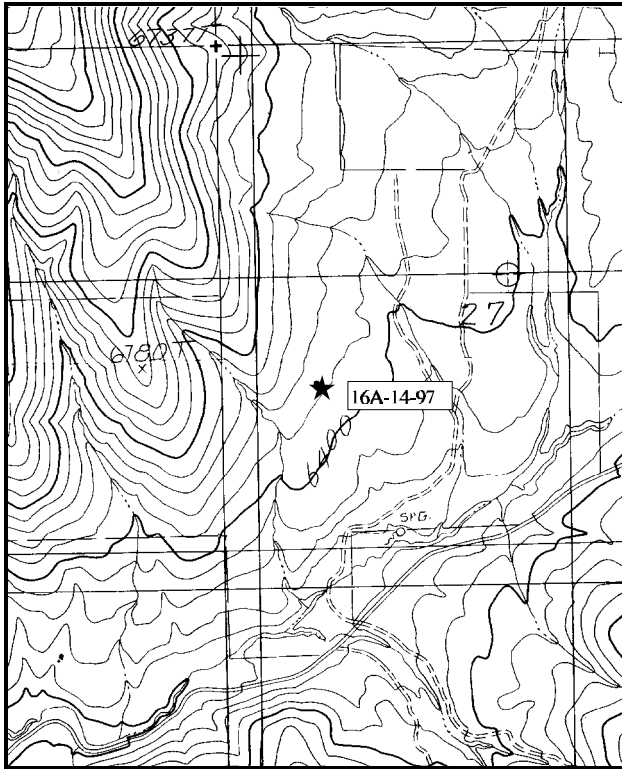
Range Type: Big sagebrush

Compass bearing: frequency baseline 165 M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

In Fountain green, at the intersection of State Street and 100 North, go east on 100 North for 0.3 miles to the old dump. Continue up Big Hollow for 3.3 miles to a gate parallel to the road onto DWR land. Turn left through the gates and go 0.1 miles to a spring in a wash. Continue on this road for 0.5 miles to a fork. Stay left and go 0.1 miles to the north end of an enclosure. Park here. From the north-west corner of the enclosure walk 142 paces at a bearing of 256 degrees M to a tall fencepost in the sagebrush. This 4-foot tall green fencepost is the 0-foot baseline stake.



Map Name: Big Hollow .

Diagrammatic Sketch

Township 13S , Range 3E , Section 27

UTM 4389654.916 N , 450200.302 E

DISCUSSION

Trend Study No. 16A-14 (25-14)

The Big Hollow study is located on Division property east of Fountain Green on a large area that was chained in 1964. However, there is little evidence of the treatment on the site which is located near the bottom of a ridge. Trees appear to have never been very dense on the site, and no seeded species were present. Other areas of the chaining were apparently more heavily seeded. There are only a few scattered junipers on the site, averaging 6-10 feet in height. The dominant vegetation is basin big sagebrush with a smaller element of bitterbrush. There is a perennial spring 200 yards southeast of the study. Due to the availability of water during the dry year of 1989, deer were using the area during the summer. However, the majority of big game use occurs in winter and spring. One recent winter-killed fawn was found on the site in 1989. In 1997, rabbit pellet groups were relatively abundant with a quadrat frequency of 26%. A pellet group transect of 50, 100ft² circular plots (this should not be confused with the pellet-group quadrat frequencies) was read in 1997 and estimated 31 deer days use/acre, 2 elk days use/acre, and 6 cattle days use/acre.

The soil is a moderately deep, sandy clay loam with an effective rooting depth (see methods) of almost 12 inches. It contains a substantial amount of small rocks that are concentrated as erosion pavement on the soil surface. Rock and pavement cover together had a cover value of 30% in 1989 and 23% in 1997. Rock is concentrated in the upper 8 inches of the soil profile. As a result, soil temperature was relatively high, averaging 63^oF at an average depth of 13 inches. Litter is moderately low due to the sparse herbaceous understory. Percent bare ground was 17% in 1989, but has since declined to 11%. Considering the amount of rock, pavement, and exposed soil, there is little erosion because of the level topography.

As winter range, browse is the key forage component. Basin big sagebrush (*Artemisia tridentata tridentata*) currently makes up 63% of the browse cover on the site. It is characteristically tall and vigorous on this site with light utilization. Population density was originally estimated at 2,599 plants/acre in 1989. Recruitment was adequate, vigor good, but percent decadency was moderately high at 33%. Data from 1997 show a 32% decline in density to 1,780 plants/acre. The number of mature plants remains similar with the density of young and decadent plants decreasing. Some of the difference between years may be due to the much larger sample used in 1997, but 42% of the difference can be explained by the number of dead plants on the site (340 plants/acre).

Bitterbrush numbered only 599 plants/acre in 1989. Vigor was good on the moderate to heavily hedged plants. They have relatively open crowns, average growth and seed production. The taller shrubs exhibit good leader growth when the branches are out of reach from browsing. During the 1997 reading, density of bitterbrush was estimated at only 280 plants/acre. Since no dead plants were encountered, this density is considered a more accurate population estimate due to the larger sample size used in 1997 which gives better estimates for populations that are clumped and discontinuous in their distribution. Bitterbrush in 1997 was classified as moderately to heavily hedged. Percent decadency is relatively low at 21%, but all decadent plants sampled displayed poor vigor and appeared to be dying. Young plants account for 29% of the population and are abundant enough to replace decadent individuals.

Broom snakeweed, an undesirable invader/increaser, has increased by 96% since 1989 from a density of only 799 plants/acre to 22,560. Strip frequency (see methods) indicates that it is widely distributed throughout the site with a frequency of 79%. The age distribution of the population would also indicate that it shows characteristics of an expanding population.

The understory is comprised of a sparse stand of native grasses and a few forbs. Cheatgrass alone makes up

41% of the grass cover. The nearby enclosure supports a much higher abundance of seeded grasses. No seeded grasses were found on the immediate area of the sampled site.

1989 APPARENT TREND ASSESSMENT

The Big Hollow area provides quality big game winter range. There is an abundance of browse forage. The site sampled is less productive in terms of herbaceous vegetation for spring use, but other parts of the treated area have robust stands of seeded grasses. Trends for deer winter range values are stable.

1997 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in percent bare soil and an increase in nested frequency of perennial grasses. Browse trend for the preferred species, basin big sagebrush and bitterbrush appear stable, however, the large increase in broom snakeweed from 799 plants/acre to 22,560 plants/acre indicates a deteriorating trend. The herbaceous understory is sparse, but sum of nested frequency of perennial grasses and forbs increased slightly. The nearby enclosure supports a good stand of seeded and native grasses, illustrating the obviously heavy livestock use of the herbaceous vegetation outside of the fence.

TREND ASSESSMENT

soil - up slightly

browse - down due to alarming, almost exponential increase of broom snakeweed

herbaceous understory - up slightly for the perennial species

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 14

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	11	39	5	18	.70
G	Bromus tectorum (a)	-	238	-	84	3.74
G	Carex spp.	-	*41	-	16	.74
G	Oryzopsis hymenoides	74	67	29	29	1.85
G	Poa secunda	-	3	-	1	.00
G	Sitanion hystrix	89	*40	41	18	.86
G	Stipa comata	12	*46	6	19	1.05
Total for Grasses		186	474	81	185	8.96
F	Alyssum alyssoides (a)	-	148	-	58	1.02
F	Astragalus lentiginosus	1	-	1	-	-
F	Calochortus nuttallii	-	2	-	2	.01
F	Chaenactis douglasii	12	*21	5	11	.11
F	Chenopodium spp.	-	2	-	1	.00
F	Cirsium spp.	8	17	4	8	.04

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Eriogonum spp.	1	2	1	1	.00
F	Gilia spp. (a)	-	1	-	1	.00
F	Hackelia patens	-	4	-	1	.03
F	Lactuca serriola	-	1	-	1	.00
F	Orobanche fasciculata	-	1	-	1	.00
F	Polygonum douglasii (a)	-	15	-	6	.05
F	Sphaeralcea coccinea	42	35	14	18	.47
F	Tragopogon dubius	8	3	4	1	.01
Total for Forbs		72	252	29	110	1.78

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

BROWSE TRENDS --

Herd unit 16A , Study no: 14

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata tridentata	61	14.77
B	Artemisia tridentata vaseyana	1	.30
B	Gutierrezia sarothrae	79	5.73
B	Juniperus osteosperma	0	.00
B	Opuntia spp.	5	.18
B	Purshia tridentata	12	2.27
Total for Browse		158	23.27

BASIC COVER --

Herd unit 16A , Study no: 14

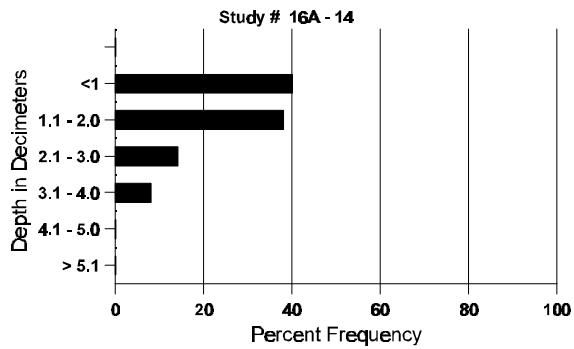
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	333	3.25	33.79
Rock	180	3.75	5.09
Pavement	292	26.25	17.61
Litter	384	49.00	44.18
Cryptogams	74	.50	1.59
Bare Ground	246	17.25	11.16

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 14

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
11.7	63.4 (13.2)	6.8	48.0	27.1	24.9	2.9	13.3	166.4	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 14

Type	Quadrat Frequency '97
Rabbit	26
Elk	2
Deer	32
Cattle	1

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 14

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total						
		1	2	3	4		1	2							
Artemisia tridentata tridentata															
S	89	2	-	-	1	-	-	-	-	3	-	-	200		3
	97	4	-	-	-	-	-	-	-	4	-	-	80		4
Y	89	4	-	-	1	-	-	-	-	5	-	-	333		5
	97	9	-	-	-	-	-	-	-	9	-	-	180		9
M	89	15	6	-	-	-	-	-	-	19	2	-	1400	31 33	21
	97	54	1	-	1	-	-	-	-	56	-	-	1120	36 48	56
D	89	11	1	-	1	-	-	-	-	12	-	-	866		13
	97	21	2	-	1	-	-	-	-	16	-	-	480		24
X	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	340		17
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		18%		00%		03%		-32%							
'97		03%		00%		09%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	2599	Dec:	33%		
										'97	1780		27%		
Artemisia tridentata vaseyana															
M	89	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	1	-	-	-	-	-	-	-	1	-	-	20	-	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		00%		00%		00%		Appeared							
'97		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-		
										'97	20		-		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	327	5	-	2	-	-	-	-	-	334	-	-	-	6680		334	
M	89	11	-	-	-	-	-	-	-	-	11	-	-	-	733	6	4	11
	97	758	-	-	35	-	-	-	-	-	793	-	-	-	15860	10	11	793
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	180		9	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+96%							
'97		.44%			00%			.08%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	799	Dec:	0%			
												'97	22560		0%			
Opuntia spp.																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140	5	9	7
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	160		-			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
Y	89	1	1	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	1	-	1	2	-	-	-	-	-	4	-	-	-	80		4	
M	89	-	4	-	-	-	-	-	-	-	4	-	-	-	266	24	38	4
	97	-	4	1	1	1	-	-	-	-	7	-	-	-	140	57	69	7
D	89	1	1	1	-	-	-	-	-	-	3	-	-	-	200		3	
	97	1	-	1	-	-	1	-	-	-	-	-	-	3	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		67%			11%			00%			-53%							
'97		36%			29%			21%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	599	Dec:	33%				
											'97	280		21%				

Trend Study 16A-15-97

Study site name: Old Pinery Reseeding .

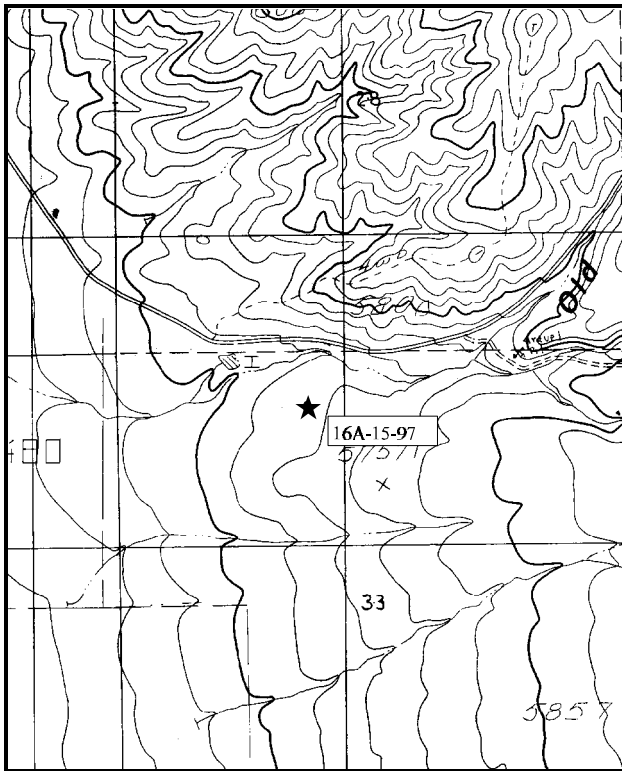
Range type: Chained Pinyon-Juniper Reseeded

Compass bearing: frequency baseline 188 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

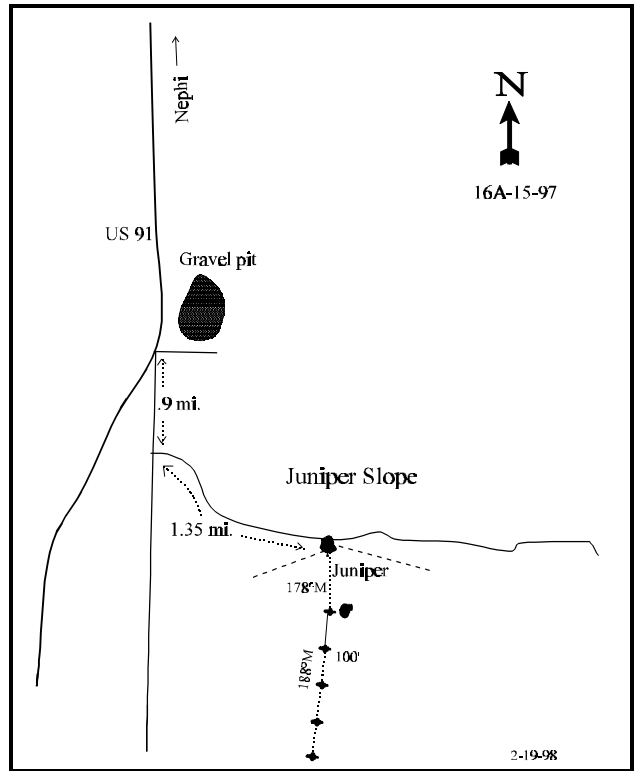
LOCATION DESCRIPTION

From Nephi, proceed south on U.S. 91 to a dirt road just past a gravel pit. Turn left on the dirt road, and proceed south 0.9 miles to another intersection. Turn left at the intersection and proceed southeast for 1.35 miles toward Old Pinery Canyon. Stop at the corner of the fence line. From the easternmost of the two middle fenceposts, the O-foot marker of the baseline is located 130 paces away at an azimuth of 178 degrees true. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3960, is attached to the O-foot baseline stake.



Map Name: Nephi, Utah

Township 13 S, Range 1 E, Section 33



Diagrammatic Sketch

UTM 4388460.223 N, 428889.356 E

DISCUSSION

Trend Study No. 16A-15 (26-1)

The Old Pinery study is on privately owned rangeland located south of Old Pinery Creek. Previously the area was dominated by juniper and pinyon, but has since been chained and seeded. Elevation is 5,760 feet with a gentle west facing slope of 3%. Tree removal was relatively successful with only 12 trees/acre in the 4-6 foot class found on the site in 1997. Animal use was very low in 1983 due to lack of cover and forage. However, deer pellet groups were common with a quadrat frequency of 41% in 1997. Old cattle sign was also noted that year with a quadrat frequency of 18%. There was no sign of elk use.

Soil at the site is a deep alluvially deposited loam with an effective rooting depth (see methods) estimated at 19 inches. Few rocks are found on the surface and in the profile. Soil reaction is slightly acid with a pH of 6.2. Erosion is currently not a problem due to the abundant vegetation and litter cover combined with the gentle terrain.

The browse composition consists primarily of mountain big sagebrush which accounted for 83% of the browse cover in 1997. It should be noted that the total browse cover only comes to about 7%. Estimates from 1983 indicate a population density of 1,332 plants/acre. During this reading there were no young plants or seedlings encountered and use was light. Density increased 71% to 4,532 plants/acre by 1989 due to a dramatic increase in the number of young plants (0 to 3,433 plants/acre). Seedlings were also abundant (8,166 plants/acre) which would indicate an expanding population. Use was mostly light and vigor good. With the much larger sample size used in 1997, the estimated density was 2,240 plants/acre. The lack of any dead plants would suggest that this significantly larger sample is a more accurate estimate of sagebrush density over the entire area, especially when the population is clumped or has a discontinuous distribution. The population is mostly young (71%) and seedlings are also abundant. Utilization was light to moderate on most plants with only a few individuals receiving heavy use. Seed heads from the 1996 growing season indicate excellent seed production last year.

The only other preferred browse found on the site consists of a few scattered, heavily hedged bitterbrush plants. Only 60 plants/acre were estimated with the larger sample used in 1997. All plants sampled displayed a clubbed appearance. Broom snakeweed, an invader, has increased from 600 plants/acre in 1983 to 8,565 plants/acre in 1989. The population has since declined 82%. The proportion of young plants also declined (46% to 18%) indicating a stabilized population.

The herbaceous understory was dominated by cheatgrass in 1983 and it appeared that the seeding was not successful. Seeded and native perennial grasses were rare and no perennial forbs were encountered that year. By 1989 sum of nested frequency for perennial grasses nearly tripled. A few perennial forbs were also encountered. During the 1997 reading, seeded and native grasses continued to increase. Cheatgrass is still present, but only accounts for 10% of the grass cover. Western wheatgrass and Sandberg bluegrass are also abundant. More perennial forbs were found in 1997, however, annual species still dominate by providing 86% of the forb cover.

1983 APPARENT TREND ASSESSMENT

This study is an interesting management situation because it is illustrative of a poorly planned and executed seeding project. Poor value juniper-pinyon range has been converted to even less productive range. Current forage production from all classes of vegetation is probably less than 30 lbs/acre. In spite of current poor condition, trend is up mainly because it has nowhere else to go. If no further seeding is done, there will be a

slow increase in sagebrush and perhaps a more rapid invasion of snakeweed. Perennial grasses will also improve but very slowly. The greatest threat to the area is from fire. A second attempt at seeding a mixture of desirable shrubs, forbs and grasses could possibly improve conditions.

1989 TREND ASSESSMENT

The variability of seeding success after the juniper chaining remains obvious. Those areas not occupied by a dense stand of crested wheatgrass have an abundance of cheatgrass, annual forbs, and broom snakeweed. The site shows definite improvement over 1983, when the whole area appeared to be in an impoverished condition. In addition, the study is located in one of the poorer locations of the whole treatment. Ground cover characteristics have changed since 1983. Litter cover has declined from 75% to 63%, while bare ground increased from 18% to 27%. However, it appears from photos that this change is primarily the result in a change from mostly cheatgrass to a stand of perennial grasses. Trend is considered stable at this time. Trend for mountain big sagebrush is up. Density has increased from 1,332 plants/acre to 4,532. The sagebrush is vigorous and lightly hedged. There has been a definite increase in recruitment which would indicate an expanding population. Density of broom snakeweed has also increased dramatically. It appears to be expanding on areas without good perennial grass competition. Trend for the herbaceous understory is up. Quadrat frequency of crested wheatgrass increased from 14% to 48%. The native Sandberg bluegrass and western wheatgrass have increased significantly and are now common along the baseline. No perennial forbs were identified in 1983, but several species were identified in 1989. However, none are valuable as forage.

TREND ASSESSMENT

soil - stable

browse - up

herbaceous understory - up

1997 TREND ASSESSMENT

Soil trend continues to be stable. Percent bare ground declined from 27% to 14% with litter cover also declining significantly from 63% to 36%. Erosion is currently not a problem due to the gentle terrain combined with the excellent vegetation cover. The browse trend appears to be improving despite the supposed decline in sagebrush density. It should be noted that no dead sagebrush were found on the site suggesting that the new, larger sample used this year is responsible for the change in sagebrush density. The larger sample and improved design gives significantly better population estimates for species with clumped or discontinuous distributions. Currently, the population is mostly young (71%) with a very high biotic potential (proportion of seedlings to the population) of 41%. This would indicate an expanding population. Another positive sign is the decline in broom snakeweed density. The herbaceous trend is also up with an increase in sum of nested frequency for perennial grasses and forbs. However, the forb composition is dominated by annuals which account for 86% of the forb cover.

TREND ASSESSMENT

soil - stable

browse - up

herbaceous understory - up

HERBACEOUS TRENDS --
Herd unit 16A , Study no: 15

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	a ₃₅	b ₁₂₁	b ₁₁₀	14	48	48	5.19
G	Agropyron smithii	a ₂₃	b ₁₄₈	b ₁₆₃	10	52	54	3.49
G	Agropyron spicatum	a ₂₃	a ₇	b ₃₆	12	3	18	1.39
G	Bromus tectorum (a)	-	-	259	-	-	90	2.30
G	Festuca spp. (a)	-	-	277	-	-	80	5.50
G	Poa bulbosa	a ⁻	a ⁻	b ₆₄	-	-	25	.89
G	Poa pratensis	b ₅₅	a ⁻	a ⁻	29	-	-	-
G	Poa secunda	a ₄	b ₁₀₄	c ₁₉₀	2	45	74	3.79
G	Sitanion hystrix	-	8	-	-	3	-	-
Total for Grasses		140	388	1099	67	151	389	22.58
F	Agoseris glauca	-	-	7	-	-	2	.01
F	Alyssum alyssoides (a)	-	-	281	-	-	88	.91
F	Allium spp.	a ⁻	b ₅₇	b ₄₇	-	27	21	.13
F	Astragalus spp.	a ⁻	a ⁻	b ₉	-	-	5	.10
F	Astragalus utahensis	-	-	2	-	-	1	.15
F	Calochortus nuttallii	a ⁻	a ⁻	b ₁₁	-	-	4	.02
F	Cerastium spp.	a ⁻	b ₁₆	a ⁻	-	6	-	-
F	Cirsium spp.	a ⁻	a ⁻	b ₉	-	-	4	.05
F	Convolvulus arvensis	-	-	2	-	-	1	.00
F	Collinsia parviflora (a)	-	-	196	-	-	68	.78
F	Cymopterus longipes	a ⁻	a ₃	b ₁₇	-	3	8	.21
F	Descurainia pinnata (a)	-	3	-	-	2	-	-
F	Epilobium paniculatum (a)	-	-	75	-	-	29	.14
F	Erodium cicutarium (a)	-	-	158	-	-	55	1.72
F	Erigeron spp	-	-	2	-	-	1	.00
F	Eriogonum racemosum	-	-	6	-	-	3	.04
F	Grindelia squarrosa	-	-	3	-	-	1	.00
F	Lactuca serriola	a ⁻	c ₂₆	b ₁₁	-	12	5	.02
F	Microsteris gracilis (a)	-	-	58	-	-	22	.16
F	Phlox longifolia	a ⁻	b ₉	c ₃₂	-	5	13	.09
F	Polygonum douglasii (a)	-	-	23	-	-	10	.05

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Ranunculus testiculatus (a)	-	-	287	-	-	85	2.15
F	Sphaeralcea coccinea	-	3	-	-	1	-	-
F	Tragopogon dubius	_a -	_a 3	_b 9	-	1	6	.05
F	Vicia americana	-	-	9	-	-	3	.06
Total for Forbs		0	120	1254	0	57	435	6.89

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 15

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	46	5.53
B	Gutierrezia sarothrae	19	.53
B	Juniperus osteosperma	1	.15
B	Purshia tridentata	3	.42
Total for Browse		69	6.63

BASIC COVER --

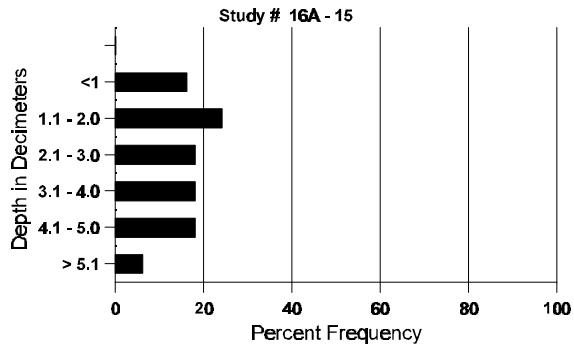
Herd unit 16A , Study no: 15

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	387	3.00	9.50	43.06
Rock	103	2.25	.25	4.32
Pavement	175	0	.50	.67
Litter	395	75.00	63.00	36.01
Cryptogams	262	1.50	0	5.95
Bare Ground	266	18.25	26.75	14.39

SOIL ANALYSIS DATA --
 Herd Unit 16A, Study no: 15

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
19.1	44.8 (16.9)	6.2	37.4	39.7	22.8	1.8	19.2	208.0	.4

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16A , Study no: 15

Type	Quadrat Frequency '97
Rabbit	12
Deer	41
Cattle	18

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 15

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Artemisia tridentata vaseyana																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	162	-	-	16	-	-	67	-	-	-	-	-	245	8166		245
	97	36	10	-	-	-	-	-	-	-	-	-	-	46	920		46
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	86	-	-	5	-	-	12	-	-	-	-	-	103	3433		103
	97	72	-	8	-	-	-	-	-	-	-	-	-	69	1600		80
M	83	38	-	-	-	-	-	-	-	-	-	-	-	38	1266	13 13	38
	89	27	1	-	-	-	-	-	-	-	-	-	-	28	933	15 16	28
	97	18	11	2	-	-	-	-	-	-	-	-	-	31	620	22 41	31
D	83	2	-	-	-	-	-	-	-	-	-	-	-	1	66		2
	89	4	1	-	-	-	-	-	-	-	-	-	-	4	166		5
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			03%			+71%						
'89		01%			00%			.73%			-51%						
'97		10%			09%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	1332	Dec:	5%		
												'89	4532		4%		
												'97	2240		1%		

AGE	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Gutierrezia sarothrae																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	119	-	-	-	-	-	-	-	-	119	-	-	-	3966		119
	97	14	-	-	-	-	-	-	-	-	14	-	-	-	280		14
M	83	19	-	-	-	-	-	-	-	-	19	-	-	-	633	11 13	19
	89	123	-	-	1	-	-	-	-	-	124	-	-	-	4133	11 9	124
	97	64	-	-	-	-	-	-	-	-	64	-	-	-	1280	7 8	64
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	14	-	-	-	-	-	-	-	-	14	-	-	-	466		14
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+93%						
'89		00%			00%			00%			-82%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	633	Dec:	0%			
											'89	8565		5%			
											'97	1560		0%			
Juniperus osteosperma																	
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+ 0%						
'89		00%			00%			00%			-39%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	33	Dec:	-			
											'89	33		-			
											'97	20		-			

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	'97	-	-	2	-	-	1	-	-	-	-	-	-	60	11	43	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'83		00%			00%			00%				None						
'89		00%			00%			00%				Appeared						
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	60		-			

Trend Study 16A-16-97

Study site name: Levan Farm Reseeding .

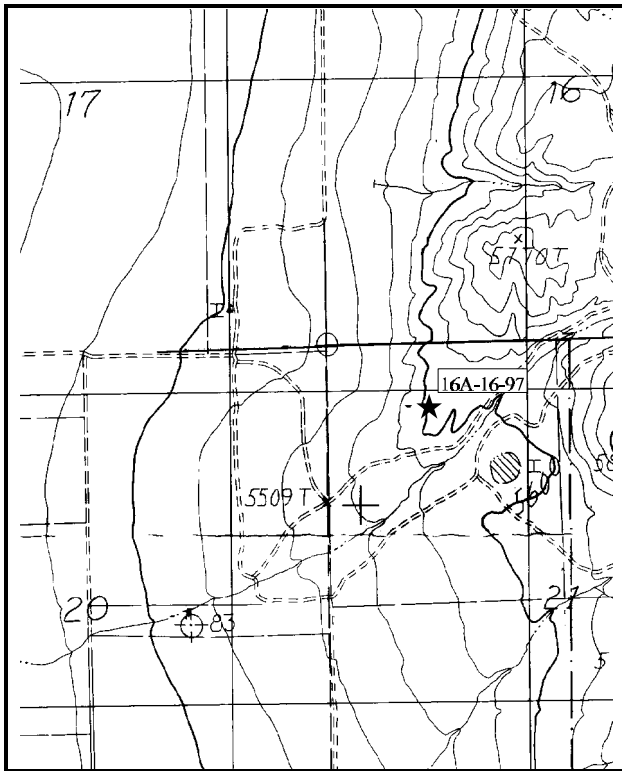
Range type: Reseeded Pinyon-Juniper .

Compass bearing: frequency baseline 165 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11& 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

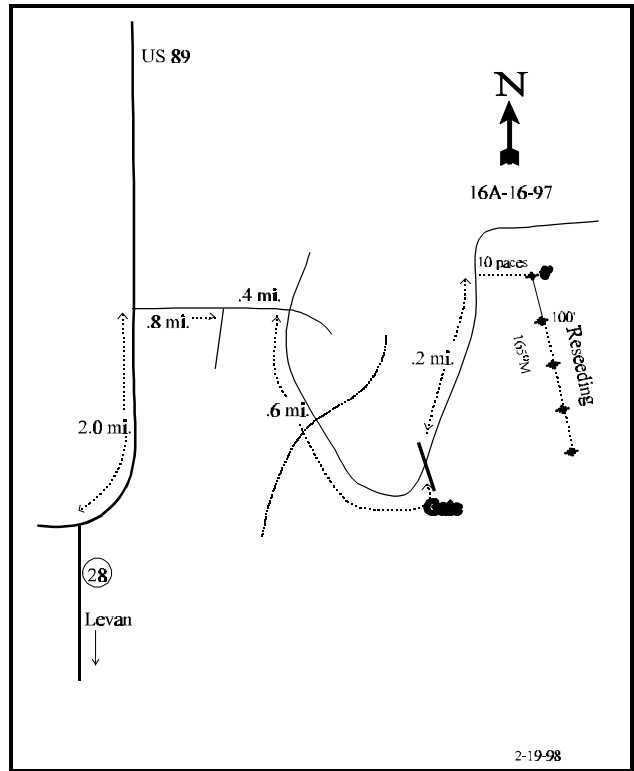
LOCATION DESCRIPTION

From the junction of Highway U.S. 89 and Highway 28 in Levan, proceed north towards Nephi for 2.0 miles to a dirt road to the east. Turn right and proceed east for 0.8 miles to a fork. Continue straight ahead for 0.40 miles to a "three-way" fork. Take the right (i.e., southernmost) fork for 0.6 miles through a gate, to another fork. Take the left fork for 0.20 miles to a chained-reseeded area, and stop. The baseline is located 10 paces to the east between two windrows of slash. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3965, is attached to the O-foot stake of the baseline.



Map Name: Levan, Utah .

Township 14 S , Range 1 E , Section 21



Diagrammatic Sketch

UTM 4383307.305 N , 429025.024 E

DISCUSSION

Trend Study No. 16A-16 (26-2)

The Levan Farm study is located on a chained juniper-pinyon site northeast of Levan. Utilized by deer and a few elk during severe winters, the area was purchased by the Division of Wildlife Resources shortly after the chaining was completed. This site closely resembled the previous study at Old Pinery. No serious seeding effort appears to have been made on this site. As a result, the area is nearly devoid of perennial plants. The only obvious difference from the Old Pinery chaining is that juniper slash had been windrowed. Slope on the site is nearly level with a slight west aspect and an elevation of about 5,520 feet. Wildlife use has been relatively light over the years due to the lack of forage.

Soil conditions are similar to that of study #15. Effective rooting depth (see methods) is estimated at nearly 14 inches with few rocks on the surface. Soil texture is a clay loam with a neutral pH of 7.1. Phosphorus may be a limiting factor to plant development as it is only 7.7 ppm, where any value less than 10 ppm is considered limiting. Erosion was reported to be occurring in 1983, but there does not appear to be any significant problems on the site due to the gentle terrain and improvements in protective cover.

Valuable browse forage is limited and consists entirely of basin big sagebrush (*Artemisia tridentata tridentata*). Some basin big sagebrush was apparently transplanted after the chaining and 100 mature plants/acre were estimated in 1983. No sagebrush plants were found in 1989. Current population density is only 660 plants/acre. Recruitment is good with 61% of the population consisting of young plants and a reproductive potential of 9% (proportion of seedlings to population). Utilization has been light since 1983. The only other common browse species on the site is broom snakeweed which has increased in density from 3,066 plants/acre in 1983 to 9,952 plants/acre in 1997. Seedlings and young are common indicating a dynamic population which should further increase in density.

The herbaceous understory is very poor and dominated by annuals and biennial weeds. Currently, cheatgrass accounts for 80% of the grass cover while annual forbs provide 87% of the forb cover. Perennial grasses and forbs are lacking.

1983 APPARENT TREND ASSESSMENT

Soil trend is improving only because vegetative condition cannot be worse. The nearly level terrain has prevented serious soil erosion. Vegetative trend will also improve for essentially the same reason. Further seeding and/or transplanting is strongly recommended.

1989 TREND ASSESSMENT

The soil trend is stable. Litter is still provided mainly by cheatgrass. Significantly more pavement cover was estimated in 1989, along with less bare soil. There has been some soil loss, which will probably continue on areas with some slope. While the transplanted sagebrush that survived have grown to a height of 5 feet in ten years and have incredibly high amounts of seed production, the trend study did not get an adequate sample of the variable, sparse population and no sagebrush occurred within the density plots in 1989. However, sagebrush canopy cover averages 2% on the study site, ranging from 0 to 8%. The sagebrush observed and photographed are very vigorous. There is virtually no woody competition. The sagebrush are unutilized and surrounded by seedlings. Broom snakeweed occurs at similar densities, but seedlings are very abundant and density will likely increase. Trend for browse is considered down slightly. The herbaceous understory is very poor and dominated by annuals and biennial weeds. Besides sunflower and prickly lettuce, the list of forbs includes such

undesirable species as bur buttercup, Russian thistle, and gumweed. Trend for the few perennial grasses and forbs is stable, but in very poor condition.

TREND ASSESSMENT

soil - stable

browse - down slightly and lacking

herbaceous understory - stable, but in very poor condition

1997 TREND ASSESSMENT

Soil trend continues to be stable yet it is in poor condition. Litter cover is relatively low at only 30%. Browse trend has improved. The larger sample used in 1997 estimates 660 sagebrush plants/acre, 61% of which are young. The sagebrush appears unutilized and in good vigor. On the negative side, broom snakeweed has continued to increase dramatically from 3,765 plants/acre to 9,952 plants/acre. It currently accounts for 70% of the browse cover on the site. Some of the increase may be due to the increased sample, but it is obvious that the population is increasing due to the large numbers of young and seedling plants. Strip frequency of snakeweed is high at 93%, indicating its abundance over the whole site. Trend for the herbaceous understory is stable, yet very poor condition. Perennial grasses are still rare and valuable perennial forbs are lacking.

TREND ASSESSMENT

soil - stable, but poor

browse - up slightly for big sagebrush, but still dominated by broom snakeweed

herbaceous understory - stable, but in very poor condition (composition is mostly weeds)

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 16

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron intermedium	-	-	2	-	-	1	.00
G	Agropyron spicatum	a-	a-	b10	-	-	6	.22
G	Agropyron trichoporum	-	4	-	-	1	-	-
G	Bromus tectorum (a)	-	-	269	-	-	90	4.20
G	Oryzopsis hymenoides	a-	a-	b8	-	-	4	.36
G	Poa secunda	a6	ab9	b17	2	5	7	.38
G	Sitanion hystrix	-	3	7	-	2	3	.06
Total for Grasses		6	16	313	2	8	111	5.24
F	Agoseris glauca	-	-	6	-	-	2	.03
F	Alyssum alyssoides (a)	-	-	281	-	-	86	3.72
F	Astragalus eurekensis	-	3	-	-	3	-	-
F	Asclepias speciosa	-	1	-	-	1	-	-
F	Camelina microcarpa (a)	-	-	9	-	-	4	.07

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Calochortus nuttallii	3	-	4	1	-	2	.03
F	Chorispora tenella (a)	-	-	5	-	-	2	.03
F	Cirsium spp.	a-	b14	a1	-	7	1	.03
F	Convolvulus arvensis	a-	a-	b10	-	-	5	.39
F	Crepis acuminata	-	-	3	-	-	1	.00
F	Epilobium paniculatum (a)	-	-	13	-	-	4	.07
F	Erodium cicutarium (a)	-	-	54	-	-	23	.41
F	Gilia spp. (a)	-	-	1	-	-	1	.00
F	Helianthus annuus (a)	a3	c240	b166	1	88	68	.41
F	Lactuca pulchella	b226	a13	a12	85	8	6	.03
F	Marrubium vulgare	1	-	-	1	-	-	-
F	Ranunculus testiculatus (a)	-	-	264	-	-	75	4.43
F	Sisymbrium altissimum (a)	-	-	7	-	-	4	.04
F	Sphaeralcea coccinea	-	3	2	-	1	1	.15
F	Streptanthus cordatus	-	4	3	-	2	2	.01
F	Taraxacum officinale	-	-	4	-	-	2	.15
F	Tragopogon dubius	a-	ab5	b14	-	3	6	.03
Total for Forbs		233	283	859	88	113	295	10.07

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 16

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata tridentata	24	2.83
B	Chrysothamnus nauseosus albicaulis	0	.85
B	Gutierrezia sarothrae	93	9.29
B	Juniperus osteosperma	1	.38
Total for Browse		118	13.35

BASIC COVER --

Herd unit 16A , Study no: 16

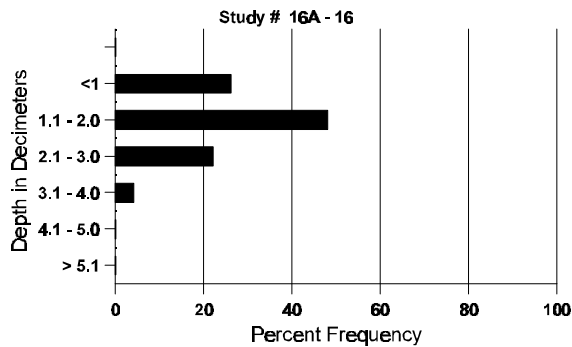
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	375	0	1.75	31.58
Rock	145	3.00	3.00	2.70
Pavement	266	3.75	18.00	13.90
Litter	394	58.25	47.50	29.85
Cryptogams	160	0	0	2.36
Bare Ground	311	35.00	29.75	23.82

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 16

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.9	50.6 (16.9)	7.1	41.1	29.1	29.8	2.6	7.7	92.8	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 16

Type	Quadrat Frequency '97
Rabbit	7
Deer	16
Cattle	4

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 16

AGE	YGR	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 tridentata																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	17	-	-	-	-	-	-	-	-	17	-	-	-	340		17	
M	83	3	-	-	-	-	-	-	-	-	3	-	-	-	100	16	24	3
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	16	-	-	-	-	-	-	-	-	16	-	-	-	320	32	41	16
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Died out							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	100	Dec:	-			
												'89	0		-			
												'97	660		-			
Chrysothamnus nauseosus albicaulis																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	39	73	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Appeared							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	66		-			
												'97	0		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total							
		1	2	3	4										
Gutierrezia sarothrae															
S	83	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	302	-	-	-	-	-	-	-	-	-	-	10066		302
	97	195	-	-	-	-	-	-	-	-	-	-	3900		195
Y	83	3	-	-	-	-	-	-	-	-	-	-	100		3
	89	11	-	-	-	-	-	-	-	-	-	-	366		11
	97	265	-	-	-	-	-	-	-	-	-	-	5300		265
M	83	87	-	-	-	-	-	-	-	-	-	-	2900	9 9	87
	89	86	-	-	-	-	-	-	-	-	-	-	2866	9 10	86
	97	877	-	-	-	-	-	-	-	-	-	-	17540	7 9	877
D	83	2	-	-	-	-	-	-	-	-	-	-	66		2
	89	16	-	-	-	-	-	-	-	-	-	2	533		16
	97	11	-	-	-	-	-	-	-	-	-	5	220		11
X	83	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	500		25
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>					<u>%Change</u>						
'83		00%	00%	00%					+19%						
'89		00%	00%	02%					+84%						
'97		00%	00%	.43%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	3066	Dec:	2%		
										'89	3765		14%		
										'97	23060		1%		
Juniperus osteosperma															
Y	83	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	-	-	20		1
X	83	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>					<u>%Change</u>						
'83		00%	00%	00%					None						
'89		00%	00%	00%					Appeared						
'97		00%	00%	00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-		
										'89	0		-		
										'97	20		-		

Trend Study 16A-17-97

Study site name: Chicken Creek

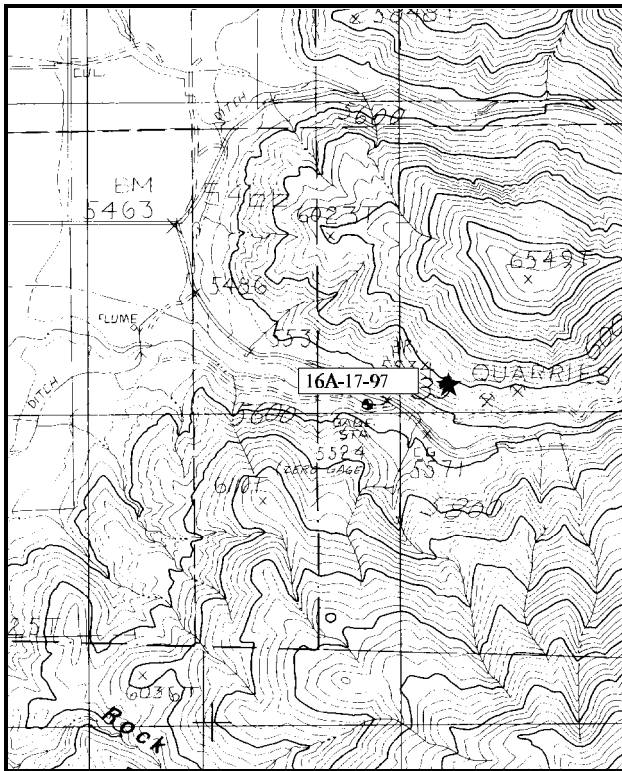
Range type: Stansbury Cliffrose

Compass bearing: frequency baseline 280M degrees. (Line 2 298°M, line 3,4 357°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 71ft), line 2 (34ft), line 3 (95ft), line 4 (59ft).

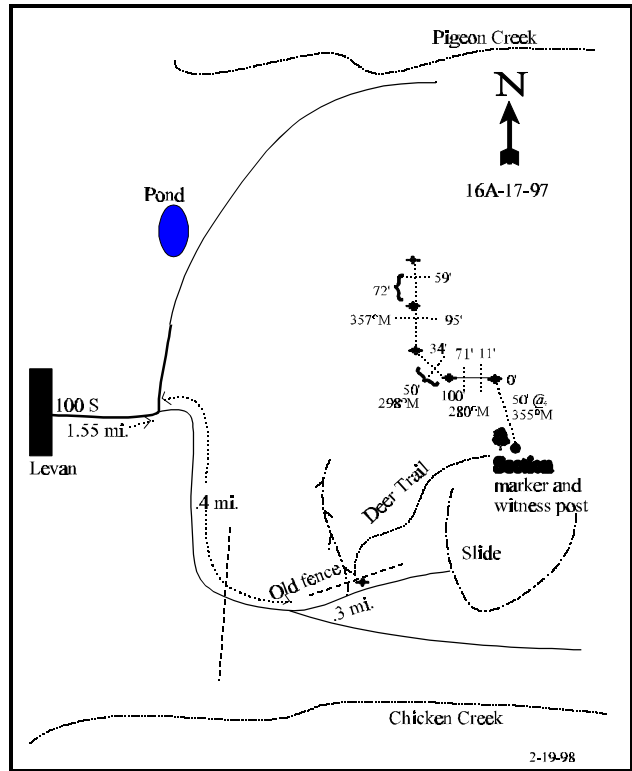
LOCATION DESCRIPTION

From the intersection of 100 South and Main Street in Levan, proceed east on 100 South 1.55 miles to a fork. Turn right (i.e., south) and proceed 0.40 miles towards Chicken Creek to a road to the left. Turn left and proceed east for 0.30 miles to a green steel "T" fencepost on the north side of the road. (Fencepost may no longer exist). From the fencepost walk up slope at an azimuth of 344 degrees true to the eastern most juniper on the ridge. There is a section marker and witness post next to the juniper. The O-foot baseline stake is located 50ft away at an azimuth 355M degrees. The study is marked by green, steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Levan, Utah

Township 14S, Range 1E, Section 33



Diagrammatic Sketch

UTM 4378096.277 N, 429135.717 E

DISCUSSION

Trend Study No. 16A-17 (26-3)

The Chicken Creek study is located on deer winter range near the mouth of Chicken Creek Canyon. The site samples a Stansbury cliffrose type with serviceberry, juniper, mountain big sagebrush, and Gambel oak intermixed. The study area sits on a narrow bench with shale covered slopes ranging from 10% to 60%. Elevation is 6,000 feet. Pellet groups were abundant in 1983 with quadrat frequency of deer pellet groups in 1997 at 39%. Few elk pellet groups were found.

Soil depth appears moderate, but badly eroded. The soil is actually deep in places with an effective rooting depth (see methods) estimated at nearly 22 inches. Parent material is limestone with many gravel-sized fragments covering the surface (currently pavement cover is 27%). Larger rock outcrops are also found on the site. The soil has a clay loam texture with a neutral pH of 6.9. Soil pedestaling is common on the site and the area appears geologically unstable. Several large cracks in the ground surface were noted in 1983 and are indicative of a high potential for slippage or landslides.

The key browse species consist of Stansbury cliffrose and serviceberry. Some other species are more abundant, but not nearly as preferred or productive. Cliffrose provides 50% of the browse cover in 1997. Many of the mature plants are tall and partly unavailable to browsing. Population density was originally estimated at 399 plants/acre in 1983. Percent decadence was high at 83% and utilization was very heavy on available plants. Percent decadence remained at 83% in 1989 and use remained heavy on half of the cliffrose. By 1997, density was estimated at 240 plants/acre with the a much larger sample size. Dead plants, first counted in 1997, numbered 100 plants/acre. The number of dead plants can explain almost 70% of the decrease in its density. Recruitment is poor with one seedling encountered in 1997. Seedlings of cliffrose have difficulty competing and establishing within dense understories of annual weeds, but what is of more concern for the preferred browse is the potential for the loss of the community to wildfire.

Serviceberry occurs only occasionally. All plants encountered in 1989 were heavily hedged. Currently, the population density is low at only 80 plants/acre. Other shrubs which provide some additional forage include, mountain big sagebrush, true mountain mahogany, white-stemmed rubber rabbitbrush, chokecherry, and Gambel oak. All of these species, with the exception of oakbrush, occur sporadically.

The herbaceous understory is sparse and of poor quality. Currently, cheatgrass provides 45% of the grass cover. However, it is not widespread over the site for it occurs mostly under the crowns of juniper trees. Bluebunch wheatgrass is the most abundant perennial grass on the site. The forb component is poor and contains several annuals.

1983 APPARENT TREND ASSESSMENT

Soil condition is poor and continues to decline. Rapid erosion has already removed much of the surface soil, leaving behind large areas of erosion pavement. Suitable seed beds for plant establishment are rare. Vegetative trend is also down. The most preferred browse species; cliffrose, serviceberry, and big sagebrush appear to all be declining. Total browse density, forage production, and forage availability are very low. The herbaceous understory is depleted and what remains is of poor quality for deer. Management options are few due to the steep slope.

1989 TREND ASSESSMENT

Soil trend appears stable but in very poor condition. There is a very low percentage of litter cover and pavement forms most of the ground cover, creating near-talus conditions. By the appearance of the hole and associated undercutting, the slope near density plot #1 with continued soil loss will most likely experience another landslide. The juniper and cliffrose overstory dominate the site. Junipers are sparse, but evenly distributed over the whole hillside. There is a fair diversity of browse, but most of it is severely hedged to the point of unavailability and decadence. The density of cliffrose decreased to 199 plants/acre. The plants are largely decadent, heavily hedged and partly unavailable. There were fewer serviceberry and these are also in bad condition. Rubber rabbitbrush was the only browse to show an increase in density. The point-quarter method estimated there to be 10 junipers per acre. There are large stands of oakbrush on the slope below. Trend for the herbaceous understory is up slightly. There is a fair amount of bluebunch wheatgrass on the slope. Frequency increased slightly. There is a low frequency of forbs, and some species may have minor forage value.

TREND ASSESSMENT

soil - stable, but in poor condition

browse - down

herbaceous understory - up slightly, but poor

1997 TREND ASSESSMENT

Trend for soil remains stable, but in poor condition. Trend for browse appears to be slowly declining. Density of cliffrose increased since 1989, but the change is likely due to the larger sample used in 1997. Dead plants are common and utilization continues to be heavy. Other browse occur in small numbers and recruitment remains poor. Trend for the herbaceous understory is down slightly due to a slight decline in the sum of nested frequency for bluebunch wheatgrass. Composition of forbs is still very poor.

TREND ASSESSMENT

soil - stable, but in poor condition

browse - down slightly

herbaceous understory - down slightly and poor composition

HERBACEOUS TRENDS --
Herd unit 16A , Study no: 17

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	<i>Agropyron spicatum</i>	a150	b185	a139	55	74	56	12.44
G	<i>Bromus tectorum</i> (a)	-	-	260	-	-	86	10.29
G	<i>Poa secunda</i>	a-	b25	b19	-	13	8	.38
Total for Grasses		150	210	418	55	87	150	23.11
F	<i>Camelina microcarpa</i> (a)	-	-	23	-	-	12	.06
F	<i>Chorispora tenella</i> (a)	-	-	7	-	-	3	.01
F	<i>Cirsium</i> spp.	a-	a-	b17	-	-	8	.53
F	<i>Cryptantha flavocolata</i>	-	5	-	-	3	-	-
F	Cruciferae (a)	-	-	12	-	-	4	.54
F	<i>Cryptantha</i> spp.	b14	ab6	a-	5	3	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	21	-	-	10	.12
F	<i>Eriogonum brevicaule</i>	9	14	11	4	5	7	.52
F	<i>Erodium cicutarium</i> (a)	-	-	13	-	-	4	.07
F	<i>Galium aparine</i> (a)	-	-	62	-	-	26	2.00
F	<i>Hackelia patens</i>	a2	a-	b19	1	-	8	.44
F	<i>Lathyrus brachycalyx</i>	a2	a2	b25	1	1	9	.31
F	<i>Lappula occidentalis</i> (a)	-	-	8	-	-	4	.02
F	<i>Lactuca pulchella</i>	c27	a-	b6	15	-	4	.02
F	<i>Machaeranthera canescens</i>	4	-	1	2	-	1	.00
F	<i>Physalis hederifolia</i>	-	7	2	-	3	1	.00
F	<i>Phlox longifolia</i>	a-	a3	b21	-	1	10	.07
F	<i>Ranunculus testiculatus</i> (a)	-	-	6	-	-	2	.01
F	<i>Sisymbrium altissimum</i> (a)	-	-	35	-	-	16	.18
F	<i>Streptanthus cordatus</i>	a3	a8	b23	3	3	13	.06
F	<i>Tragopogon dubius</i>	2	-	-	1	-	-	.00
F	Unknown forb-annual	-	-	5	-	-	2	.03
Total for Forbs		63	45	317	32	19	144	5.05

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 17

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	3	.41
B	Cercocarpus montanus	1	-
B	Chrysothamnus nauseosus albicaulis	6	.90
B	Cowania mexicana stansburiana	12	3.00
B	Gutierrezia sarothrae	5	.01
B	Mahonia repens	20	.07
B	Prunus virginiana	6	.00
B	Quercus gambelii	9	1.58
B	Rhus glabra cismontana	0	.03
Total for Browse		62	6.03

BASIC COVER --

Herd unit 16A , Study no: 17

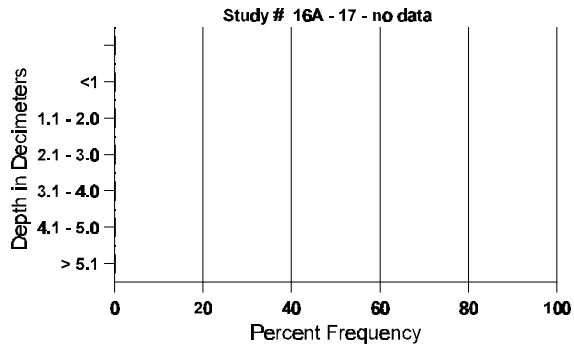
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	323	2.25	7.00	29.85
Rock	245	4.75	4.25	13.62
Pavement	290	52.00	57.25	26.51
Litter	378	33.50	29.75	27.93
Cryptogams	13	0	0	.26
Bare Ground	179	7.50	1.75	8.96

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 17

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
21.7	48.0 (13.0)	6.9	39.4	30.7	29.8	2.8	11.6	192.0	1.2

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 17

Type	Quadrat Frequency '97
Elk	2
Deer	39

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 17

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total				
		1	2	3	4							
<i>Amelanchier alnifolia</i>												
Y	83	1	-	-	-	-	-	1	33		1	
	89	-	-	-	-	-	-	-	0		0	
	97	-	3	-	-	-	-	-	3		3	
M	83	-	1	-	-	-	-	-	1	18	8	1
	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	1	-	-	-	-	1	49	69	1
D	83	-	1	2	-	-	-	-	3			3
	89	-	-	1	-	-	1	-	2			2
	97	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		40%		40%		00%		-60%				
'89		00%		100%		00%		+18%				
'97		75%		25%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	166	Dec:	60%			
						'89	66		100%			
						'97	80		0%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Artemisia tridentata vaseyana</i>												
M	83	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	0	34	30	0
X	83	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>				<u>%Change</u>				
'83		00%	00%	00%				None				
'89		00%	00%	00%				None				
'97		00%	00%	00%								
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-			
						'89	0		-			
						'97	0		-			
<i>Cercocarpus montanus</i>												
M	83	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	20	88	86	1
X	83	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>				<u>%Change</u>				
'83		00%	00%	00%				None				
'89		00%	00%	00%				Appeared				
'97		100%	00%	00%								
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-			
						'89	0		-			
						'97	20		-			

AGE	Y	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.		
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133		4	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	3	-	-	-	-	-	-	-	-	3	-	-	-	100	27 33	3	
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100	28 34	3	
	97	1	2	-	-	-	-	-	-	-	3	-	-	-	60	26 40	3	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	1	-	-	1	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+57%							
'89		00%			00%			00%			-48%							
'97		33%			00%			17%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	100	Dec:	0%			
												'89	233		0%			
												'97	120		33%			
<i>Cowania mexicana stansburiana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	-	1	1	-	-	-	-	-	-	2	-	-	-	66	43 72	2	
	89	-	-	-	-	-	-	1	-	-	1	-	-	-	33	114 126	1	
	97	-	1	4	1	1	1	-	-	-	8	-	-	-	160	50 48	8	
D	83	-	2	8	-	-	-	-	-	-	5	-	5	-	333		10	
	89	-	1	2	-	1	1	-	-	-	3	-	-	2	166		5	
	97	1	1	1	1	-	-	-	-	-	2	-	-	2	80		4	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	100		5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		25%			75%			42%			-50%							
'89		33%			50%			33%			+17%							
'97		25%			50%			17%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	399	Dec:	83%			
												'89	199		83%			
												'97	240		33%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	7	-	-	-	-	-	-	-	-	7	-	-	-	140	9	15	7
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	180		-			
Juniperus osteosperma																		
M	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	67	118	1
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	116	145	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Died out							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	-			
												'89	0		-			
												'97	0		-			

AGE	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Mahonia repens																		
Y	'83	40	-	-	-	-	-	-	-	-	40	-	-	-	1333		40	
	'89	87	-	-	-	-	-	-	-	-	87	-	-	-	2900		87	
	'97	22	-	-	1	-	-	-	-	-	23	-	-	-	460		23	
M	'83	108	-	-	-	-	-	-	-	-	108	-	-	-	3600	5	4	108
	'89	18	13	-	7	-	-	-	-	-	38	-	-	-	1266	4	5	38
	'97	93	-	-	21	-	-	-	-	-	114	-	-	-	2280	3	4	114
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-16%							
'89		10%			00%			00%			-34%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	4933	Dec:	-			
												'89	4166		-			
												'97	2740		-			
Prunus virginiana																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	7	3	-	-	-	1	-	-	-	11	-	-	-	220		11	
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	15	15	3
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		20%			13%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	0		0%			
												'97	300		7%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Quercus gambelii																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	14	-	-	-	-	-	-	-	-	14	-	-	-	280		14
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	85	-	-	-	-	-	-	-	-	85	-	-	-	1700		85
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	18	-	-	-	-	-	-	-	-	18	-	-	-	360	113 140	18
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	100		5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	2060		-		

Trend Study 16A-18-97

Study site name: Deep Creek

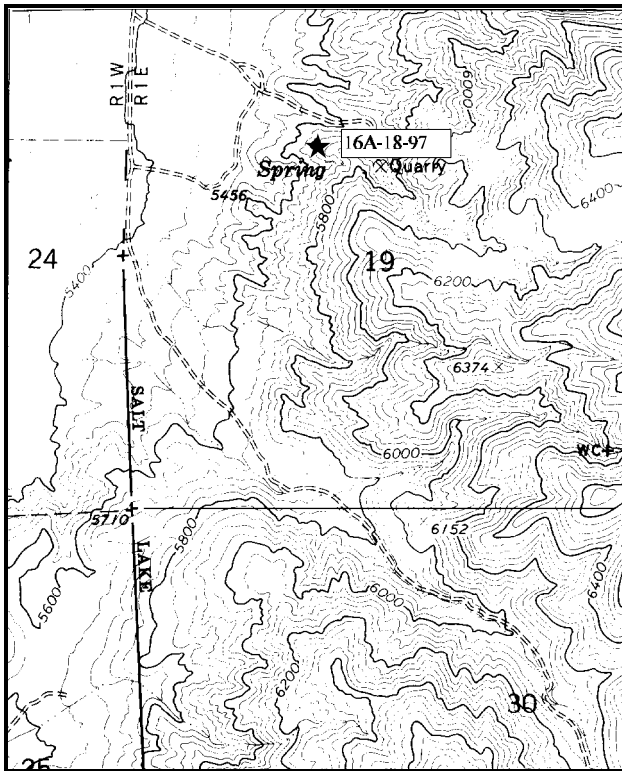
Range Type: Mixed mountain brush

Compass bearing: frequency baseline 235M degrees. (Line 3 264°M, line 4 249°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

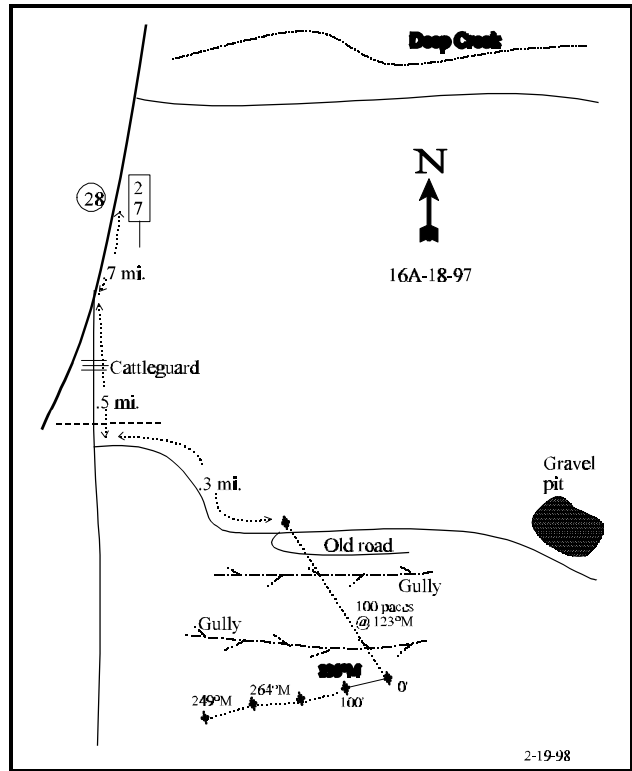
LOCATION DESCRIPTION

From the post office in Levan go south on U-28 for 3.8 miles. Turn left 0.7 miles past mile marker 27 (east then south) and go 0.5 miles, crossing a cattle guard and a gate, and coming to a fork in the road. Take a left (east) and go 0.3 miles to another fork. Stay right at this last fork and go 0.1 miles and stop at the witness post. From here, the 0-foot baseline stake is 100 paces away at an azimuth of 123 M degrees. There are some large boulders around the 100-foot baseline stake.



Map Name: Chriss Canyon

Township 15S, Range 1E, Section 19



Diagrammatic Sketch

UTM 4371923.538 N, 425756.979 E

DISCUSSION

Trend Study No. 16A-18 (26-4)

The Deep Creek study is on critical deer winter range located just south of Deep Creek. The study is located along a narrow ridge running east to west. The vegetational study samples northwest and southeast facing slopes of 15% to 20% which support a sparse pinyon-juniper stand associated with an understory mixture of browse species. Vegetative composition is typical of the west facing foothills from Levan south to the unit boundary. Herbaceous plants are usually very scattered and of little importance. Deer use of the area was reported moderate to heavy in 1983 and 1989. Several deer carcasses were found on the site in 1989. Pellet group quadrat frequency for deer was fairly low at 16% in 1997. A few elk pellet groups were also found at that time.

Soils are moderately deep in places with an average effective rooting depth (see methods) of just over 18 inches along the baseline. Texture is a clay with a neutral pH of 7.2. The soil has poor structure with considerable erosion pavement on the surface. Pavement consists of small, flat and thin rock that cover an increasing amount of the ground surface (9% in 1983 to 28% in 1997). Phosphorus may be limiting to plant development with a value of only 6.6 ppm, where 10 ppm can be limiting. In addition, percent organic matter is relatively low at only 1.2%. Permeability to water is likely poor and even moderate intensity storms can generate runoff from the barren shrub and tree interspaces. Erosion is apparent and unavoidable due to the poor protective ground cover. Protective cover is principally a function of aerial shrub and tree crowns, not herbaceous cover which is much more protective of the soil. With the lack of herbaceous species, the protection of the surface soil is minimal.

The site supports small populations of three preferred browse species including; mountain big sagebrush, true mountain mahogany, and green ephedra. Mountain big sagebrush numbered around 500 plants/acre in 1983 and 1989. The population has become increasingly decadent with heavy use through 1989. Vigor was also poor in 1989 with 33% being classified as such. Currently, sagebrush numbers only 300 lightly hedged plants/acre, 33% of which are decadent. Dead plants, first counted in 1997, total more than the number of live plants (340 plants/acre), indicating a definite declining population. Recruitment is also poor with few young and no seedlings counted.

Mahogany appears to have a stable population with adequate reproduction, moderate to heavy use, and low decadence. Density was stable in 1983 and 1989; however, it increased by 46% in 1997 due to the larger, more representative sample used. Although green ephedra is less preferred, it produces important winter forage. The population is currently mostly mature (86%) and unutilized.

The herbaceous understory is sparsely distributed and most shrub and tree interspaces lack vegetative cover. Even cheatgrass is infrequent and found mostly under juniper crowns. Perennial grasses occur most often in the more favorable microsites near the base of shrubs. The most common perennial species is bluebunch wheatgrass which grows in scattered patches. The only other fairly common perennial grass is Sandberg bluegrass. Forbs produce as much cover as grasses, but composition is poor. The most common species is the annual bur buttercup which makes up 40% of the forb cover. The only other common species include, tapertip hawksbeard and hoods phlox.

1983 APPARENT TREND ASSESSMENT

The soil trend appears stable to declining. The study area has poor fertility and has a long history of erosion which has depleted the site potential. Soil erosion will continue to be a problem unless some manipulative steps such as terracing or chaining and seeding are undertaken. Vegetative trend is somewhat more stable, in spite of

an apparent decline in big sagebrush density. The other key species, true mountain mahogany, appears stable or perhaps even increasing. Herbaceous understory is depleted and will continue to be so.

1989 TREND ASSESSMENT

Soil trend is down slightly due to a significant increase in percent pavement cover and a decline in litter cover. Percent bare ground declined, but it is apparent that the decline is the result of soil loss. Erosion is ongoing and there are active gullies around the site. Comparisons of the browse data indicate a stable browse component. The key browse species, namely true mountain mahogany and mountain big sagebrush, have maintained their moderate to heavily hedged growth form and normal vigor. There are 29% young plants in the mahogany population. The sagebrush population is stable in terms of density, but percent decadence has increased. Trend for the herbaceous understory is up slightly. The frequency data show a significant increase in the nested frequency of bluebunch wheatgrass. In the forb category, frequency is moderate and composition is similar between years for this relatively unimportant forage source.

TREND ASSESSMENT

soil - down slightly and in poor condition

browse - stable

herbaceous understory - up slightly, but poor

1997 TREND ASSESSMENT

The soil trend shows an increasing loss of soil with pavement cover increasing from 26% to 28% and bare ground declining from 31% to 25%. Trend is considered down slightly and in very poor condition. The browse trend appears stable. Density of mountain big sagebrush has declined, but it is not known how much of the change is due to the larger sample taken in 1997. However, the large number of dead plants alone (340 plants/acre) can explain the decline in the population. The most important browse species, mountain mahogany, accounts for 38% of the browse cover. It displays a stable population with moderate to heavy use, good vigor, and low decadence. The increase in density between 1989 and 1997 is likely due to the larger sample used in 1997 and that it gives much more accurate estimates for populations that are clumped or discontinuous in their distributions. Trend for the herbaceous understory is up slightly, but still poor. Sum of nested frequency for perennial grasses and forbs increased slightly.

TREND ASSESSMENT

soil - down slightly and in poor condition

browse - stable

herbaceous understory - up slightly, but poor composition

HERBACEOUS TRENDS --
Herd unit 16A , Study no: 18

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	_a 79	_b 141	_b 127	33	59	50	6.26
G	Bromus tectorum (a)	-	-	105	-	-	36	1.05
G	Oryzopsis hymenoides	2	-	-	1	-	-	-
G	Poa fendleriana	-	2	-	-	1	-	-
G	Poa secunda	_a 25	_a 31	_b 62	11	15	25	1.37
Total for Grasses		106	174	294	45	75	111	8.69
F	Alyssum alyssoides (a)	-	-	5	-	-	2	.01
F	Arabis spp.	1	-	5	1	-	2	.01
F	Calochortus nuttallii	9	3	10	4	1	4	.02
F	Chaenactis douglasii	3	-	-	1	-	-	-
F	Collinsia parviflora (a)	-	-	4	-	-	1	.00
F	Crepis acuminata	_a 14	_a 17	_b 53	6	9	20	2.03
F	Cruciferae (a)	-	-	43	-	-	15	.12
F	Cryptantha spp.	_b 78	_a 30	_a 27	37	17	14	.12
F	Descurainia pinnata (a)	-	-	18	-	-	7	.03
F	Eriogonum brevicaule	3	7	7	1	3	3	.01
F	Erigeron spp.	_b 19	_a 3	_a 2	6	1	1	.00
F	Galium aparine (a)	-	-	16	-	-	6	.20
F	Gilia spp. (a)	-	-	12	-	-	4	.02
F	Haplopappus acaulis	-	-	4	-	-	1	.15
F	Hackelia patens	_{ab} 5	_b 9	_a -	3	5	-	-
F	Leucelene ericoides	_a -	_a -	_b 16	-	-	5	.24
F	Machaeranthera canescens	-	1	-	-	1	-	-
F	Penstemon spp.	-	-	6	-	-	2	.01
F	Physaria australis	4	-	-	2	-	-	-
F	Physalis hederifolia	-	-	1	-	-	1	.00
F	Phlox hoodii canescens	_a 112	_b 155	_a 89	47	60	38	1.88
F	Phlox longifolia	_a 26	_a 30	_b 56	11	14	25	.20
F	Ranunculus testiculatus (a)	-	-	275	-	-	82	3.50
F	Stanleya pinnata	_{ab} 7	_b 17	_a -	3	6	-	-
F	Unknown forb-annual	-	-	8	-	-	5	.10

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Zigadenus paniculatus	-	1	1	-	1	1	.00
Total for Forbs		281	273	658	122	118	239	8.70

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 18

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	13	.74
B	Cercocarpus montanus	26	4.73
B	Chrysothamnus viscidiflorus stenophyllus	5	.36
B	Ephedra viridis	18	2.62
B	Juniperus osteosperma	3	3.95
Total for Browse		65	12.42

BASIC COVER --

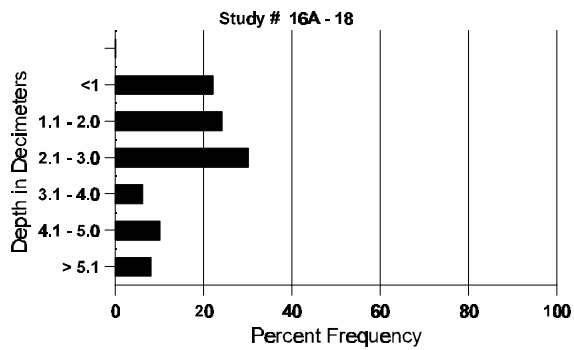
Herd unit 16A , Study no: 18

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	358	2.50	9.75	27.87
Rock	211	2.25	5.25	8.19
Pavement	312	6.75	20.50	20.05
Litter	382	46.50	33.75	25.98
Cryptogams	35	2.00	0	.67
Bare Ground	286	40.00	30.75	25.02

SOIL ANALYSIS DATA --
 Herd Unit 16A, Study no: 18

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
18.3	49.0 (17.0)	7.2	28.7	19.4	51.8	1.2	6.6	124.8	.4

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16A , Study no: 18

Type	Quadrat Frequency '97
Rabbit	9
Elk	2
Deer	16

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 18

AGE	YGR	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.	
<i>Artemisia tridentata vaseyana</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	2	6	1	-	-	-	-	-	-	9	-	-	-	300	28	34	9
	89	-	3	2	-	-	-	1	-	-	6	-	-	-	200	21	19	6
	97	8	1	-	-	-	-	-	-	-	9	-	-	-	180	26	30	9
D	83	-	2	5	-	-	-	-	-	-	7	-	-	-	233		7	
	89	-	4	4	-	-	-	1	-	-	4	-	-	5	300		9	
	97	4	1	-	-	-	-	-	-	-	3	-	-	2	100		5	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	340		17	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		50%			38%			00%			- 6%							
'89		47%			40%			33%			-40%							
'97		13%			00%			13%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	533	Dec:	44%			
												'89	500		60%			
												'97	300		33%			
<i>Cercocarpus montanus</i>																		
Y	83	-	4	-	-	-	-	-	-	-	4	-	-	-	133		4	
	89	-	4	-	-	-	-	-	-	-	4	-	-	-	133		4	
	97	1	5	-	-	-	-	-	-	-	6	-	-	-	120		6	
M	83	1	6	2	-	-	-	-	-	-	9	-	-	-	300	35	36	9
	89	-	3	-	-	4	1	-	-	-	8	-	-	-	266	40	41	8
	97	-	17	14	-	-	-	-	-	-	31	-	-	-	620	39	48	31
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	2	-	-	-	-	-	-	-	-	-	2	66		2	
	97	-	5	1	-	-	-	-	-	-	5	-	-	1	120		6	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		77%			15%			00%			+ 7%							
'89		79%			21%			14%			+46%							
'97		63%			35%			02%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	433	Dec:	0%			
												'89	465		14%			
												'97	860		14%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total						
		1	2	3	4		1	2							
<i>Chrysothamnus viscidiflorus stenophyllus</i>															
M	'83	3	-	-	-	-	-	-	3	-	-	100	11	14	3
	'89	3	1	-	-	-	-	-	4	-	-	133	10	13	4
	'97	4	-	-	-	-	-	-	4	-	-	80	10	16	4
D	'83	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	0			0
	'97	1	-	-	-	-	-	-	1	-	-	20			1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'83		00%		00%		00%		+25%							
'89		25%		00%		00%		-25%							
'97		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	100	Dec:	0%		
										'89	133		0%		
										'97	100		20%		
<i>Cowania mexicana stansburiana</i>															
M	'83	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	2	-	-	-	-	-	2	-	-	66	26	35	2
	'97	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'83		00%		00%		00%		Appeared							
'89		100%		00%		00%		Died out							
'97		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-		
										'89	66		-		
										'97	0		-		

AGE	Y	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.		
<i>Ephedra viridis</i>																		
Y	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	'83	6	-	-	-	-	-	-	-	-	6	-	-	-	200	40 48	6	
	'89	4	-	-	-	-	-	-	-	-	4	-	-	-	133	35 24	4	
	'97	14	3	-	-	2	-	-	-	-	18	-	1	-	380	41 56	19	
D	'83	1	1	-	-	-	-	-	-	-	2	-	-	-	66		2	
	'89	6	-	-	-	-	-	-	-	-	6	-	-	-	200		6	
	'97	2	1	-	-	-	-	-	-	-	3	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		11%			00%			00%			+10%							
'89		00%			00%			00%			+24%							
'97		27%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	299	Dec:	22%				
											'89	333		60%				
											'97	440		14%				
<i>Juniperus osteosperma</i>																		
M	'83	-	-	-	-	-	-	-	2	-	2	-	-	-	66	67 207	2	
	'89	-	-	-	-	-	-	-	2	-	2	-	-	-	66	165 136	2	
	'97	1	-	-	-	-	-	-	1	-	3	-	-	-	60	- -	3	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		00%			00%			00%			- 9%							
'97		00%			33%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	66	Dec:	-				
											'89	66		-				
											'97	60		-				

Trend Study 16A-19-97

Study site name: Flat Canyon .

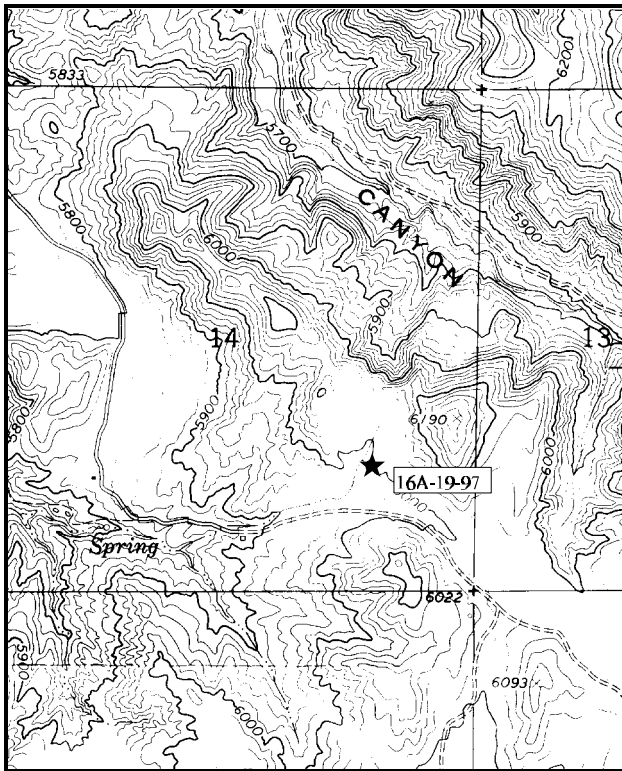
Range type: Bitterbrush/Sagebrush

Compass bearing: frequency baseline 204M degrees. (Line 2-4 171°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

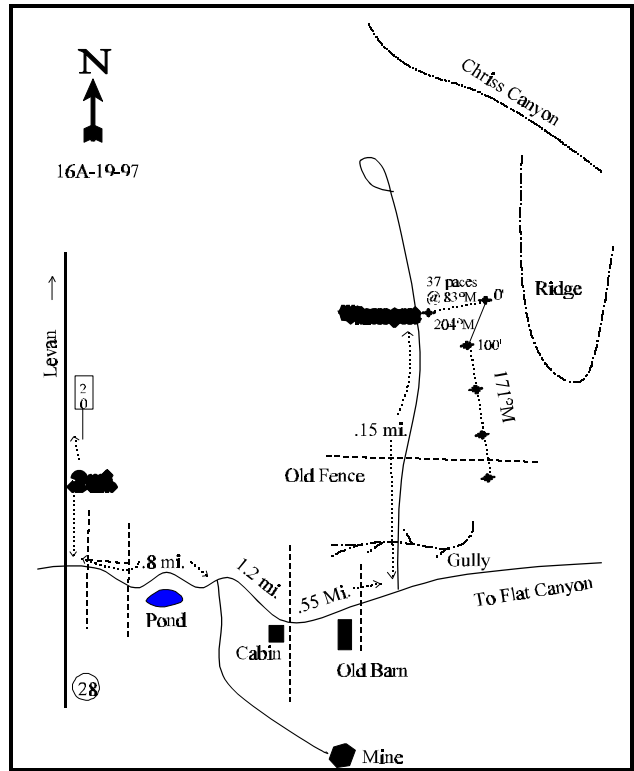
LOCATION DESCRIPTION

From Levan, go south on highway 28 to 0.2 miles south of mile marker #20. Turn left here (east) and go 0.8 miles to a fork, keep left. Continue 1.2 miles to an old fence by an old cabin where the road makes a 90° turn to the east. Continue up the main road for 0.5 miles to a faint road which turns off to the left down into the sagebrush. Follow this road for 0.15 miles to a witness post on the right side of the road. From here walk up the hill about 37 paces bearing 83°M to the 0 foot baseline stake which is marked with browse tag#9084.



Map Name: Skinner Peaks .

Township 16S, Range 1W, Section 14



Diagrammatic Sketch

UTM 4366398.064 N, 424612.029 E

DISCUSSION

Trend Study No. 16A-19 (26-5)

The Flat Canyon trend study was established in 1989 on the critical and heavily used winter range in the hills around Flat and Chris Canyons, north of Gunnison. Much of the area around the area is inaccessible, posted private land. The trend study was located on a site typical of the slightly higher elevation range in the area, having a moderate density of juniper with a big sagebrush and bitterbrush understory. The study is in an area permitted by the BLM for spring sheep grazing, but there was sign of cattle use in 1989. Big game use was reported heavy in 1989, but currently pellet group quadrat frequency of deer is moderate at 28% while elk is only at 1%. No sign of livestock was noted on the site in 1997.

The study site is on a small ridge with a varying slope from 35% on the side of the ridge to only 3% to 5% on the ridge top. The original baseline sampled the steeper side of the ridge while the extended baseline from 1997 samples more of the ridge top. The elevation is 6,000 feet. Soil at the site is moderately deep with an estimated effective rooting depth (see methods) of just over 17 inches. There appears to be a caliche layer in places that varies in depth. The soil penetrometer can apparently penetrate the layer. Rocks appear to be alluvially deposited and are rounded. Large and small gravel sized rocks are common on the surface and throughout the profile. Rocks found at about 1 foot in depth have a calcium carbonate coating. The soil has a sandy loam texture with little structure and a neutral pH of 7.2. Organic matter is limited at only 1.7% and phosphorus may be limiting to plant growth at only 4.4 ppm. Anything below 10 ppm is considered to have effect on the development of plants. Some erosion is occurring, but it does not appear to be severe on the site.

Juniper on the site average 53 trees per acre, the majority of which are mature. Some of the trees have been highlined. Key browse species include mountain big sagebrush and bitterbrush. Mountain big sagebrush had a moderate density of 2,532 plants/acre in 1989, declining to 1,220 plants/acre by 1997. Sagebrush canopy cover averaged 8% in 1989 and nearly 9% in 1997. Half of the sagebrush were classified as mature in 1989. These shrubs were large, moderately hedged with only fair vigor and rather depressed annual growth. Twenty-six percent of the population was decadent and there is an equal number of young and seedling plants. The population became increasingly more mature by 1997 with 72% of the stand consisting of mature plants. Some of the change in density may be the result of the larger sample used in 1997. However, the abundant number of dead plants (1,020 plants/acre), first counted in 1997, suggests a real decline. Seedlings and young plants appear to be abundant enough to maintain the current stand.

The bitterbrush is the interesting component on this site. Growth form varies from prostrate, layering plants to 8 foot tall, open tree-like forms. Plant characteristics appear mainly as bitterbrush, but there must be hybridization with cliffrose. The low bitterbrush have been especially heavily hedged. While the taller plants have also been heavily browsed, some forage is unavailable. A density of 533 all mature plants/acre were estimated in 1989. During the 1997 reading, 480 mature plants/acre were estimated along with 100 young plants/acre and 20 decadent. Use continues to be moderate to heavy with normal vigor. A small amount of ephedra, low rabbitbrush, and rubber rabbitbrush also occur on the site.

Perennial bunch grasses are fairly common, but widely spaced. The prevalent species are bluebunch wheatgrass, Sandberg bluegrass, and needle-and-thread. They had been only lightly grazed in 1989 with no utilization by late May of 1997. Cheatgrass currently provides 48% of the grass cover and is found primarily under shrub and tree canopies. Forbs are fairly diverse, but unproductive.

1989 APPARENT TREND ASSESSMENT

The slight erosion on the site is no more serious than it ever has been. A further loss of understory vegetation would be detrimental to the soil condition, as seen in nearby stands of juniper. There are few young of the key browse species, but the age class distribution is fairly stable for the long-lived species. The heavy use and reduced vigor on the sagebrush and bitterbrush could indicate a downward trend. Overall, the vegetative trend is stable to possibly declining.

1997 TREND ASSESSMENT

Soil trend appears stable. Erosion is still occurring yet it does not appear severe. Percent bare soil has increased slightly, while percent litter cover declined from 42% to 32%. Some of the changes may be the result of the larger sample taken in 1997. Trend for browse is stable. Density of mountain big sagebrush has declined and dead plants are nearly as numerous as live ones. Some of the dead sagebrush appear to have died recently, but not apparently due to an accumulation of deep snow. Seedlings and young appear to be abundant enough to maintain the current population. Bitterbrush is moderately to heavily hedged, percent decadency is only 3%, vigor is good, and recruitment is adequate. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses has declined slightly, while frequency of perennial forbs has increased.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - stable, but poor composition of mostly weeds

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 19

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	171	*122	73	50	3.44
G	Bromus tectorum (a)	-	275	-	91	5.80
G	Oryzopsis hymenoides	27	11	11	5	.10
G	Poa secunda	20	*65	8	26	1.22
G	Sitanion hystrix	2	6	1	2	.15
G	Stipa comata	38	26	20	13	1.33
Total for Grasses		258	505	113	187	12.05
F	Agoseris glauca	-	*20	-	9	.27
F	Alyssum alyssoides (a)	-	1	-	1	.00
F	Astragalus tenellus	-	4	-	3	.07
F	Castilleja linariaefolia	-	2	-	2	.06
F	Calochortus nuttallii	-	*41	-	18	.16
F	Chaenactis douglasii	-	*25	-	9	.69
F	Chorispora tenella (a)	-	4	-	1	.03

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Cirsium spp.	-	5	-	2	.04
F	Cryptantha spp.	6	*16	3	8	.11
F	Epilobium paniculatum (a)	-	3	-	1	.00
F	Erodium cicutarium (a)	-	2	-	1	.00
F	Gilia spp. (a)	-	61	-	23	2.15
F	Lactuca serriola	-	4	-	1	.00
F	Machaeranthera canescens	3	-	2	-	.00
F	Phlox austromontana	-	6	-	3	.18
F	Phlox longifolia	9	9	6	4	.04
F	Polygonum douglasii (a)	-	3	-	1	.00
F	Streptanthus cordatus	3	5	1	3	.04
F	Tragopogon dubius	-	*9	-	5	.10
Total for Forbs		21	220	12	95	4.00

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

BROWSE TRENDS --

Herd unit 16A , Study no: 19

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Artemisia tridentata vaseyana	43	8.83
B	Chrysothamnus viscidiflorus viscidiflorus	4	.15
B	Gutierrezia sarothrae	7	.35
B	Juniperus osteosperma	1	2.96
B	Opuntia spp.	3	.03
B	Purshia tridentata	14	3.04
Total for Browse		72	15.37

BASIC COVER --

Herd unit 16A , Study no: 19

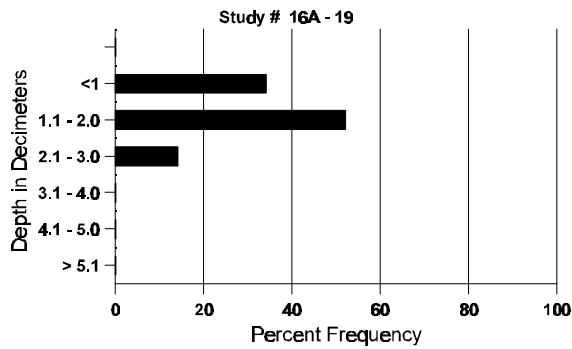
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	340	4.75	26.96
Rock	251	8.75	7.50
Pavement	313	21.00	15.75
Litter	379	42.25	32.46
Cryptogams	61	1.25	.92
Bare Ground	294	22.00	28.46

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 19

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.2	50.8 (17.1)	7.2	70.4	15.8	13.8	1.6	4.4	153.6	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 19

Type	Quadrat Frequency '97
Rabbit	2
Elk	1
Deer	28

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 19

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	89	1	-	-	-	-	-	-	-	-	-	-	-	66			1	
	97	6	-	-	-	-	-	-	-	-	-	-	-	120			6	
Y	89	9	-	-	-	-	-	-	-	-	-	-	-	600			9	
	97	7	-	-	1	-	-	-	-	-	-	-	-	160			8	
M	89	3	15	1	-	-	-	-	-	-	-	-	-	1266	20	24	19	
	97	37	6	-	1	-	-	-	-	-	-	-	-	880	22	35	44	
D	89	8	-	2	-	-	-	-	-	-	-	-	-	666			10	
	97	9	-	-	-	-	-	-	-	-	-	-	-	180			9	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	1020			51	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		39%			08%			21%			-52%							
'97		10%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	2532	Dec:	26%			
												'97	1220		15%			
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	89	-	-	1	-	-	-	-	-	-	-	-	-	66			1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
M	89	1	-	-	-	-	-	-	-	-	-	-	-	66	20	13	1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	28	33	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			50%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	132	Dec:	-			
												'97	0		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total					
		1	2	3	4		1	2						
<i>Chrysothamnus viscidiflorus viscidiflorus</i>														
Y	89	1	-	-	-	-	-	-	-	-	-	66		1
	97	2	-	-	-	-	-	-	-	-	-	40		2
M	89	3	1	1	-	-	-	-	-	-	-	333	12 13	5
	97	5	-	-	-	-	-	-	-	-	-	100	13 19	5
D	89	1	-	-	-	-	-	-	-	-	-	66		1
	97	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>						
'89		14%		14%		14%		-70%						
'97		00%		00%		00%								
Total Plants/Acre (excluding Dead & Seedlings)										'89	465	Dec:	14%	
										'97	140		0%	
<i>Ephedra viridis</i>														
M	89	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	-	-	-	-	-	-	-	-	-	-	0	18 13	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>						
'89		00%		00%		00%		None						
'97		00%		00%		00%								
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-	
										'97	0		-	
<i>Gutierrezia sarothrae</i>														
S	89	-	-	-	-	-	-	-	-	-	-	0		0
	97	9	-	-	-	-	-	-	-	-	-	180		9
Y	89	-	-	-	-	-	-	-	-	-	-	0		0
	97	58	-	-	-	-	-	-	-	-	-	1160		58
M	89	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	12	-	-	-	-	-	-	-	-	-	240	10 14	12
X	89	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>						
'89		00%		00%		00%		Appeared						
'97		00%		00%		00%								
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-	
										'97	1400		-	

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Juniperus osteosperma</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
<i>Opuntia spp.</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	3	10	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	80		-			
<i>Purshia tridentata</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	2	3	-	-	-	-	-	-	-	5	-	-	100			5	
M	89	-	5	3	-	-	-	-	-	-	8	-	-	533	15	32	8	
	97	-	17	6	-	-	1	-	-	-	24	-	-	480	57	46	24	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	1	-	-	-	-	-	-	1	-	-	20			1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	20			1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		63%			38%			00%			+11%							
'97		67%			27%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	533	Dec:	0%			
												'97	600		3%			

Trend Study 16A-20-97

Study site name: Triangle Ranch .

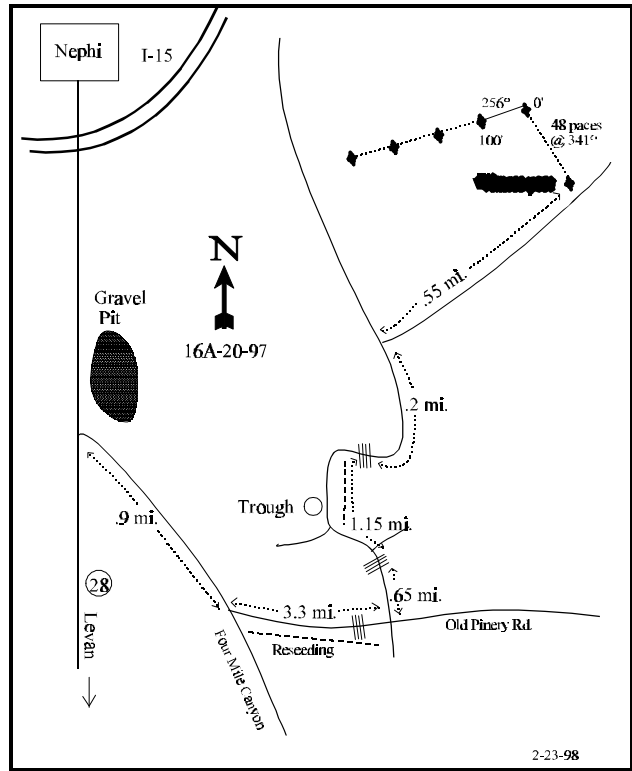
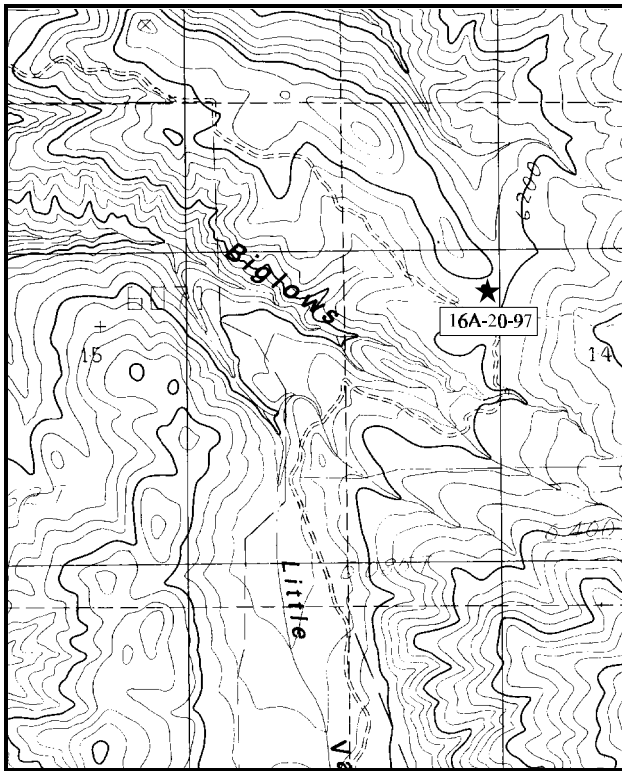
Range type: Chained, Cabled Reseeded P.J.

Compass bearing: frequency baseline 256M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Just south of Nephi on highway 28, turn south past the gravel pit onto a graded road. Go 0.9 miles to a fork. Bear left on the Old Pinery road. Go 3 miles to a cattle guard. Continue 0.3 miles to an intersection. Turn left here and go 0.65 miles to a cattle guard at the top of the hill, then drive through Little Valley 1.1 miles to a gate at the north end of the valley and 0.05 more to a cattle guard. Proceed up the jeep trail 0.2 miles to a fork, bear right. Go 0.55 miles to another fork in a chaining. Take the right fork 0.05 miles to the witness post. From the witness post, go 48 paces at 341°M to the O foot baseline stake.



Map Name: Nephi .

Diagrammatic Sketch

Township 13S , Range 1E , Section 14

DISCUSSION

Trend Study No. 16A-20 (26-6)

The Triangle Ranch study was established in 1989 within a chaining on the Division's Triangle Ranch property. The site is in a valley between the low hills south of Nephi. It has a slightly western aspect with a gentle slope of 10% and an elevation of 6,200 feet. The area provides a variety and abundance of browse and herbaceous forage. Gambel oak and juniper are reestablishing themselves after the treatment, but there is an excellent stand of big sagebrush and grass on the study site. In 1989, there was sign of moderate use by deer and elk, mainly in spring and fall as the area often receives significant snow cover. The area had also been grazed by cattle and horses. During the 1997 reading, no deer or elk pellet groups were encountered. Some old cattle pats were found.

The soil is a moderately deep, clay loam with an effective rooting depth (see methods) estimated at 21 inches. There are few rocks on the surface or in the soil profile. Organic matter is abundant on the surface, but percent organic matter in the top 6 to 8 inches of the soil is fairly low at only 1.9%. Erosion is limited due to the gentle slope and the abundant vegetation and litter cover.

Mountain big sagebrush is well established as the most frequent browse species. It provides 12% ground cover and makes up 86% of the total browse cover. Currently, the population density is estimated at 3,380 plants/acre. Population estimates from 1989 are similar, but percent decadence was much higher at that time (60%) compared to 13% in 1997. Utilization has remained light to moderate with plants showing good vigor. Recruitment continues to be adequate. Bitterbrush and white-stemmed rubber rabbitbrush occur in small numbers and provide additional forage. All bitterbrush plants encountered in 1997 were heavily hedged yet still have good vigor and none were classified as being decadent.

Some oak and juniper trees are reestablishing themselves on the site. Point-centered quarter data estimated 72 juniper/acre in 1989. Forty percent were young trees under 4 feet tall, 35% mature, and the rest were in the 4-8 foot class. In 1997, point-center quarter data estimated their density at 68 trees/acre.

The herbaceous understory is diverse and abundant with grasses producing a total of 27% ground cover while forbs provide only 6%. The dominant perennial grasses are Kentucky bluegrass which provides 31% of the grass cover, intermediate wheatgrass which produces 16% of the grass cover, and sheep fescue which adds an additional 15% of the grass cover. Other common grasses include western wheatgrass, smooth brome, orchard grass, bulbous bluegrass, and Sandberg bluegrass. Although forbs are diverse, they produce little forage. The only common perennial species is Beckwith milkvetch and false dandelion which account for 46% of the forb cover.

1989 APPARENT TREND ASSESSMENT

The soil trend appears stable. While the sagebrush population generally appears stable, the data may indicate a declining trend. A rereading will be very interesting on this site. Grasses may still be increasing, and the increase of juniper is slow but steady.

1997 TREND ASSESSMENT

Trend for soil is stable with similar ground cover characteristics compared to 1989. Erosion is not currently a problem on the site. The browse trend is up slightly. Density has remained similar, but percent decadence has declined from 60% in 1989 to only 13% currently. It appears that due to the lack of dead plants (180

plants/acre), many of the decadent sagebrush encountered in 1989 have regained their vigor. Utilization continues to be mostly light and recruitment, in spite of the vigorous herbaceous understory, remains more than adequate to maintain the stand. Trend for the herbaceous understory is up due to an increase in the sum of nested frequency for perennial grasses and forbs. Some of the changes in frequency of grasses and forbs may be partly due to the larger sample taken in 1997, but it appears that western wheatgrass has declined significantly in its sum of nested frequency while Kentucky bluegrass has increased significantly. With more precipitation at the higher elevation of the site, one would expect Kentucky bluegrass to be more competitive than western wheatgrass.

TREND ASSESSMENT

soil - stable

browse - up slightly

herbaceous understory - up

HERBACEOUS TRENDS --

Herd unit 16A , Study no: 20

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	40	*17	24	8	.78
G	Agropyron intermedium	62	109	30	36	4.19
G	Agropyron smithii	330	*140	97	50	1.06
G	Agropyron spicatum	4	-	3	-	-
G	Bromus inermis	13	*37	6	12	1.17
G	Bromus tectorum (a)	-	71	-	25	.39
G	Dactylis glomerata	28	*83	14	31	2.34
G	Elymus cinereus	-	1	-	1	.00
G	Elymus salina	-	5	-	2	.76
G	Festuca ovina	30	*89	12	34	4.06
G	Poa bulbosa	-	*64	-	21	2.33
G	Poa fendleriana	-	1	-	1	.03
G	Poa pratensis	74	*182	31	57	8.13
G	Poa secunda	82	59	30	22	1.19
Total for Grasses		663	858	247	300	26.48
F	Agoseris glauca	5	*90	3	37	.80
F	Alyssum alyssoides (a)	-	39	-	16	.08
F	Antennaria rosea	-	6	-	2	.01
F	Arabis spp.	10	10	4	4	.02
F	Astragalus beckwithii	-	*60	-	25	1.83

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	<i>Astragalus convallarius</i>	25	*6	13	3	.06
F	<i>Balsamorhiza sagittata</i>	-	3	-	1	.00
F	<i>Calochortus nuttallii</i>	-	*9	-	5	.02
F	<i>Cerastium</i> spp.	4	-	2	-	-
F	<i>Cirsium</i> spp.	-	-	-	-	.03
F	<i>Collomia linearis</i> (a)	-	7	-	5	.05
F	<i>Collinsia parviflora</i> (a)	-	198	-	72	.63
F	<i>Crepis acuminata</i>	14	12	6	6	.13
F	<i>Cymopterus</i> spp.	8	4	4	2	.03
F	<i>Draba</i> spp. (a)	-	3	-	1	.00
F	<i>Epilobium paniculatum</i> (a)	-	66	-	30	.17
F	<i>Eriogonum racemosum</i>	5	3	3	1	.00
F	<i>Eriogonum umbellatum</i>	6	6	2	2	.06
F	<i>Galium aparine</i> (a)	-	25	-	9	.50
F	<i>Lappula occidentalis</i> (a)	-	12	-	5	.02
F	<i>Lactuca serriola</i>	5	2	2	1	.00
F	<i>Linum lewisii</i>	13	19	5	9	.15
F	<i>Phlox longifolia</i>	18	21	9	8	.04
F	<i>Polygonum douglasii</i> (a)	-	8	-	3	.01
F	<i>Ranunculus testiculatus</i> (a)	-	101	-	34	.26
F	<i>Sanguisorba minor</i>	1	-	1	-	-
F	<i>Sphaeralcea coccinea</i>	12	9	6	4	.02
F	<i>Taraxacum officinale</i>	-	1	-	1	.00
F	<i>Tragopogon dubius</i>	45	53	24	21	.57
F	Unknown forb-annual	-	22	-	10	.05
F	<i>Viola</i> spp.	-	5	-	4	.02
F	<i>Zigadenus paniculatus</i>	1	6	1	3	.04
Total for Forbs		172	806	85	324	5.71

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16A , Study no: 20

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	62	12.08
B	Chrysothamnus nauseosus albicaulis	6	.06
B	Gutierrezia sarothrae	6	.02
B	Juniperus osteosperma	2	1.14
B	Purshia tridentata	2	.15
B	Quercus gambelii	0	.63
Total for Browse		78	14.09

BASIC COVER --

Herd unit 16A , Study no: 20

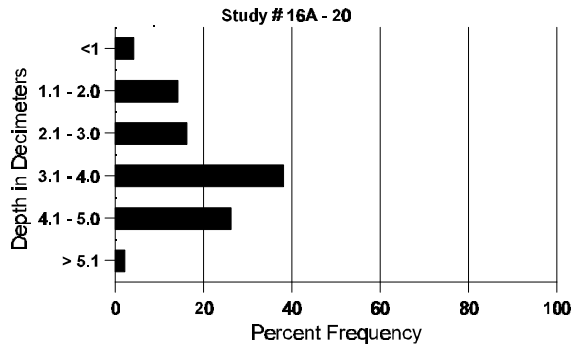
Cover Type	Nested Frequency '97	Average Cover % '89 '97	
Vegetation	385	6.50	48.11
Rock	42	1.00	.22
Pavement	154	.50	1.14
Litter	400	79.75	51.00
Cryptogams	25	1.25	.07
Bare Ground	235	11.00	12.95

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 20

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
21.3	43.8 (17.7)	6.2	42.0	31.4	26.6	1.9	17.7	185.6	.4

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A , Study no: 20

Type	Quadrat Frequency '97
Rabbit	2
Cattle	7

BROWSE CHARACTERISTICS --

Herd unit 16A , Study no: 20

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches)		Total			
		1	2	3	4		Ht.	Cr.				
	1 2 3 4 5 6 7 8 9	1	2	3	4							
	Amelanchier alnifolia											
M	'89	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	0	32	30	0
	% Plants Showing	<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
	'89	00%		00%		00%		None				
	'97	00%		00%		00%						
	Total Plants/Acre (excluding Dead & Seedlings)								'89	0	Dec:	-
									'97	0		-

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7	
Y	89	5	1	-	-	-	-	-	-	-	6	-	-	-	400		6	
	97	43	1	-	-	-	-	-	-	-	44	-	-	-	880		44	
M	89	5	9	-	-	-	-	-	-	-	13	1	-	-	933	22 24	14	
	97	75	23	5	-	-	-	-	-	-	103	-	-	-	2060	26 38	103	
D	89	13	17	-	-	-	-	-	-	-	29	1	-	-	2000		30	
	97	10	1	-	11	-	-	-	-	-	4	-	1	6	440		22	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	180		9	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		54%			00%			00%			+ 1%							
'97		15%			03%			04%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	3333	Dec:	60%				
											'97	3380		13%				
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	34 29	4	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			14%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	140		14%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	89	8	-	-	-	-	-	-	-	-	8	-	-	-	533		8	
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
M	89	36	-	-	-	-	-	-	-	-	36	-	-	-	2400	7 8	36	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140	5 3	7	
D	89	4	-	-	-	-	-	-	-	-	1	-	2	1	266		4	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			06%			-92%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	3199	Dec:	8%				
											'97	240		0%				
<i>Juniperus osteosperma</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				
<i>Purshia tridentata</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	-	-	2	-	-	-	-	-	-	2	-	-	-	40	23 32	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	200	Dec:	-				
											'97	0		-				
Symphoricarpos oreophilus																		
M	89	-	-	1	-	-	-	-	-	-	1	-	-	-	66	40	34	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	89	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	132	Dec:	50%				
											'97	0		0%				

DISCUSSION

Trend Study No. 16A-21 (42-7)

*** This site was dropped from the study list in 1997 and will not be reread. Text from the 1989 report has been left below. Maps and data tables can be found in the 1989 Utah Big Game Range Trend Study report.

This winter range study is located on private land above Jerusalem on the west side of Sanpete Valley. The land is grazed by domestic sheep. The foothills are dominated by juniper and oak with sagebrush openings. The study is in one of the large sagebrush openings, on a 7% slope with a southeast aspect. The elevation is 5,900 feet.

The soil is moderately deep, but rocky. It is fine-textured and dark brown in color, due to a high percentage of organic matter. Litter cover is good, 74%. There is a minimum of exposed soil (8%). There is no erosion due to the gentle slope and adequate litter cover.

The dominant species in the opening is mountain big sagebrush. There may be some basin big sagebrush represented by the six foot tall individuals. The average height of the majority of the sagebrush is 2 feet. There is abundant seed production on the sage this year, and leader growth is fair. Most sagebrush show light use and light to moderate hedging. Sagebrush cover averages 11%. The density of mature sagebrush is 1,733 plants/acre, 41% of the population. Thirty percent of the sagebrush were classified as decadent, but an equal number of seedling and young sage were found. The low-growing bitterbrush on the site is heavily hedged. Vigor is fair with a density of 533 plants/acre. Other browse includes scattered oak clumps, mostly mature plants that are heavily hedged on the clone perimeter, leaving much of the forage unavailable due to height. There are also a few juniper in the opening, some are highlined. Pricklypear cactus is common. There is a significant amount of broom snakeweed in the understory.

The bluebunch wheatgrass is fairly competitive and grows vigorously in the decadent sagebrush. The shrub interspaces are occupied by Sandberg bluegrass, bulbous bluegrass, and cheatgrass. There has been light grazing on the grasses recently. Forbs are relatively rare. Eight perennial species were identified.

1989 APPARENT TREND ASSESSMENT

The population of the key browse species, big sagebrush, is dynamic but hardy, with a large percentage of older, decadent plants. Only the bitterbrush and readily-available oak show signs of heavy hedging. The long term trend is stable to declining. The soil trend is stable due to the adequate ground cover present to minimize erosion.

SUMMARY

WILDLIFE MANAGEMENT UNIT - 16A - NEBO

Quality winter range is lacking on this unit. Big sagebrush openings in the oak-sagebrush sites, Strawberry Highline Canal (#1), Santaquin’s Bench (#2) and Santaquin Hill (#3) in southern Utah County are slowly being turned to thick Oak clones with little understory. Winter range sites at Gardner Canyon (#8), Birch Creek (#9), North Canyon (#10), Reese Flat (#11), Tithing Mountain (#12), Steele Ranch (#13), Chicken Creek (#17), and Deep Creek (#18) support poor herbaceous understory’s with associated poor ground cover conditions and erosion problems on some sites. However, overall browse trends on the unit are stable to improving on all but the study sites at Big Hollow (#14) and Chicken Creek (#15). A trend summary table can be found below.

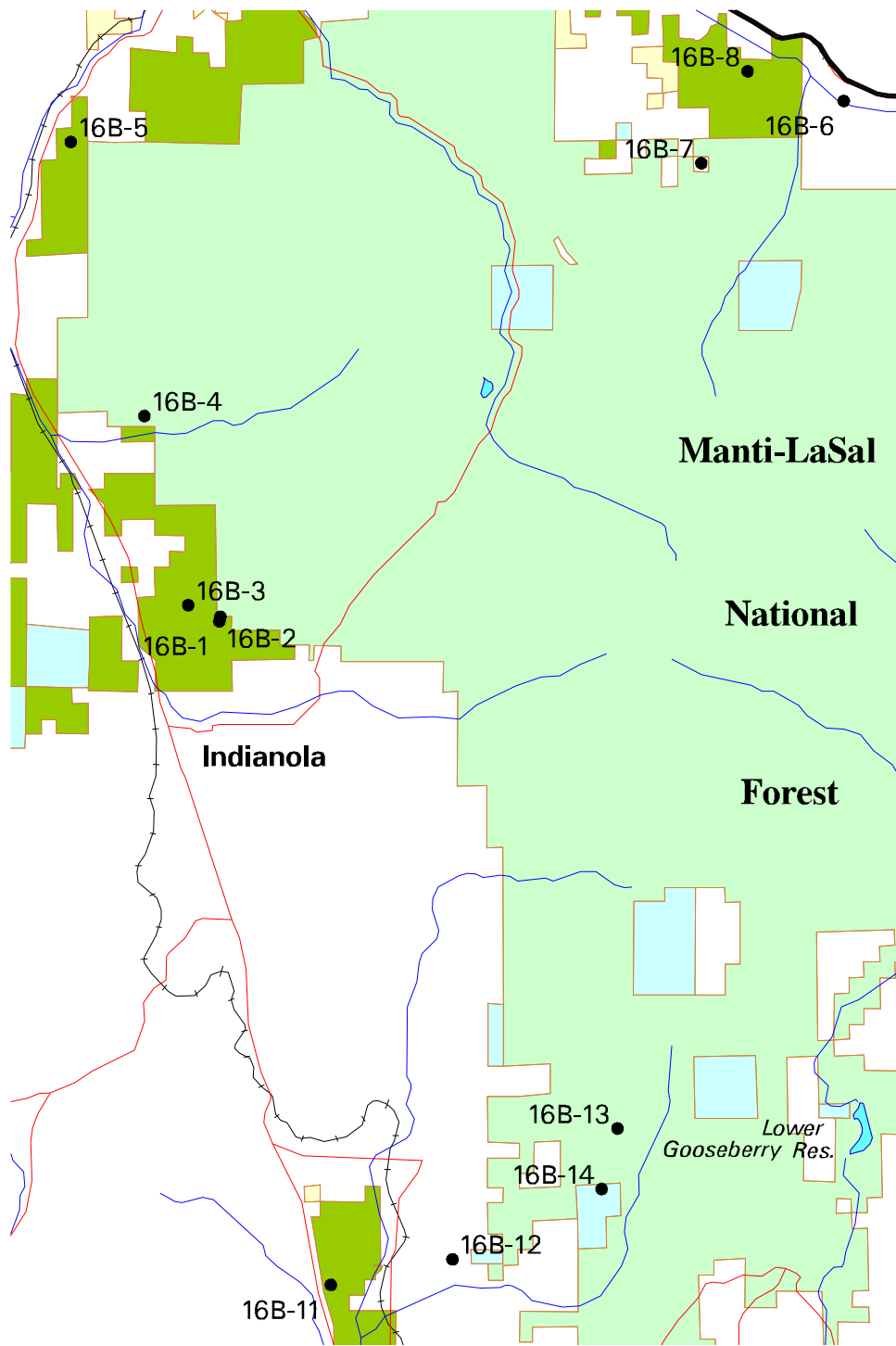
TREND SUMMARY UNIT - 16A - NEBO

Site	1989			1997		
	Soil	Browse	Grasses & Forbs	Soil	Browse	Grasses & forbs
16A-1 Strawberry Highline Canal	0	0	+	0	0	0
16A-2 Santaquin’s Bench	-	-	+	0	0	+
16A-3 Santaquin Hill	+	-	+	0	0	-
16A-4 Wash Canyon	0	0	+	+	-	0
16A-5 Nebo Creek	+	0	+	0	0	0
16A-6 Hop Creek Browse	+	0	0	0	0	+
16A-7 Willow Creek	0	0	0	0	0	-
16A-8 Gardner Cyn	0	-	0	+	0	0
16A-9 Birch Creek	0	0	+	-	0	-
16A-10 North Canyon	0	0	+	0	0	+
16A-11 Rees Flat	0	0	-	+	+	+
16A-12 Tithing Mountain	established in 1989			0	0	+
16A-13 Steele Ranch	established in 1989			0	0	0
16A-14 Big Hollow	established in 1989			+	-	+
16A-15 Old Pinery	0	+	+	0	+	+
16A-16 Levan Farm Seeding	0	-	0	0	0	0
16A-17 Chicken Creek	0	-	0	0	-	-
16A-18 Deep Creek	-	0	+	-	0	+
16A-19 Flat Canyon	established in 1989			0	0	0

Site	1989			1997		
	Soil	Browse	Grasses & Forbs	Soil	Browse	Grasses & forbs
16A-20 Triangle Ranch	established in 1989			0	+	+










+ = upward trend, - = downward trend, 0 = stable trend, NR = not read

Management Unit 16B



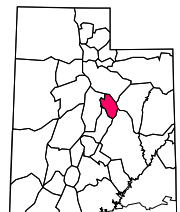
Map Scale 1:182,000 (1" = 2.87 mi)

Legend

- | | | |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|  Forest Service |  Private Land |  Transect Location |
|  BLM |  State Wildlife Reserve |  Road |
|  State of Utah |  Water Body |  Water Course |



Unit Location



WILDLIFE MANAGEMENT UNIT - 16 - MANTI-NEBO

SUB UNIT - 16B - MANTI-NEBO, MANTI NORTH

Boundary Description

Utah, Sanpete, Emery and Carbon counties - Boundary begins at Highway SR-10 and Highway SR-31 in Huntington; then north of SR-10 to Highway US-6; northwest on US-6 to Highway US-89; south o US-89 to SR-31; southeast on SR-31 to Huntington.

Old Herd Unit Description

NW and SW Manti Herd Unit

Unlike other studies reread and reported on in 1989, the studies in the Northwest and Southwest Manti deer herd units are newly established Interagency Range Trend Studies. These studies complete establishment of permanently-marked trend studies in the Central region. Sites were selected on the basis of recommendations of local Interagency personnel. Some are on the location of 1978 line-intercept (LI) study sites. Where applicable in the Herd Unit Evaluation, comparisons with the LI data are discussed. The trend studies were established and read in August and early September 1989 and again in June and early July of 1997.

The availability of winter range and it's condition and productivity have always been an issue on these important central deer herd units. Due to location and access, a large number of hunters use these units. They continue to contribute an important portion of the yearly statewide deer harvest. The Lake Fork-Mill Fork, Mount Pleasant, and Ephraim portions of the Northwest and Southwest Manti deer herd units are considered in the top priority of deer herd units requiring winter habitat preservation action. Elk are an increasingly important factor on these units, and several studies were established in consideration of the importance of monitoring critical elk habitat.

The following individual study site discussions include information on the location and physical aspects of the site, plant composition and utilization, and a preliminary assessment of soil and vegetative trends. The page describing the location of each site includes a written location description and study site maps. Background site information was provided by the cooperating land management agencies.

Trend Study 16B-1-97

Study site name: Long Ridge South .

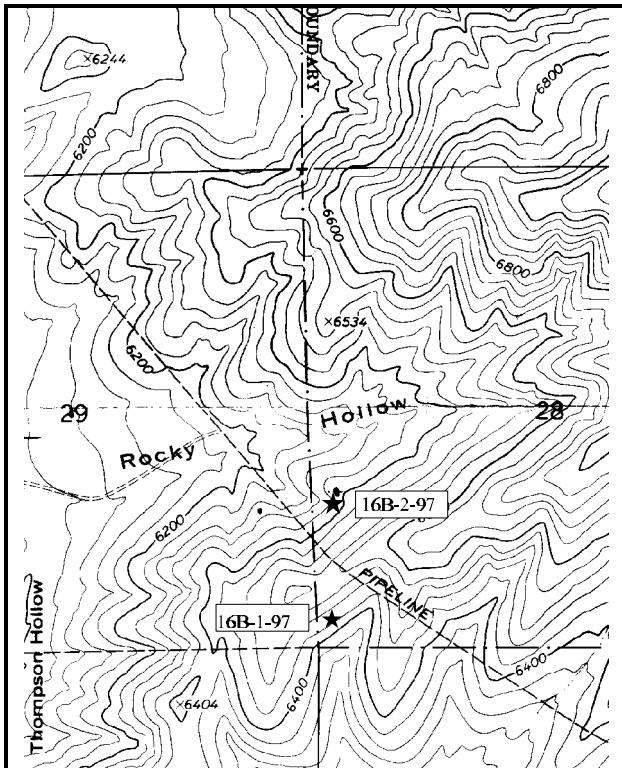
Range Type: Mixed mountain brush

Compass bearing: frequency baseline 120M degrees. (Line 2-4 200°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

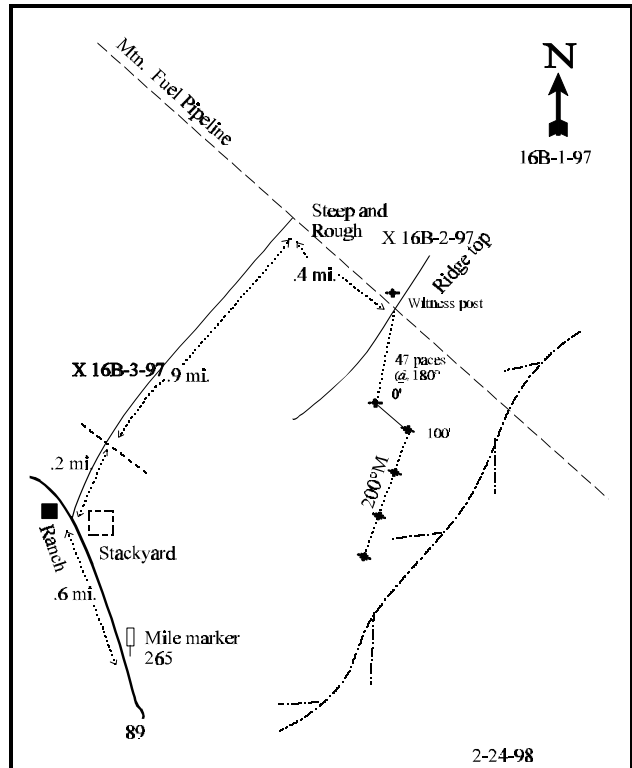
LOCATION DESCRIPTION

Go north from Fairview on U.S.89 for approximately 15 miles to a ranch house and stackyard. Turn right, go through a DWR gate into Lassen Draw Property. Go 0.2 miles to another gate/fence. Continue up road, past transect 16B-3, about 0.9 miles to a pipeline intersection at the upper end of the valley. If possible, drive 0.4 miles up steep hill following the pipeline to the top of the first ridge. Stop here at an intersection/witness post. From the southwest corner of the intersection, walk 47 paces at a bearing of 180M degrees to the 0-foot baseline stake, marked by browse tag #9090.



Map name: Indianola

Township 11S , Range 4E , Section 28



Diagrammatic Sketch

UTM 4408641.205 N , 458276.094 E

DISCUSSION

Trend Study No. 16B-1 (28-1)

The Long Ridge South trend study, along with its companion study #16B-2, is located on Division property near Long Ridge, north of Indianola. The mountain brush covered hillsides are important wintering areas for both deer and elk. The trend study is on a steep south-facing slope of 35% to 40% with an elevation of 6,480 feet. The area receives heavy use in the winter. Quadrat frequency for deer pellet groups in 1997 was high at 46%, compared to elk which had a 19% quadrat frequency.

The soil is relatively shallow and very rocky on the surface and through the profile. Effective rooting depth (see methods) was estimated at just over 10 inches, but depth measurements may not be as accurate as possible because of the rockiness of the soil profile. Rocks on the site are rounded large cobble. Some smaller sized pavement is concentrated on the surface in exposed, isolated areas. Soil texture is a sandy clay loam with a slightly acid pH (6.2). The soil is very well drained with a moderate erosion hazard and moderate runoff. Erosion does not appear to be a serious problem on the site due to the abundant vegetation and litter cover.

This site supports a fair diversity of preferred browse species including; serviceberry, mountain big sagebrush, and antelope bitterbrush. The dominant overstory is made up of serviceberry. Mature shrubs average just over 4 feet in height with many plants classified as partially unavailable. Density was estimated at 423 plants/acre in 1989. Serviceberry was heavily hedged where available that year, but vigor was good and percent decadence low at 15%. During the 1997 reading, the larger sample (see methods) estimated a smaller density of 340 plants/acre. Utilization was heavy but less so than in 1989. Percent decadence increased to 47%, however only 13% of the decadent plants were classified as dying. Recruitment is poor with no seedlings and only a few young plants encountered. Dead plants, first counted in 1997, indicate a definite decline in the population. Recruitment and establishment will be difficult in this community for any plant that is not an annual, as 61% of the herbaceous understory is made up of the very competitive, annual cheatgrass.

Big sagebrush found on the site was classified as mountain big sagebrush (*Artemisia tridentata vaseyana*), however, some plants exhibit characteristics of basin big sagebrush (*A. tridentata tridentata*). If both are present, they will hybridize together. Density was estimated at just under 800 plants/acre in 1989, with the average height of mature plants at nearly three feet. Some sagebrush were 5 feet tall. Use was light to moderate with heavy use on some plants. The heavily used individuals are those with the most characteristics of mountain big sagebrush which are the most preferred. Vigor was normal on most plants and decadence low at 25%. The much larger sample used in 1997 estimates 700 sagebrush/acre. Utilization is similar to 1989 estimates, but percent decadence has declined to only 5%. Few dead plants were found within the population, therefore the change in the population estimate was caused by the larger sample which is more representative of the general area. Average height measurements also declined as less basin big sagebrush type plants were sampled along the lengthened baseline. Recruitment is good with 29% of the population consisting of young plants.

Bitterbrush is the other preferred browse found on the site. It currently makes up 20% of the browse cover with a relatively stable density estimated at 232 plants/acre in 1989 and 220 plants/acre in 1997. Mature plants average about 3½ feet in height. Utilization is very heavy and vigor depressed on nearly 1/3 of the bitterbrush sampled in 1997. Percent decadency is relatively low at 27%. However, recruitment is poor with no seedlings and young sampled either sampling date.

Low rabbitbrush dominates the understory and accounts for 39% of the shrub cover. It is mostly unutilized with mature plants averaging only one foot in height. Density was estimated at 1,199 plants/acre in 1989 and 2,460 in 1997. No seedlings and few young occur, indicating it would now have a relatively stable population.

The herbaceous understory is abundant, but dominated by cheatgrass which makes up 81% of the grass cover. The only common perennial species is bluebunch wheatgrass which contributes 19% of the grass cover. Several other perennial species are present and are in very low numbers. The forb composition is diverse yet nearly half (47%) of the forb cover comes from annual species like pale alyssum, little pod false flax, and storksbill. Common perennial species include Louisiana sage, Beckwith milkvetch, spreading fleabane, and scarlet globemallow.

1989 APPARENT TREND ASSESSMENT

The soil is somewhat limiting, but current erosion is slight, indicating a stable trend. Vegetative trend is stable to possibly slightly down. There is a low frequency of forbs and desirable browse compared to other mountain brush sites. Production of the preferred browse, serviceberry, may become less available.

1997 TREND ASSESSMENT

Trend for soil appears up with a decrease in percent bare soil from 9% to 3%. Trend for browse is down slightly. Mountain big sagebrush appears to be stable, but serviceberry is declining in density and increasing in decadence. Bitterbrush is very heavily utilized with reduced vigor on nearly 1/3 of the population and no reproduction evident. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency for perennial grasses and forbs. Cheatgrass still dominates the understory, while bluebunch wheatgrass increased significantly in its nested frequency value.

TREND ASSESSMENT

soil - up slightly

browse - down slightly for serviceberry and bitterbrush which contributes 42% of the browse cover, or 81% of the preferred browse species cover

herbaceous understory - up slightly

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 1

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'89	'97	'89	'97	
G	Agropyron spicatum	138	*197	55	71	5.51
G	Bromus tectorum (a)	-	347	-	100	23.89
G	Carex spp.	4	-	1	-	-
G	Poa fendleriana	22	6	9	4	.09
G	Poa secunda	4	3	1	1	.03
G	Sitanion hystrix	-	4	-	1	.00
G	Sporobolus cryptandrus	-	1	-	1	.03
G	Stipa comata	5	1	2	1	.03
Total for Grasses		173	559	68	179	29.60
F	Agoseris glauca	-	*16	-	9	.12
F	Alyssum alyssoides (a)	-	171	-	65	.88

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	<i>Artemisia ludoviciana</i>	74	*34	34	14	.92
F	<i>Astragalus beckwithii</i>	-	*24	-	11	.38
F	<i>Astragalus utahensis</i>	-	5	-	3	.04
F	<i>Balsamorhiza sagittata</i>	15	*4	8	2	.04
F	<i>Camelina microcarpa</i> (a)	-	52	-	21	1.78
F	<i>Calochortus nuttallii</i>	5	1	3	1	.01
F	<i>Cirsium</i> spp.	6	5	2	2	.06
F	<i>Collomia linearis</i> (a)	-	40	-	21	.26
F	<i>Collinsia parviflora</i> (a)	-	8	-	4	.04
F	<i>Crepis acuminata</i>	-	6	-	3	.02
F	<i>Cryptantha</i> spp.	-	2	-	1	.03
F	<i>Cynoglossum officinale</i>	-	2	-	1	.03
F	<i>Descurainia pinnata</i> (a)	-	7	-	2	.04
F	<i>Epilobium paniculatum</i> (a)	-	6	-	5	.02
F	<i>Erodium cicutarium</i> (a)	-	146	-	55	1.39
F	<i>Erigeron divergens</i>	-	*75	-	34	1.75
F	<i>Eriogonum racemosum</i>	10	6	4	2	.03
F	<i>Haplopappus acaulis</i>	-	4	-	2	.30
F	<i>Lappula occidentalis</i> (a)	-	6	-	2	.01
F	<i>Lactuca serriola</i>	-	4	-	3	.02
F	<i>Lithospermum ruderale</i>	10	11	5	4	.22
F	<i>Lomatium dissectum</i>	4	2	3	1	.00
F	<i>Microsteris gracilis</i> (a)	-	1	-	1	.00
F	<i>Phlox longifolia</i>	6	4	4	2	.01
F	<i>Polygonum douglasii</i> (a)	-	3	-	2	.01
F	<i>Ranunculus testiculatus</i> (a)	-	3	-	1	.00
F	<i>Sisymbrium altissimum</i> (a)	-	1	-	1	.00
F	<i>Sphaeralcea coccinea</i>	14	*42	7	17	.79
F	<i>Tragopogon dubius</i>	-	2	-	1	.00
F	<i>Viguiera multiflora</i>	-	1	-	1	.01
Total for Forbs		144	694	70	294	9.30

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16B , Study no: 1

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	16	4.17
B	Artemisia tridentata vaseyana	27	1.82
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	46	7.42
B	Gutierrezia sarothrae	12	.51
B	Opuntia spp.	16	1.27
B	Purshia tridentata	11	3.71
B	Tetradymia canescens	4	.03
Total for Browse		133	18.95

BASIC COVER --

Herd unit 16B , Study no: 1

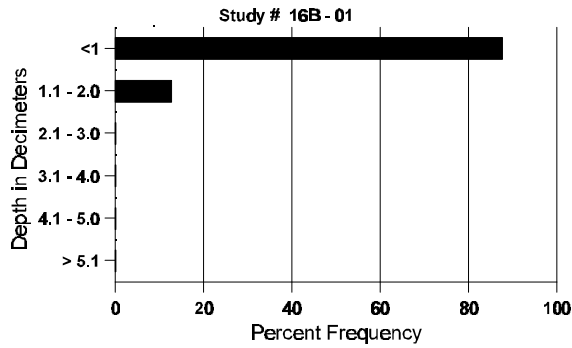
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	380	6.75	49.93
Rock	233	18.00	15.18
Pavement	147	14.50	2.49
Litter	385	52.00	52.19
Cryptogams	64	.25	.40
Bare Ground	117	8.50	2.52

SOIL ANALYSIS DATA --

Herd Unit 16B, Study no: 01

Effective rooting depth (inches)	Temp °F (depth)	PH	% sand	% silt	% clay	% OM	PPM P	PPM K	dS/m
10.2	55.6 (13.1)	6.2	60.7	18.7	20.6	2.7	21.3	217.6	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16B , Study no: 1

Type	Quadrat Frequency '97
Elk	19
Deer	46

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 1

A Y E	G R	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.	
<i>Amelanchier alnifolia</i>																		
S	89	-	-	-	-	-	-	2	-	-	2	-	-	-	66			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0				0
	97	-	-	-	1	-	-	-	-	-	1	-	-	20				1
M	89	-	-	5	-	-	5	-	1	-	11	-	-	366	89	45		11
	97	-	-	-	1	-	6	1	-	8	-	-	-	160	52	46		8
D	89	-	-	2	-	-	-	-	-	1	-	1	-	66				2
	97	-	-	1	-	3	4	-	-	7	-	-	1	160				8
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0				0
	97	-	-	-	-	-	-	-	-	-	-	-	-	80				4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>					<u>%Change</u>					
'89		00%			92%			08%					-21%					
'97		18%			65%			06%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	432	Dec:	15%			
												'97	340		47%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
Y	89	7	7	-	-	-	-	-	-	-	14	-	-	-	466		14	
	97	10	-	-	-	-	-	-	-	-	10	-	-	-	200		10	
M	89	-	2	2	-	-	-	-	-	-	4	-	-	-	133	34 52	4	
	97	10	6	1	1	4	1	-	-	-	23	-	-	-	460	24 31	23	
D	89	2	2	2	-	-	-	-	-	-	5	-	-	1	200		6	
	97	-	-	2	-	-	-	-	-	-	1	-	-	1	40		2	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		46%			17%			04%			-12%							
'97		29%			11%			03%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	799	Dec:	25%				
											'97	700		6%				
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	22 19	1	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	26 32	1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-39%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	20		-				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	13	-	-	-	-	-	-	-	-	13	-	-	-	260		13	
M	89	31	-	-	-	-	-	-	-	-	6	-	25	-	1033	12 20	31	
	97	108	-	1	-	1	-	-	-	-	110	-	-	-	2200	13 24	110	
D	89	4	-	-	-	-	-	1	-	-	1	-	3	1	166		5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			81%			+51%							
'97		.81%			.81%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1199	Dec:	14%				
											'97	2460		0%				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
Echinocactus spp.																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	4	6	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	13	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	0		-				
Gutierrezia sarothrae																		
M	89	56	-	-	-	-	-	-	-	-	56	-	-	-	1866	11	8	56
	97	23	-	-	1	-	-	-	-	-	24	-	-	-	480	10	11	24
D	89	6	-	-	-	-	-	-	-	-	5	-	-	1	200			6
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			02%			-77%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2066	Dec:	10%				
											'97	480		0%				
Opuntia spp.																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	89	22	-	-	-	-	-	-	-	-	22	-	-	-	733	6	14	22
	97	19	-	-	2	-	-	-	-	-	21	-	-	-	420	7	18	21
D	89	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			04%			-45%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	799	Dec:	4%				
											'97	440		5%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total						
		1	2	3	4		1	2							
<i>Purshia tridentata</i>															
M	89	-	3	2	-	-	-	-	5	-	-	166	26	43	5
	97	-	-	3	-	1	4	-	8	-	-	160	42	63	8
D	89	-	-	1	-	1	-	-	2	-	-	66			2
	97	-	-	1	-	-	2	-	-	-	3	60			3
X	89	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		57%		43%		00%		- 5%							
'97		09%		91%		27%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	232	Dec:	28%		
										'97	220		27%		
<i>Tetradymia canescens</i>															
Y	89	-	-	-	-	-	-	-	-	-	0				0
	97	-	1	-	-	-	-	-	1	-	-	20			1
M	89	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	2	1	-	-	-	-	-	3	-	-	60	12	24	3
D	89	-	5	-	-	-	-	-	-	-	5	166			5
	97	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		100%		00%		100%		-52%							
'97		50%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	166	Dec:	100%		
										'97	80		0%		

Trend Study 16B-2-97

Study site name: Long Ridge North .

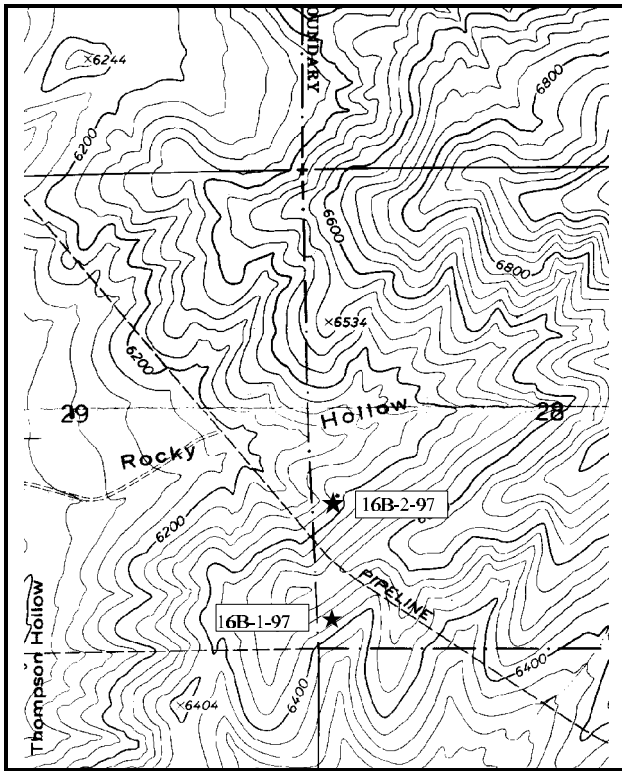
Range Type: Big sagebrush/grass

Compass bearing: frequency baseline 310M degrees. (Lines 2-4 40°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

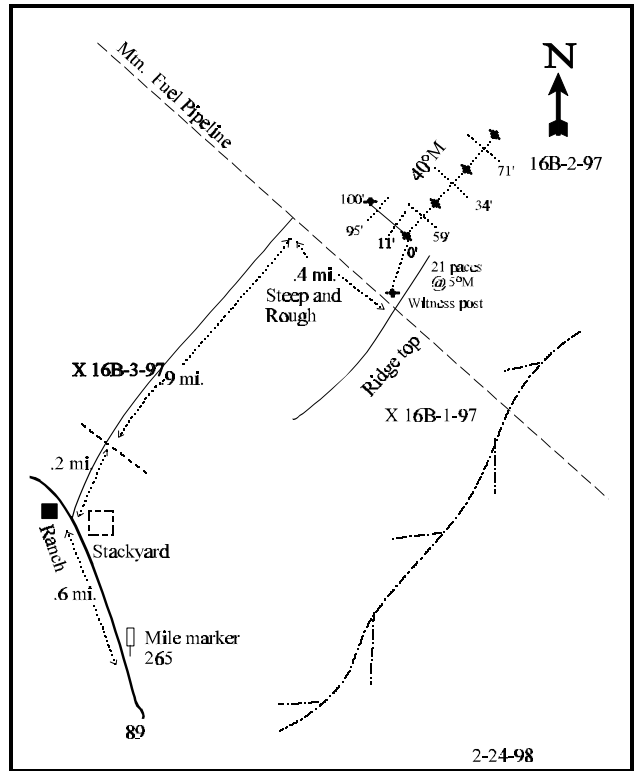
LOCATION DESCRIPTION

Go north from Fairview on U.S. 89 for approximately 15 miles to a ranch house and stackyard. Turn right and go through a DWR gate into Lassen Draw property. Go 0.2 miles to another gate/fence. Continue up road, past transect 16B-3, about 0.9 miles to a pipeline intersection at the upper end of the valley. If possible, drive 0.4 miles up steep hill following pipeline to the top of the first ridge. Stop here at an intersection/witness post. From the witness post, walk 21 paces at 5 M degrees to the O-foot baseline stake.



Map Name: Indianola .

Township 11S , Range 4E , Section 28



Diagrammatic Sketch

UTM 4408757.454 N , 458304.488 E

DISCUSSION

Trend Study No. 16B-2 (28-2)

The Long Ridge North study is on the opposite side of the ridge from #16B-1. It is on a northwest facing slope above Rocky Hollow. This site represents a sagebrush/grass range type with a few scattered serviceberry. The site is located on Division land at 6,500 feet in elevation and is designated as key big game winter range. Both deer and elk use this site, primarily in the winter, however two does were observed in the area during the 1997 reading. Pellet group quadrat frequency was moderately high for deer at 41%, with elk somewhat lower at 29%.

Soils on this site are similar to the nearby study #16B-1. Effective rooting depth (see methods) is estimated at almost 14 inches. Rocks and pavement are common on the surface and within the soil profile. The soil is derived from a mixture of igneous rock and sandstone. It has a sandy clay loam texture and a neutral pH of 6.9. Percent organic matter is similar to site #1 (2.8%). There appears to have been some terracing done in the past on this slope. Erosion is currently not a problem due to the abundant protective ground cover.

This side of the ridge supports the same key browse species that are found on site #16B-1, however only serviceberry and mountain big sagebrush are common. Although serviceberry is relatively common, it still only accounts for about 5% of the browse cover with an estimated density of 520 plants/acre. Mature plants average only 15 inches in height. Utilization has been moderate to heavy since 1989, although vigor has improved since the previous reading in 1989 when half of the shrubs displayed poor vigor and 69% were classified as decadent plants. Mountain big sagebrush is much more abundant on this site than the Long Ridge South site with an estimated density of 2,220 plants/acre in 1997. Twice as many plants were estimated in 1989, but due to the lack of large numbers of dead plants encountered in 1997 (the dead plants can only explain 24% of the decrease its density), the change in density is primarily due to the much larger, more representative sample taken in 1997. Use of the sagebrush has been moderate to heavy with normal vigor on most plants. Percent decadency was high at 70% in 1989 but has since declined to 37%. It is apparent that some of the decadent sagebrush sampled in 1989 died during the extended years of drought. Recruitment is poor with few seedlings and young found during either reading. Bitterbrush is rare on this site with only one seedling encountered in 1997. Other browse species found include; stickyleaf low rabbitbrush, broom snakeweed, Oregon grape, wood's rose, snowberry, and gray horsebrush.

Perennial grasses and forbs are common in the understory. Bluebunch wheatgrass, Sandberg bluegrass, and muttongrass are very common and do not show much sign of utilization. Cheatgrass is found, yet it produces less than 1% cover on this site. Forb diversity is high with several useful species present.

1989 APPARENT TREND ASSESSMENT

The rocky soil is currently stable with adequate protection from abundant vegetation and litter cover. Heavy utilization is impacting the key browse species, mountain big sagebrush and serviceberry. Trend is down for those species. Otherwise, there is good diversity, a healthy understory, and relatively fewer increaser species compared to other sites.

1997 TREND ASSESSMENT

Trend for soil is stable. The increased percentage of bare ground cover is most likely the result of soil covering some of the surface rock for rock-pavement cover has gone from 44% to 21%. Trend for browse is up slightly due to improved vigor and lower percent decadence for serviceberry and reduced heavy use and lower percent

decadence in mountain big sagebrush. Trend for the herbaceous understory is relatively stable for perennial grasses and up for forbs. Sum of nested frequency for perennial grasses is similar between years with a decline in frequency of bluebunch wheatgrass, but an increase in the nested frequency of muttongrass and Sandberg bluegrass. Sum of nested frequency of perennial forbs increased markedly due to a significant increase in the nested frequency of sego lily (6 to 101). Overall trend for the herbaceous understory is considered up slightly.

TREND ASSESSMENT

soil - stable

browse - up slightly

herbaceous understory - up slightly

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 2

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	295	270	99	92	7.18
G	Bromus tectorum (a)	-	57	-	21	.46
G	Poa fendleriana	164	177	58	68	3.37
G	Poa secunda	140	*192	52	71	3.75
G	Sitanion hystrix	-	3	-	1	.00
G	Stipa comata	49	*29	24	12	.16
Total for Grasses		648	728	233	265	14.94
F	Agoseris glauca	-	*49	-	24	.15
F	Alyssum alyssoides (a)	-	29	-	11	.05
F	Allium spp.	-	3	-	2	.01
F	Antennaria rosea	20	*55	8	23	.70
F	Arabis spp.	51	*6	25	3	.01
F	Artemisia ludoviciana	3	3	1	1	.15
F	Astragalus beckwithii	58	60	30	34	1.51
F	Astragalus utahensis	-	*21	-	13	.51
F	Balsamorhiza sagittata	5	10	2	4	.36
F	Castilleja chromosa	31	*8	14	5	.02
F	Calochortus nuttallii	6	*101	4	46	.22
F	Chaenactis douglasii	2	-	1	-	-
F	Cirsium spp.	1	5	1	3	.33
F	Collomia linearis (a)	-	46	-	21	.10
F	Collinsia parviflora (a)	-	36	-	15	.27
F	Crepis acuminata	20	24	12	10	.05

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Cryptantha spp.	47	*22	19	10	.22
F	Cymopterus longipes	67	*117	35	51	.75
F	Epilobium paniculatum (a)	-	1	-	1	.00
F	Eriogonum racemosum	64	*31	29	15	.23
F	Eriogonum umbellatum	29	18	16	12	.09
F	Lappula occidentalis (a)	-	5	-	2	.01
F	Linum lewisii	1	3	1	2	.01
F	Lithospermum ruderales	8	17	5	7	.42
F	Lupinus argenteus	40	47	24	23	2.43
F	Microsteris gracilis (a)	-	12	-	5	.02
F	Phlox longifolia	24	12	11	7	.03
F	Ranunculus testiculatus (a)	-	8	-	5	.02
F	Sphaeralcea coccinea	13	9	6	3	.01
F	Taraxacum officinale	3	-	2	-	-
F	Tragopogon dubius	-	*20	-	8	.04
Total for Forbs		493	778	246	366	8.81

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

BROWSE TRENDS --

Herd unit 16B , Study no: 2

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	18	.63
B	Artemisia tridentata vaseyana	76	9.75
B	Chrysothamnus viscidiflorus viscidiflorus	41	2.69
B	Gutierrezia sarothrae	19	.07
B	Mahonia repens	3	.06
B	Opuntia spp.	15	.25
B	Purshia tridentata	0	.00
B	Rosa woodsii	1	-
B	Symphoricarpos oreophilus	4	-
B	Tetradymia canescens	25	.52
Total for Browse		202	13.99

BASIC COVER --

Herd unit 16B , Study no: 2

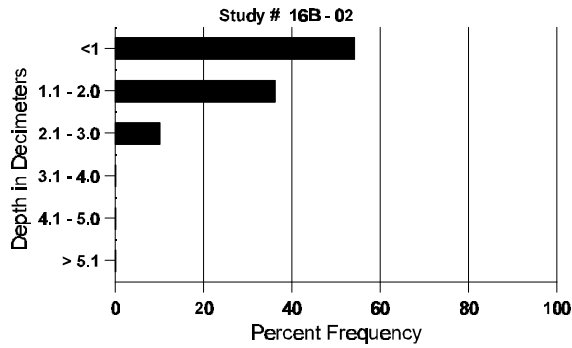
Cover Type	Nested Frequency '97	Average Cover % '89 '97	
Vegetation	362	13.50	35.95
Rock	275	12.00	9.81
Pavement	323	31.75	10.85
Litter	394	35.75	33.23
Cryptogams	61	.50	.40
Bare Ground	306	6.50	17.84

SOIL ANALYSIS DATA --

Herd Unit 16B, Study no: 02

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.5	50.4 (14.0)	6.9	54.7	19.7	25.6	2.8	13.6	294.4	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16B , Study no: 2

Type	Quadrat Frequency '97
Rabbit	3
Elk	29
Deer	41

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 2

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total		
		1	2	3	4					
Amelanchier alnifolia										
Y	89	3	-	-	-	-	-	-	3	3
	97	5	1	-	2	-	-	-	8	8
M	89	-	-	-	-	-	-	-	0	0
	97	6	1	7	1	-	-	-	15	15
D	89	1	3	3	-	-	-	-	466	7
	97	1	-	1	1	-	-	-	60	3
X	89	-	-	-	-	-	-	-	0	0
	97	-	-	-	-	-	-	-	40	2
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>		
'89		30%		30%		50%		-22%		
'97		08%		31%		04%				
Total Plants/Acre (excluding Dead & Seedlings)						'89	666	Dec:	70%	
						'97	520		12%	

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	3	1	-	-	-	-	-	-	-	4	-	-	-	80		4	
M	89	6	8	5	-	-	-	-	-	-	17	2	-	-	1266	15 16	19	
	97	14	36	15	-	-	-	-	-	-	65	-	-	-	1300	26 33	65	
D	89	10	24	15	-	-	-	-	-	-	45	-	-	4	3266		49	
	97	20	22	-	-	-	-	-	-	-	33	-	-	9	840		42	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	580		29	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		46%			29%			06%			-52%							
'97		53%			14%			08%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	4665	Dec:	70%				
											'97	2220		38%				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	89	1	1	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	7 4	1	
	97	68	-	-	-	-	-	-	-	-	68	-	-	-	1360	9 13	68	
D	89	2	1	-	-	-	-	-	-	-	1	-	1	1	200		3	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		33%			00%			33%			+72%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	399	Dec:	50%				
											'97	1420		1%				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<i>Gutierrezia sarothrae</i>																		
M	89	10	-	-	-	-	-	-	-	-	10	-	-	-	666	10	6	10
	97	25	-	-	-	-	-	-	-	-	25	-	-	-	500	6	6	25
D	89	1	-	-	-	-	-	-	-	-	-	-	-	1	66			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			09%			-32%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	732	Dec:	9%			
												'97	500		0%			
<i>Mahonia repens</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	25	-	-	-	-	-	-	-	-	25	-	-	-	500	4	4	25
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	520		-			
<i>Opuntia spp.</i>																		
S	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	5	-	-	-	-	-	-	-	-	5	-	-	-	333	4	7	5
	97	17	-	-	-	-	-	-	-	-	17	-	-	-	340	4	8	17
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 5%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	399	Dec:	0%			
												'97	380		5%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Purshia tridentata</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
<i>Rosa woodsii</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	20	8	7	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
<i>Symphoricarpos oreophilus</i>																		
Y	89	-	1	-	-	-	-	-	-	-	-	-	-	66			1	
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	2	1	-	-	-	-	-	-	-	-	-	-	60	3	8	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			100%			+18%							
'97		25%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-			
												'97	80		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
Tetradymia canescens																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	6	4	1
	97	29	-	-	-	-	-	-	-	-	29	-	-	-	580	9	16	29
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+82%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	132	Dec:	0%				
											'97	740		11%				

Trend Study 16B-3-97

Study site name: Rocky Hollow .

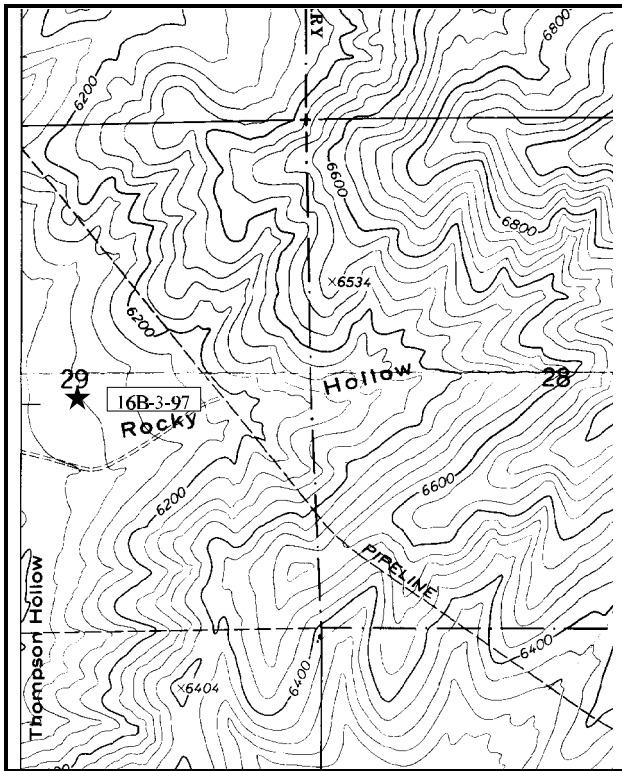
Range Type: Big sagebrush/grass

Compass bearing: frequency baseline 180M degrees. (Lines 2-4 260°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

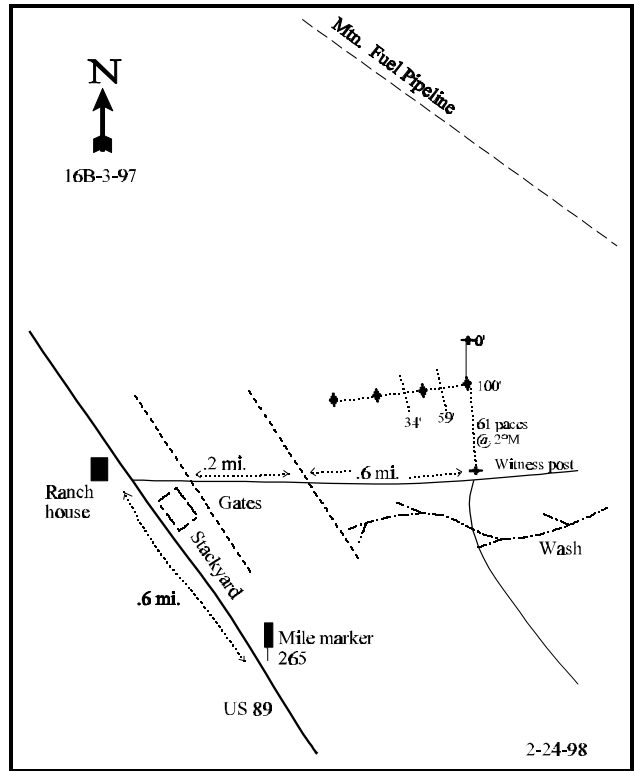
LOCATION DESCRIPTION

Go north from Fairview on U.S. 89 for approximately 15 miles to a ranch house and stackyard (0.6 miles north of mile marker 265). Turn right, go through a DWR gate into Lassen Draw property. Go 0.2 miles to another gate/fence. Continue up road another 0.6 miles to a green and red witness post on the left (i.e.~ north) just 3 paces off the road. From the witness post, walk 61 paces at 2 degrees M to the 100-foot baseline stake.



Map Name: Indianola .

Township 11S, Range 4E, Section 29



Diagrammatic Sketch

UTM 4409059.346 N, 457466.774 E

DISCUSSION

Trend Study No. 16B-3 (28-3)

The Rocky Hollow study samples the sagebrush type in the swales at the base of the foothills. It is on Division property and samples the same area as an old line-intercept transect. Deer and elk use is relatively heavy in the winter with evidence of trespass cattle in the summer of 1989. Pellet group data from 1997 shows a moderately high quadrat frequency for deer at 38% and a markedly lower frequency of 19% for elk. Some cattle sign was also encountered, yet no cattle were seen on the site. Cows were present across the fence to the west. The elevation of the site is 6,050 feet with a gentle 5% slope and western aspect. The soil is moderately deep with an effective rooting depth (see methods) of almost 16 inches. Soil texture is a sandy clay loam with a slightly acid pH (6.1). There are some large rocks on, or just below the soil surface. The amount of rock on the surface and throughout the soil profile increases as one goes down the slope.

The key browse species consists of a moderately dense stand of mountain big sagebrush (*Artemisia tridentata vaseyana*). It appears to be hybridizing with basin big sagebrush (*A. tridentata tridentata*). Density was estimated at 2,599 plants/acre in 1989. Utilization was light to moderate with normal vigor on most plants. Percent decadence was relatively high at 38% and recruitment poor with no seedlings encountered and only 3% of the population being young plants. With the much larger sample used in 1997, estimated sagebrush density is 1,700 plants/acre. More than half of the sagebrush are mature (62%), while the percentage for decadent plants was 29%. Seedlings and young are present in small numbers. Dead plants, first counted in 1997, number 660 plants/acre. Utilization is still light to moderate and vigor is normal on all but 36% of the decadent shrubs. It was reported that some of the decadency and reduced vigor could have been caused by snow mold.

Small numbers of serviceberry and bitterbrush offer additional forage. All of the serviceberry sampled and many of the bitterbrush observed on site were classified as heavily hedged. The most numerous shrub on the site consists of stickyleaf low rabbitbrush which currently numbers just over 2,000 plants/acre. Age class distribution indicates a stable population with mostly mature plants (96%). Prickly pear cactus is also relatively abundant providing 10% of the browse cover.

The herbaceous understory is dominated by annual grasses and forbs. Cheatgrass currently accounts for 60% of the grass cover. Perennial grasses and forbs are found almost exclusively under the protection of shrub canopies. Bluebunch wheatgrass, Sandberg bluegrass, and bottlebrush squirreltail are the most common perennial species.

1989 APPARENT TREND ASSESSMENT

The condition of this site is rather poor. The preferred species, both forbs and browse, are depleted and increasers are common. The sagebrush, not the most preferred palatable subspecies, is classified as stable. Overall vegetative trend is down on the untreated areas. There is a declining soil trend.

1997 TREND ASSESSMENT

The soil trend appears stable with similar amounts of protective ground cover as reported in 1989. Trend for mountain big sagebrush appears stable due to improved reproduction and a slightly reduced percent decadency. Dead plants are common, suggesting that the decline in density can mostly be explained by the number of dead plants. The increaser, sticky leaf low rabbitbrush, also appears stable. Trend for the herbaceous understory is up slightly. Sum of nested frequency for perennial grasses has increased slightly, while frequency of perennial forbs has more than doubled since 1989.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - up slightly

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 3

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron smithii	-	2	-	1	.03
G	Agropyron spicatum	80	63	32	28	3.84
G	Bromus tectorum (a)	-	328	-	98	13.18
G	Oryzopsis hymenoides	15	*3	7	1	.38
G	Poa secunda	43	*104	20	38	3.18
G	Sitanion hystrix	23	39	12	21	.89
G	Stipa comata	-	*9	-	5	.46
Total for Grasses		161	548	71	192	21.98
F	Agoseris glauca	-	*15	-	8	.26
F	Alyssum alyssoides (a)	-	170	-	62	.71
F	Allium spp.	13	*61	8	27	.20
F	Antennaria rosea	-	3	-	1	.00
F	Astragalus beckwithii	-	*21	-	13	.58
F	Astragalus utahensis	-	*22	-	11	.79
F	Castilleja linariaefolia	-	*17	-	8	.21
F	Camelina microcarpa (a)	-	2	-	1	.00
F	Cirsium spp.	-	3	-	1	.03
F	Collomia linearis (a)	-	46	-	22	.11
F	Comandra pallida	3	-	1	-	-
F	Collinsia parviflora (a)	-	313	-	95	3.76
F	Crepis acuminata	4	1	3	1	.00
F	Cymopterus longipes	21	*42	13	17	.08
F	Erigeron pumilus	2	-	1	-	-
F	Eriogonum racemosum	3	-	1	-	-
F	Lithospermum ruderale	3	*15	3	6	.49
F	Lupinus argenteus	6	6	4	4	.40
F	Machaeranthera canescens	4	-	1	-	-

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Microsteris gracilis (a)	-	6	-	3	.01
F	Phlox longifolia	1	7	1	3	.01
F	Polygonum douglasii (a)	-	14	-	7	.18
F	Ranunculus testiculatus (a)	-	72	-	29	.54
F	Sphaeralcea coccinea	51	61	22	22	1.23
F	Tragopogon dubius	-	5	-	4	.04
F	Vicia americana	54	*137	25	51	3.19
Total for Forbs		165	1039	83	396	12.87

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

BROWSE TRENDS --

Herd unit 16B , Study no: 3

T y p e	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	2	.03
B	Artemisia tridentata vaseyana	61	11.59
B	Chrysothamnus viscidiflorus viscidiflorus	54	3.90
B	Opuntia spp.	56	1.75
Total for Browse		173	17.27

BASIC COVER --

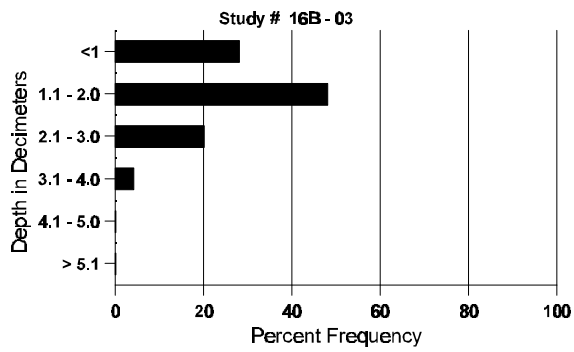
Herd unit 16B , Study no: 3

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	382	10.00	46.29
Rock	151	10.75	7.54
Pavement	64	6.00	.98
Litter	380	53.25	37.26
Cryptogams	185	1.75	3.27
Bare Ground	241	18.25	16.51

SOIL ANALYSIS DATA --
 Herd Unit 16B, Study no: 03

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.5	50.4 (15.7)	6.1	54.7	24.7	20.6	1.5	22.8	316.8	.4

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16B , Study no: 3

Type	Quadrat Frequency '97
Rabbit	5
Elk	19
Deer	38
Cattle	2

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 3

AGE	YGR	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.	
<i>Amelanchier alnifolia</i>																		
S	89	-	-	-	-	-	-	1	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	1	-	-	1	-	-	66		1		
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
M	89	-	-	2	-	-	-	-	-	-	1	-	1	133	29	29	2	
	97	-	-	1	-	-	1	-	-	2	-	-	-	40	32	41	2	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	20		1		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			67%			33%			-80%							
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	199	Dec:	-			
												'97	40		-			
<i>Artemisia tridentata vaseyana</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	2	-	-	-	-	-	-	-	2	-	-	-	40		2		
Y	89	1	-	-	-	-	-	-	-	1	-	-	-	66		1		
	97	5	1	-	1	-	-	-	-	7	-	-	-	140		7		
M	89	13	10	-	-	-	-	-	-	21	1	1	-	1533	32	31	23	
	97	30	23	-	-	-	-	-	-	53	-	-	-	1060	35	51	53	
D	89	7	8	-	-	-	-	-	-	14	-	-	1	1000		15		
	97	12	13	-	-	-	-	-	-	16	-	-	9	500		25		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	660		33		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		46%			00%			05%			-35%							
'97		44%			00%			11%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	2599	Dec:	38%			
												'97	1700		29%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	36	-	-	1	-	-	-	-	-	31	-	6	-	2466	13 13	37	
	97	98	-	-	-	-	-	-	-	-	97	-	-	1	1960	12 17	98	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	1	-	-	1	40		2	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			15%			-23%							
'97		00%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2666	Dec:	0%				
											'97	2040		2%				
<i>Opuntia spp.</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266		4	
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
M	89	14	-	-	-	-	-	-	-	-	11	-	3	-	933	6 16	14	
	97	111	-	-	4	-	-	-	-	-	115	-	-	-	2300	11 17	115	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	3	-	-	1	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			17%			+50%							
'97		00%			00%			.83%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1199	Dec:	0%				
											'97	2400		3%				
<i>Purshia tridentata</i>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	0		-				

Trend Study 16B-4-97

Study site name: Dry Creek Chaining .

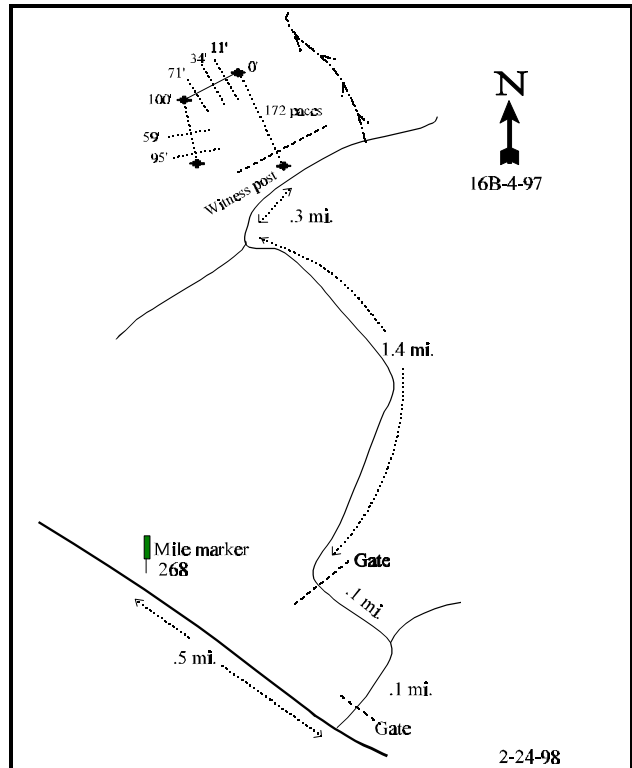
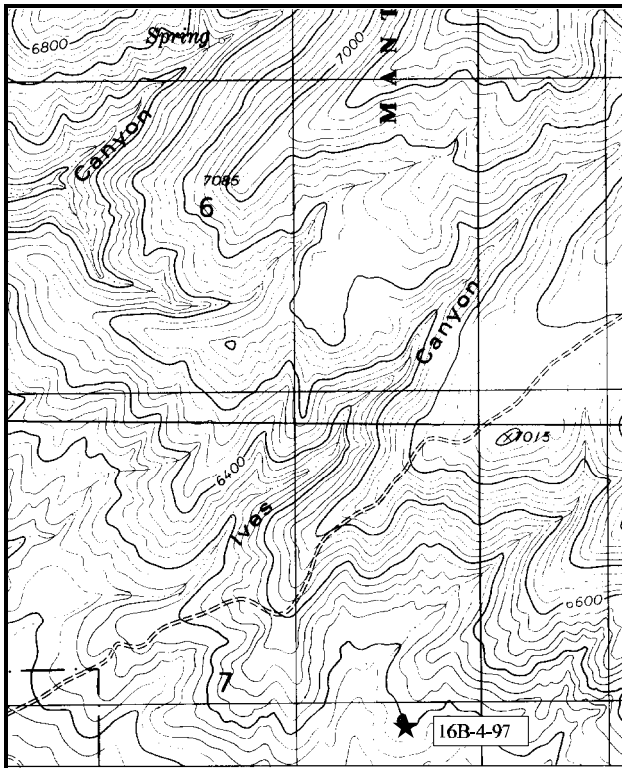
Range type: Chained Cabled Reseeded P.J.

Compass bearing: frequency baseline 229M degrees. (Line 2 162°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11, 34 & 71ft), line 2 (59 & 95ft).

LOCATION DESCRIPTION

From mile marker 268 on U.S. 89 go 0.5 miles to a gate on the left. Go through this gate (east) 0.1 miles to a fork. Stay left and go 0.1 miles through another gate and veer right. Go 1.4 miles to a fork and turn right. Go 0.3 miles to a witness post at a gully on the left. From this post walk 172 paces north going over a fence about 100 feet from the road to the 0-foot baseline stake.



Map Name: Spencer Canyon .

Diagrammatic Sketch

Township 11S , Range 4E , Section 7

UTM 4413970.446 N , 456328.772 E

DISCUSSION

Trend Study No. 16B-4 (28-4)

The Dry Creek Chaining study was established in 1989 on an old chaining on Forest Service property near the site of a 1978 line-intercept transect. The area has an overstory of pinyon, juniper, and Gambel oak. Sign of big game use is moderately low, but more abundant for rabbits. There is not much livestock use.

The site is on a 20% slope with a generally southwest aspect and an elevation of 6,700 feet. Drainage is southerly towards the wash in Dry Canyon and takes the form of an active gully. The soil is shallow and rocky with an effective rooting depth (see methods) of just over 11 inches. Texture is a clay loam with a neutral pH (7.3). Phosphorus could be limiting to plant development on this site (9.2 ppm, where 10 ppm is thought to be limiting for a site development). Percent organic matter is relatively high at 3.2%. Pavement and rock cover are significant, accounting for 22% of the ground cover. There is evidence of sheet erosion and sedimentation buildup in nearby gullies. Litter cover is good but discontinuous. Percent bare soil is currently at 15%.

In the openings, grass dominates and provides good soil protection. Bare areas tend to be found in the more dense browse stands. Juniper and pinyon have been released and/or reestablished on the site. The point-centered quarter method in 1989 estimated 99 juniper/acre and 87 pinyon/acre for a total of 186 trees/acre. Most of these trees were in the 4-8 foot tall class. Data from 1997 estimate 65 pinyon/acre and 96 juniper/acre for a total of 161 trees/acre. Average diameter of pinyon is approximately 6.5 inches while juniper averages 3.7 inches. There is a stand of large, unchained trees directly above on the ridge.

The important browse species are true mountain mahogany, bitterbrush, and Gambel oak. The oak had a density of 4,299 plants/acre in 1989, mostly classified as young. Oak forage was mostly unavailable on 34% of the trees and the remainder were only lightly used, if at all. During the 1997 reading, the larger, more representative sample estimated only 600 oak plants/acre. The latter sample represents the area better. The more preferred mountain mahogany, bitterbrush, and a few snowberry show signs of hedging. Currently, mountain mahogany accounts for 30% of the browse cover with a density of 360 plants/acre. Use is light to moderate. Snakeweed and pricklypear cactus are common along the more open baseline, although they were not encountered in the old density plots in 1989. Currently, snakeweed numbers 2,060 plants/acre with mostly mature plants.

Perennial grasses are diverse but only produce 8% cover. The most common species is intermediate wheatgrass which accounts for the majority of the grass cover (54%). Annual cheatgrass is also fairly abundant and produces an additional 20% of the grass cover. All other grass species produce less than one-half of one percent cover. Forbs species are diverse, yet far less prevalent, with rock goldenrod producing 68% of the forb cover.

1989 APPARENT TREND ASSESSMENT

The soil has some downward trend indicators, but could improve with increased vegetative cover. Grasses are vigorous. The available browse forage is only lightly utilized. There is evidence that less desirable species are increasing indicating a slight downward trend making this area a candidate for re-treatment.

1997 TREND ASSESSMENT

Trend for soil is slightly down. Percent bare ground increased from 11% to 15%, while litter cover declined from 58% to 41%. Nested frequency of perennial grasses also declined. Density estimates of many of the browse species have changed due to the much larger sample size used in 1997 giving greatly improved estimates

for browse species that characteristically have distributions that are clumped or discontinuous. Trend for the key species appears stable with light use and low percent decadency. The increasing dominance of pinyon and juniper trees will eventually cause a decline in the understory shrub component. Trend for the herbaceous understory is down due to a 30% decline in the sum of nested frequency of perennial grasses. Frequency of perennial forbs increased slightly.

TREND ASSESSMENT

soil - down slightly

browse - stable

herbaceous understory - down

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 4

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	50	51	20	22	.43
G	Agropyron intermedium	171	*121	57	42	4.38
G	Agropyron spicatum	45	21	18	10	.44
G	Bromus inermis	71	*21	31	11	.47
G	Bromus tectorum (a)	-	121	-	40	1.60
G	Carex spp.	19	*3	8	1	.15
G	Oryzopsis hymenoides	19	17	8	8	.23
G	Poa fendleriana	11	-	6	-	-
G	Poa secunda	6	*45	4	22	.34
G	Sitanion hystrix	11	4	5	2	.03
Total for Grasses		403	404	157	158	8.09
F	Alyssum alyssoides (a)	-	25	-	12	.06
F	Balsamorhiza sagittata	2	3	1	2	.24
F	Camelina microcarpa (a)	-	6	-	3	.04
F	Calochortus nuttallii	-	6	-	3	.01
F	Chaenactis douglasii	-	3	-	1	.00
F	Cirsium spp.	12	13	6	7	.18
F	Cryptantha spp.	6	*17	3	10	.10
F	Cymopterus longipes	-	-	-	-	.00
F	Descurainia pinnata (a)	-	13	-	6	.03
F	Draba spp. (a)	-	42	-	16	.08
F	Epilobium paniculatum (a)	-	1	-	1	.00
F	Erodium cicutarium (a)	-	2	-	1	.00

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Eriogonum umbellatum	1	-	1	-	-
F	Gayophytum ramosissimum (a)	-	15	-	6	.03
F	Holosteum umbellatum (a)	-	2	-	1	.00
F	Lappula occidentalis (a)	-	9	-	5	.02
F	Lactuca serriola	3	-	1	-	-
F	Medicago sativa	3	-	1	-	-
F	Microsteris gracilis (a)	-	5	-	2	.01
F	Penstemon humilis	7	6	3	3	.18
F	Petroradia pumila	43	55	17	22	2.95
F	Phlox longifolia	5	16	2	6	.22
F	Polygonum douglasii (a)	-	3	-	1	.00
F	Ranunculus testiculatus (a)	-	20	-	9	.04
F	Streptanthus cordatus	1	-	1	-	-
F	Unknown forb-annual	-	44	-	18	.09
Total for Forbs		83	306	36	135	4.34

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

BROWSE TRENDS --

Herd unit 16B , Study no: 4

T y p e	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	1	-
B	Cercocarpus montanus	17	5.50
B	Gutierrezia sarothrae	32	.98
B	Juniperus osteosperma	6	3.23
B	Opuntia spp.	6	.18
B	Pinus edulis	3	3.64
B	Purshia tridentata	11	1.85
B	Quercus gambelii	10	2.11
B	Symphoricarpos oreophilus	5	.62
Total for Browse		91	18.13

BASIC COVER --

Herd unit 16B , Study no: 4

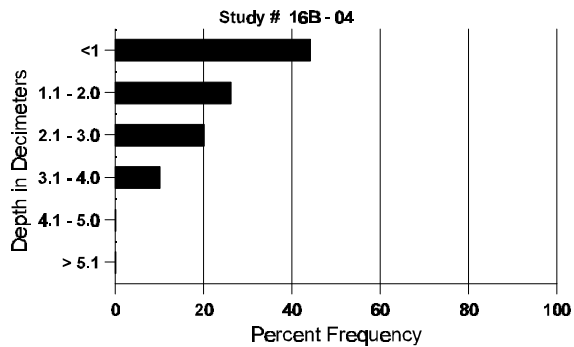
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	283	6.75	28.67
Rock	245	12.50	14.30
Pavement	244	10.25	7.50
Litter	385	57.50	41.10
Cryptogams	117	2.25	4.38
Bare Ground	244	10.75	14.62

SOIL ANALYSIS DATA --

Herd Unit 16B, Study no: 04

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
11.1	53.0 (15.6)	7.3	34.7	30.7	34.6	3.2	9.2	80.0	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16B , Study no: 4

Type	Quadrat Frequency '97
Rabbit	20
Elk	13
Deer	9

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 4

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
M	89	-	-	-	-	-	-	1	-	-	1	-	-	-	33	68	23	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	0		-			
<i>Artemisia tridentata vaseyana</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	8	9	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
<i>Cercocarpus montanus</i>																		
Y	89	-	-	-	-	-	-	2	-	-	2	-	-	-	66			2
	97	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	89	4	2	-	1	-	-	2	-	-	9	-	-	-	300	54	40	9
	97	7	3	-	6	-	-	-	-	-	16	-	-	-	320	47	49	16
D	89	2	2	-	1	1	-	2	-	-	6	-	-	2	266			8
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		26%			00%			11%			-43%							
'97		17%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	632	Dec:	42%			
												'97	360		0%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
Chrysothamnus nauseosus albicaulis																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	13	16	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
Chrysothamnus viscidiflorus viscidiflorus																		
D	89	1	-	-	-	-	-	-	-	-	-	-	-	1	33			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			100%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	100%			
												'97	0		0%			
Gutierrezia sarothrae																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	92	-	-	-	-	-	-	-	-	92	-	-	-	1840	9	10	92
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			02%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	2060		2%			

AGE	Y	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.	
<i>Juniperus osteosperma</i>																		
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	2	-	-	-	-	-	2	-	-	-	66	96	47	
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120	72	61	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 9%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	132	Dec:	-				
											'97	120		-				
<i>Opuntia spp.</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140	5	10	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	-	-	2	40				
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			22%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	180		22%				
<i>Pinus edulis</i>																		
Y	89	-	-	-	1	-	-	1	-	-	2	-	-	-	66		2	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 9%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	60		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	-	-	-	4	80		4	
M	89	1	-	-	-	-	-	-	-	-	-	-	-	1	33	19 43	1	
	97	3	6	5	-	-	-	-	-	-	-	-	-	14	280	19 39	14	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+91%							
'97		33%			28%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	360		-			
Quercus gambelii																		
S	89	3	-	-	-	-	-	-	-	-	-	-	-	3			3	
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
Y	89	41	-	-	16	-	-	22	-	-	-	-	-	79	2633		79	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	1	-	-	20	-	-	19	-	-	-	-	-	40	1333	73 30	40	
	97	25	-	-	3	-	-	-	-	-	-	-	-	27	560	36 29	28	
D	89	4	1	-	2	-	-	3	-	-	-	-	-	9	333		10	
	97	2	-	-	-	-	-	-	-	-	-	-	-	2	40		2	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		.77%			00%			.77%			-86%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	4299	Dec:	8%			
												'97	600		7%			
Symphoricarpos oreophilus																		
Y	89	-	-	-	-	-	-	1	-	-	-	-	-	1	33		1	
	97	-	-	-	1	-	-	-	-	-	-	-	-	1	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	5	-	-	5	-	-	-	-	-	-	-	-	10	200	22 28	10	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+85%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	220		-			

Trend Study 16B-5-97

Study site name: Jackson Unit .

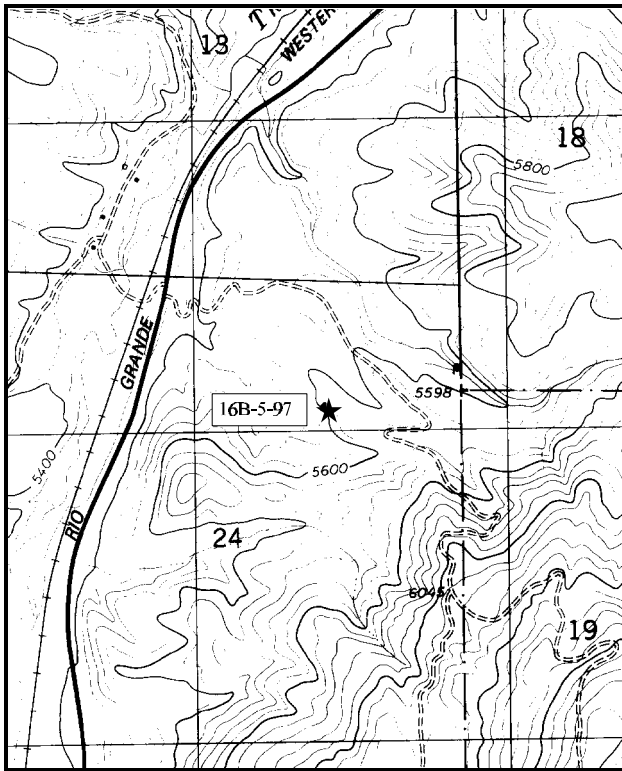
Range Type: Chained cabled reseeded P-J

Compass bearing: frequency baseline 181M degrees. (Lines 2-4 121°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 59ft), line 3 79ft), line 4 (34ft).

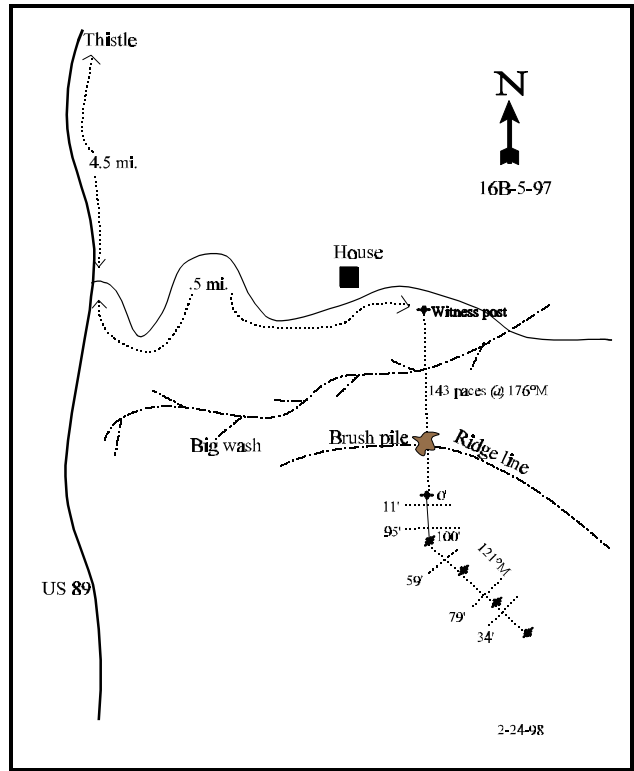
LOCATION DESCRIPTION

From thistle bridge proceed south on U.S. 89 for 4.5 miles. Here take a side-road east onto DWR reseeding for 0.5 miles. Stop at a line intercept, red steel fencepost just 10 feet south of the road. It is just north of the first 2 juniper trees encountered after entering the seeded area. One tree has been knocked over by the anchor chain, but is still rooted. From this post, walk 143 paces at 176°M degrees to the 0-foot baseline stake.



Map Name: Birdseye .

Township 10S , Range 3E , Section 24



Diagrammatic Sketch

UTM 4421086.359 N, 454417.549 E

DISCUSSION

Trend Study No. 16B-5 (28-5)

The 1972 Jackson unit chaining was previously sampled by a permanently marked line-intercept transect. This study, which is on Division property, was established in 1989. The study lies on a southwest facing 28% slope. It is the lowest elevation study in the unit at 5,600 feet. Grass is abundant, but juniper release and/or reestablishment is limiting to the sparse understory of browse. Elk appear to be using the area in moderately low numbers in winter and spring. Quadrat frequency of elk pellet groups is moderately high at 35%, with markedly less sign of deer with a quadrat frequency of 14%.

The soil is relatively deep with an effective rooting depth (see methods) of almost 15 inches. It is well-drained with a sandy clay loam texture and a neutral pH (7.2). Phosphorus is low at only 6.9 ppm and could be limiting to plant development (minimum necessary is 10 ppm). Natural vegetation on this soil type consists of juniper, pinyon pine, bitterbrush, big sagebrush, perennial grass, and rabbitbrush. The hazard of erosion is moderate. Gullies in the area appear to be stabilized with only slight soil movement. Grass cover is good. There was a high amount of bare soil in 1989 (24%) and a significant cover of rock fragments (25%). In 1997, percent bare soil is estimated at 16% with 17% cover for rock and pavement.

The study is on an open, grassy slope with scattered juniper, typical of the treated area. Juniper density was estimated using the point quarter method at 210 trees/acre, most in the 4 to 8 foot tall range. Average diameter is estimated at 6 inches. There are a few big sagebrush and small clumps of young Gambel oak. Use is light to moderate on the limited browse. Pricklypear cactus is common providing 16% of the browse cover.

Grasses are the prevalent vegetation on the slopes. The common species is a mix of seeded and native species including; crested wheatgrass, intermediate wheatgrass, needle-and-thread grass, and bluebunch wheatgrass. Grasses have increased and the prevalence of cheatgrass has decreased since 1978. The grasses receive some grazing pressure, as do the few palatable forbs which include seeded species such as Lewis flax and alfalfa. Vigor is good despite the duration of the drought. The grasses provide valuable vegetative and litter ground cover.

1989 APPARENT TREND ASSESSMENT

The soil trend is stable, with condition and ground cover characteristics undoubtedly improved over pretreatment conditions. Erosion is slight. The vegetative trend appears to be moving towards increasing juniper and oak, which is beneficial up to a point. Grasses remain in very good condition, therefore trends are currently assessed as improving.

1997 TREND ASSESSMENT

The soil trend is up slightly due to a decline in percent bare ground from 24% to 16%. Also, almost three-fourths of the vegetative cover is contributed by the herbaceous understory. Browse is limited on the site and provide little forage. Trend is considered slightly down due to a decline in sagebrush and a gradual increase in juniper tree dominance. Trend for the herbaceous understory is stable with similar nested frequency values for perennial grasses and forbs between years.

TREND ASSESSMENT

soil - up slightly

browse - down slightly

herbaceous understory - stable

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 5

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	136	133	53	54	3.98
G	Agropyron intermedium	91	97	37	33	1.54
G	Agropyron spicatum	41	57	17	21	2.84
G	Bromus inermis	4	-	1	-	-
G	Bromus tectorum (a)	-	103	-	40	.76
G	Elymus junceus	1	1	1	1	.00
G	Festuca spp. (a)	-	36	-	16	1.37
G	Oryzopsis hymenoides	48	44	27	21	.95
G	Poa secunda	2	11	1	5	.07
G	Sitanion hystrix	3	2	1	2	.06
G	Stipa comata	123	94	51	40	3.73
Total for Grasses		449	578	189	233	15.34
F	Agoseris glauca	-	2	-	1	.00
F	Alyssum alyssoides (a)	-	331	-	94	4.27
F	Allium spp.	1	3	1	1	.15
F	Astragalus spp.	1	4	1	2	.06
F	Astragalus utahensis	-	*9	-	7	.55
F	Camelina microcarpa (a)	-	2	-	1	.00
F	Cirsium spp.	1	1	1	1	.15
F	Descurainia pinnata (a)	-	1	-	1	.00
F	Eriogonum spp.	14	*-	7	-	-
F	Linum lewisii	11	10	7	5	.62
F	Medicago sativa	3	-	2	-	-
F	Oxytropis spp.	3	-	1	-	-
F	Phlox longifolia	-	5	-	3	.01
F	Streptanthus cordatus	10	4	5	2	.03
F	Tragopogon dubius	3	8	2	4	.07
F	Unknown forb-perennial	-	3	-	1	.00
F	Verbascum thapsus	-	1	-	1	.00
Total for Forbs		47	384	27	124	5.95

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

BROWSE TRENDS --

Herd unit 16B , Study no: 5

Type	Species	Strip	Average
		Frequency '97	Cover % '97
B	Artemisia tridentata tridentata	0	.15
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	-
B	Gutierrezia sarothrae	7	.03
B	Juniperus osteosperma	8	6.07
B	Opuntia spp.	41	1.19
B	Quercus gambelii	1	-
Total for Browse		59	7.45

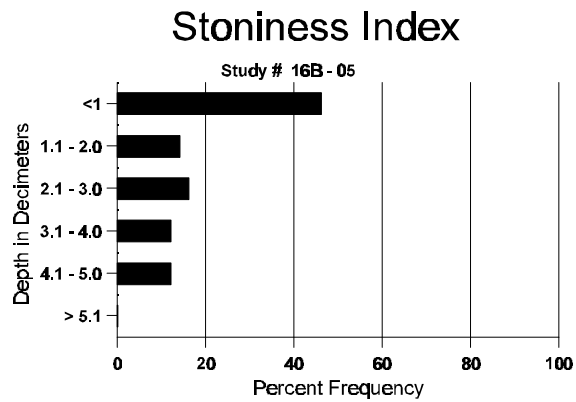
BASIC COVER --

Herd unit 16B , Study no: 5

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	364	0	31.12
Rock	259	0	8.57
Pavement	308	0	8.26
Litter	385	0	29.96
Cryptogams	182	0	4.13
Bare Ground	269	0	16.14

SOIL ANALYSIS DATA --
 Herd Unit 16B, Study no: 05

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.6	52.6 (21.7)	7.2	56.7	19.7	23.6	2.5	6.9	128.0	.6



PELLET GROUP FREQUENCY --
 Herd unit 16B , Study no: 5

Type	Quadrat Frequency '97
Rabbit	20
Elk	36
Deer	14

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 5

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata tridentata</i>																		
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	29	21	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	62	65	0
D	89	2	-	-	-	-	-	-	-	2	-	-	-	66			2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	20			1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		33%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	99	Dec:	67%			
												'97	0		0%			
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20	31	37	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	1	-	-	-	-	-	-	-	1	-	-	-	20	15	15	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	8	-	-	-	-	-	-	-	-	8	-	-	-	160	10	8
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	220		-		
Juniperus osteosperma																	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	102	55
	97	5	-	-	-	-	-	3	-	-	8	-	-	-	160	-	8
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+63%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-		
												'97	180		-		
Opuntia spp.																	
Y	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133		4
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
M	89	21	-	-	-	-	-	-	-	-	21	-	-	-	700	5	5
	97	84	-	-	-	-	-	-	-	-	84	-	-	-	1680	6	84
D	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	8	-	-	-	-	-	-	-	-	-	-	-	8	160		8
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	140		7
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+53%						
'97		00%			00%			09%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	866	Dec:	4%		
												'97	1860		9%		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	5	6	1	-	-	-	-	-	-	12	-	-	-	400		12	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40	19	24	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		50%			08%			00%			-90%							
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	400	Dec:	-				
											'97	40		-				

Trend Study 16B-6-97

Study site name: Mill Fork .

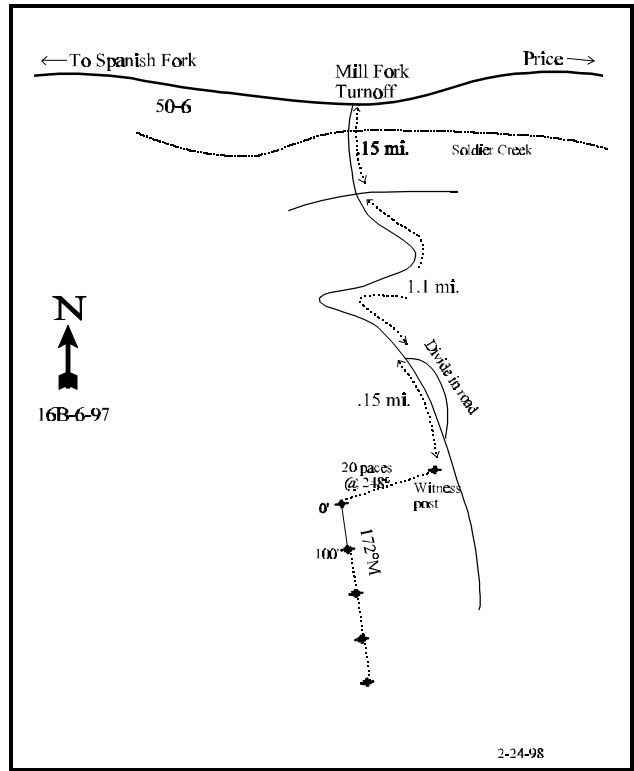
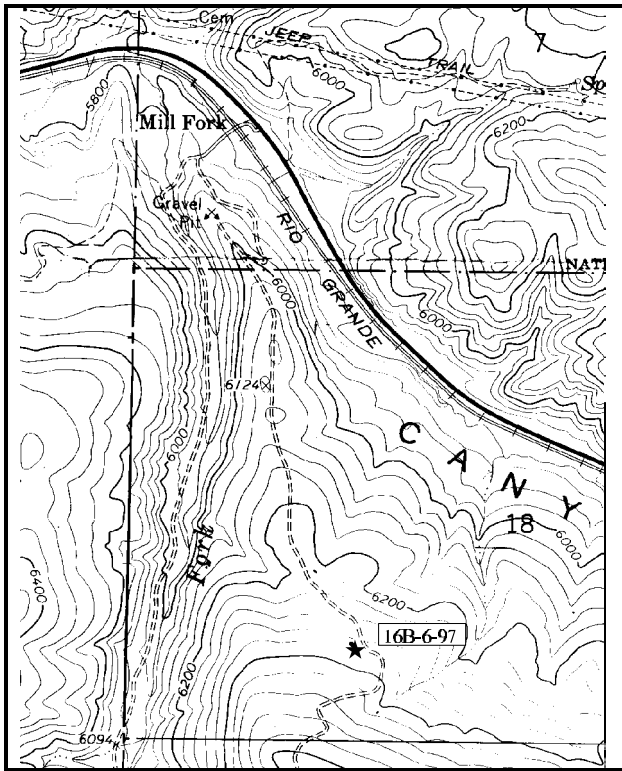
Range Type: Big sagebrush

Compass bearing: frequency baseline 172M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the sheep creek cafe and sheep creek turnoff on highway 6/50 travel east on Highway 6/50 (toward Price) for 1.9 miles to the Mill Fork turnoff on the south side of the highway. Take this road 0.15 miles to a fork. Stay left (east) and go up the hill 1.1 miles to a division in the road. Here the dense pinyon/juniper forest opens up into a sagebrush stand. Proceed another 0.15 miles to a witness post on the west side of the road. From the witness post the 0-foot baseline stake is 20 paces away at 248 degrees magnetic. It is marked by browse tag #9091.



Map Name: Mill Fork .

Diagrammatic Sketch

Township 105, Range 6E, Section 18

DISCUSSION

Trend Study No. 16B-6 (28-6)

The Division's Mill Fork property is considered an important winter range for deer and elk. The area supports a depleted sagebrush range. Elevation at the site is 6,300 feet with a 16% slope and a north-northwest aspect. This same sagebrush community was originally sampled by a line-intercept transect in 1978. The 1978 report identified the sagebrush as basin big sagebrush (*Artemisia tridentata tridentata*), but in 1989 it was identified as mountain big sagebrush (*Artemisia tridentata vaseyana*). It is a relatively dense, old stand with low production, high percent decadence (77%), and 55% of the decadent plants were further classified as dying.

The soil on the slope has an effective rooting depth (see methods) of just under 14 inches. Soil texture is a clay with a neutral pH (7.3). Erosion is an increasingly negative factor to the site. There is little soil protection from the limited understory and the shrub interspaces are barren. Currently, bare soil accounts for 27% of the ground cover.

The site is dominated by mountain big sagebrush which currently has an average cover of nearly 30%. Population density was estimated at 5,133 plants/acre in 1989. Sagebrush cover that year averaged 31%, comparable to the 1978 estimate of 28% cover. Seventy-seven percent were classified as decadent, many with poor vigor. Hedging was generally moderate. The much larger sample used in 1997 estimated 3,920 sagebrush plants/acre. It appears that many of the decadent sagebrush counted in 1989 have regained their vigor and are now more healthy. Percent decadency has declined from 77% to only 19%. Utilization is moderate. Seedling and young plants are rare.

The site supports a variety of other browse. Stickyleaf low rabbitbrush is the most numerous with an estimated density of 3,580 plants/acre. Serviceberry and snowberry are also present, providing some additional forage. Juniper, sampled as only 2 seedlings on the shrub density plots in 1989, numbered 96 trees/acre using the point-centered quarter method. Quarter method data from 1997 estimate 64 juniper trees/acre with an average diameter of 4 inches.

Diversity of the herbaceous component is fair, suggesting a higher site potential, but abundance is very low. Five perennial grass species were encountered producing less than 1% cover. There is a moderate density of forbs, with none considered as being important. The most common species are longleaf phlox and low penstemon. The total herbaceous cover is only about 5%, this would mean that it only makes up 12% of the total vegetative cover.

1989 APPARENT TREND ASSESSMENT

The vegetative trend is down due to the depleted understory, an overly decadent and unproductive sagebrush stand, and increasing juniper dominance. Conditions are further impacted by the accelerating downward soil trend with substantial erosion.

1997 TREND ASSESSMENT

The soil trend for this site is stable with similar ground cover characteristics compared to 1989. However, conditions are poor with little herbaceous ground cover and gradual erosion. The browse trend is up for the key species, mountain big sagebrush. This is due to a decline in percent decadency from 77% to 19% between 1989 and 1997. Average vigor has improved but recruitment is still poor. Density of broom snakeweed declined by 89% since 1989, but stickyleaf low rabbitbrush density increased by 37%. Trend for the herbaceous understory

is stable but depleted. Perennial grasses are nearly nonexistent.

TREND ASSESSMENT

soil - stable, but poor

browse - up for mountain big sagebrush

herbaceous understory - stable, but very depleted

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 6

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	-	*22	-	10	.91
G	Oryzopsis hymenoides	2	1	1	1	.00
G	Poa fendleriana	4	-	4	-	-
G	Sitanion hystrix	2	4	1	2	.03
G	Stipa lettermani	-	3	-	1	.03
Total for Grasses		8	30	6	14	0.99
F	Achillea millefolium	-	4	-	1	.03
F	Astragalus beckwithii	-	*7	-	5	.10
F	Aster chilensis	34	28	14	10	.51
F	Astragalus convallarius	43	*21	23	11	.18
F	Astragalus utahensis	2	4	1	4	.10
F	Calochortus nuttallii	1	*35	1	21	.10
F	Castilleja spp.	-	2	-	2	.03
F	Chaenactis douglasii	17	28	10	12	.26
F	Cirsium spp.	2	5	1	2	.01
F	Collinsia parviflora (a)	-	1	-	1	.00
F	Cymopterus spp.	-	14	-	8	.04
F	Eriogonum brevicaulle	1	1	1	1	.03
F	Machaeranthera canescens	24	13	12	7	.03
F	Penstemon humilis	41	40	17	19	1.59
F	Phlox longifolia	159	*106	60	41	.57
F	Polygonum douglasii (a)	-	3	-	1	.00
F	Taraxacum officinale	3	2	1	1	.00
F	Verbascum thapsus	3	7	1	3	.04
F	Vicia americana	4	4	3	2	.03
F	Viola spp.	-	4	-	2	.03

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
Total for Forbs		334	329	145	154	3.74

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

BROWSE TRENDS --

Herd unit 16B , Study no: 6

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	7	.36
B	Artemisia tridentata vaseyana	89	29.47
B	Chrysothamnus depressus	3	.18
B	Chrysothamnus nauseosus nauseosus	2	.00
B	Chrysothamnus viscidiflorus viscidiflorus	44	1.15
B	Gutierrezia sarothrae	6	.15
B	Juniperus osteosperma	6	2.67
B	Opuntia spp.	1	.00
B	Symphoricarpos oreophilus	13	.68
B	Tetradymia canescens	7	.06
Total for Browse		178	34.75

BASIC COVER --

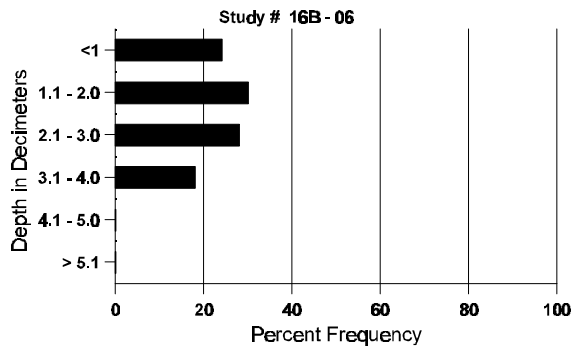
Herd unit 16B , Study no: 6

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	253	6.50	35.90
Rock	130	2.50	4.87
Pavement	243	15.25	6.28
Litter	390	47.25	42.78
Cryptogams	82	2.00	2.34
Bare Ground	272	26.50	27.07

SOIL ANALYSIS DATA --
 Herd Unit 16B, Study no: 06

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.9	42.8 (15.0)	7.3	20.7	22.7	56.6	2.8	12.3	83.2	.5

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16B , Study no: 6

Type	Quadrat Frequency '97
Rabbit	2
Elk	11
Deer	26

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 6

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4				
<i>Amelanchier alnifolia</i>									
Y	89	-	-	2	-	-	-	-	2
	97	-	-	-	-	-	-	-	0
M	89	-	-	-	-	-	-	-	0
	97	30	1	-	-	-	-	-	620
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
'89		00%		100%		00%		+79%	
'97		03%		00%		00%			
Total Plants/Acre (excluding Dead & Seedlings)						'89	133	Dec:	-
						'97	620		-
<i>Artemisia tridentata vaseyana</i>									
S	89	-	-	-	-	-	-	-	0
	97	2	-	-	-	-	-	-	40
Y	89	7	1	-	-	-	-	-	533
	97	1	-	-	-	-	-	-	20
M	89	8	1	-	-	-	-	-	600
	97	29	120	5	3	-	-	-	3140
D	89	11	45	4	-	-	-	-	4000
	97	8	19	-	-	-	-	-	540
X	89	-	-	-	-	-	-	-	0
	97	-	-	-	-	-	-	-	580
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
'89		61%		05%		27%		-28%	
'97		75%		03%		12%			
Total Plants/Acre (excluding Dead & Seedlings)						'89	5133	Dec:	78%
						'97	3700		15%
<i>Chrysothamnus depressus</i>									
M	89	-	-	-	-	-	-	-	0
	97	3	-	-	1	-	-	-	80
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
'89		00%		00%		00%		Appeared	
'97		00%		00%		00%			
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec:	-
						'97	80		-

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus nauseosus nauseosus																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	34	35	0
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			50%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	40		50%				
Chrysothamnus viscidiflorus viscidiflorus																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	89	14	-	-	2	-	-	1	-	-	17	-	-	-	1133		17	
	97	28	-	-	-	-	-	-	-	-	28	-	-	-	560		28	
M	89	6	-	-	3	-	-	2	-	-	11	-	-	-	733	13	14	11
	97	67	-	-	13	-	-	-	-	-	80	-	-	-	1600	22	13	80
D	89	6	-	-	-	-	-	-	-	-	6	-	-	-	400		6	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 5%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2266	Dec:	18%				
											'97	2160		0%				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																	
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
M	89	21	-	-	-	-	-	-	-	-	21	-	-	-	1400	10 13	21
	97	6	-	-	1	-	-	-	-	-	7	-	-	-	140	9 9	7
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-89%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	1466	Dec:	-			
											'97	160		-			
<i>Juniperus osteosperma</i>																	
S	89	1	-	-	-	-	-	1	-	-	2	-	-	-	133		2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	4	-	-	-	-	-	-	-	-	3	-	-	1	80	161 115	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		00%			00%			14%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	140		-			
<i>Opuntia spp.</i>																	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2 1	0
D	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-85%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	132	Dec:	50%			
											'97	20		0%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Quercus gambelii</i>																	
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			None						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	0		-		
<i>Symphoricarpos oreophilus</i>																	
Y	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66		1
	97	3	-	-	1	-	-	-	-	-	4	-	-	-	80		4
M	89	-	-	-	-	2	-	-	-	-	2	-	-	-	133	13 19	2
	97	16	-	-	-	-	-	-	-	-	16	-	-	-	320	16 26	16
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		67%			00%			00%			+50%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	199	Dec:	-		
												'97	400		-		
<i>Tetradymia canescens</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	8 4	1
	97	13	-	-	-	-	-	-	-	-	12	1	-	-	260	8 6	13
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+79%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-		
												'97	320		-		

Trend Study 16B-7-97

Study site name: East Dairy Fork .

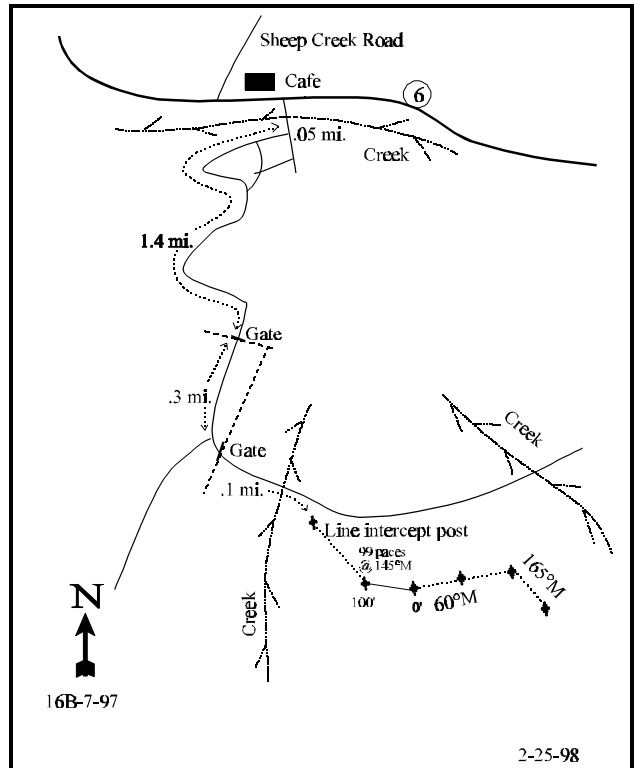
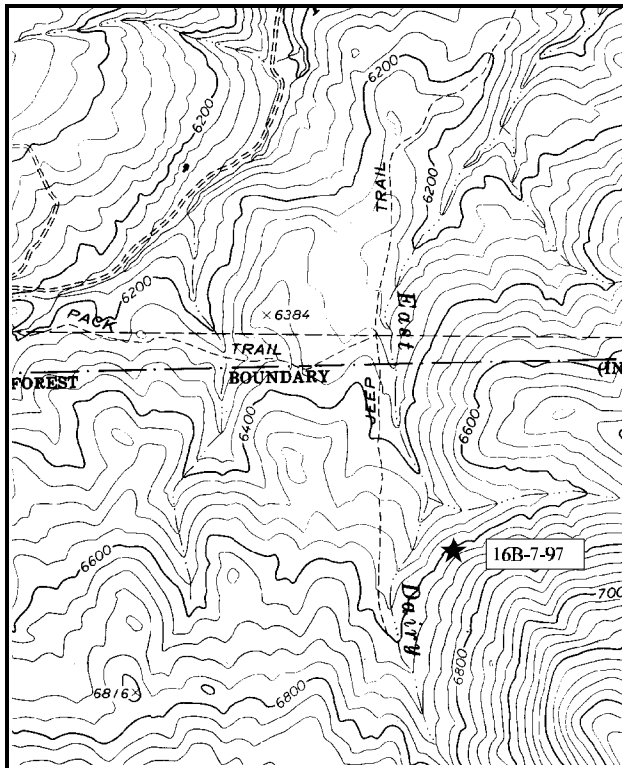
Range Type: Mixed mountain brush

Compass bearing: frequency baseline 276M degrees. (Line 2-3 60°M, line 4 165°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11& 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Near sheep creek cafe on Highway 6/50 take Dairy Fork Road on the south side of the highway 0.25 miles to a fork. Stay left on the main road 0.25 miles to another fork. Again, stay left and go 0.5 miles to another fork in the road. Take this side road to the left (east) and go 1.6 miles, crossing the creek and staying to the right at a minor fork less than 0.05 miles after the creek. Here you will encounter a fence/gate. Continue for another 0.3 miles to another fork and gate on the left (east). Take this fork 0.1 miles to the bottom of a wash. Where the road crosses the wash, take an azimuth of 133 degrees magnetic and walk 13 paces to a line intercept stake. From this stake, walk 99 paces at 145 degrees magnetic to the 0-foot baseline stake marked by some wire.



Map Name: Mill Fork .

Diagrammatic Sketch

Township 10S, Range 5E, Section not surveyed

UTM 4420534.485 N, 470796.453 E

DISCUSSION

Trend Study No. 16B-7 (28-7)

The East Dairy Fork study samples a mixed mountain brush slope with a prominent overstory of oak, pinyon, and Rocky Mountain juniper. The study is located within the Forest Service boundary, but may be on a private inholding. It is adjacent to Division land. No elk and few deer pellet groups were observed. Cattle were in the area at the time of study establishment in 1989. Sheep droppings were observed on the site in 1997.

The study is on a steep, 41% slope with a western aspect. The soil is light colored with a clay texture and a neutral pH (7.2). Phosphorus could be a limiting factor to plant development with only 7.8 ppm found in the soil. A minimum of 10 ppm are thought necessary for normal plant development. Effective rooting depth (see methods) is estimated at just over 14 inches. Rock and pavement are concentrated on the surface and produce 21% average cover. Due to the high percentage of rock, pavement, and litter cover, when combined with the abundant browse cover, bare soil occupies only 4% of the surface. Soil erosion is a concern on this slope, but currently erosion is not serious. The drainage channels below the site were extremely gullied in 1989, however they are less so in 1997. Pedestaling and terracing are common all along the steep slopes.

The site supports a variety of browse species. Overstory species consist of juniper, pinyon, Gambel oak, and an occasional Douglass fir. Gambel oak is numerous and provides 42% of the total browse cover with an estimated density of 4,660 stems/acre in 1997. Mature plants are tall, averaging nearly 4 feet in height. Important understory shrubs include mountain big sagebrush, true mountain mahogany, and snowberry. Sagebrush are scarce with only 180 plants/acre estimated in 1997. Many of these are decadent with poor vigor and light use. Snowberry is numerous with an estimated density of 15,999 plants/acre in 1989 and 4,400 in 1997. Almost all of the change in density is due to the much larger sample used in 1997 for there are no dead plants in the population. The new larger sampling design gives more accurate browse density estimates for species that characteristically have clumped or discontinuous distributions like snowberry. The snowberry is mostly mature and unutilized. The most preferred browse on the site is true mountain mahogany which accounts for 8% of the browse cover. Density was estimated at 733 plants/acre in 1989 and 540 in 1997. Mature plants average nearly 3 feet in height. Percent decadence is low and utilization is light to moderate with a few heavily hedged individuals. Use was reported to be heavier in 1989 with over one third of the shrubs displaying poor vigor. Currently, 25% of the mahogany sampled showed insect damage, but otherwise vigor was normal. Percent decadence has declined from 27% in 1989 to only 3% in 1997. The population appears stable with adequate proportion of young plants (27% in 1989 and 7% in 1997).

The herbaceous component is suffering from possible overuse. For this type of site, the grass frequency is low and all grasses combined produce less than 3% cover. Kentucky bluegrass is the most abundant species. It accounts for 50% of the grass cover. The only other common species is a sedge (*Carex*). Forbs are fairly diverse and frequency is relatively high, but most are unavailable under the shrub canopy. Common species include timber poison vetch, mat penstemon, short stem wild buckwheat, and American vetch. The limited herbaceous understory contributes little for soil protection.

1989 APPARENT TREND ASSESSMENT

The soil trend is downward, especially as the herbaceous understory is further depleted. Since the site is also used by big game in the summer, this means a downward trend. Trend for the browse component is more stable.

1997 TREND ASSESSMENT

The soil trend appears stable, but is in poor condition. Percent bare ground is low at only 4%, however shrub interspaces continue to erode due to the lack of herbaceous ground cover. The browse trend is up slightly for the most preferred key species, true mountain mahogany. Vigor has improved and percent decadence declined from 27% to 3%. Other shrubs; snowberry, mountain big sagebrush, and Gambel oak are of secondary importance. Trend for the herbaceous understory is down slightly for grasses but up for forbs. Nested frequency of bluebunch wheatgrass is down significantly while frequency of Kentucky bluegrass is up significantly. Overall, trend is considered up slightly, but very poor.

TREND ASSESSMENT

soil - stable, but in poor condition

browse - up slightly for mahogany

herbaceous understory - down slightly for grasses, but up for forbs, up slightly overall

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 7

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	38	*8	14	5	.07
G	Carex spp.	17	*31	7	16	.95
G	Oryzopsis hymenoides	50	*14	24	7	.14
G	Poa fendleriana	16	*-	6	-	-
G	Poa pratensis	3	*48	2	18	1.42
G	Poa secunda	-	*10	-	4	.10
G	Stipa lettermani	-	4	-	1	.15
Total for Grasses		124	115	53	51	2.84
F	Achillea millefolium	13	24	5	12	.26
F	Allium spp.	-	6	-	2	.01
F	Arabis spp.	-	3	-	2	.01
F	Artemisia ludoviciana	6	5	2	2	.06
F	Astragalus convallarius	6	*44	4	23	.62
F	Astragalus spp.	6	12	2	4	.09
F	Astragalus utahensis	-	3	-	2	.03
F	Castilleja linariaefolia	-	2	-	2	.01
F	Calochortus nuttallii	-	4	-	2	.01
F	Chaenactis douglasii	-	3	-	2	.01
F	Cirsium spp.	16	*-	7	-	.18
F	Comandra pallida	-	*18	-	8	.35

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	<i>Crepis acuminata</i>	-	1	-	1	.03
F	<i>Cymopterus</i> spp.	-	6	-	2	.01
F	<i>Cynoglossum officinale</i>	-	1	-	1	.00
F	<i>Eriogonum brevicaule</i>	15	*45	7	21	.60
F	<i>Ipomopsis aggregata</i>	-	3	-	2	.03
F	<i>Lathyrus lanszwertii</i> (a)	-	5	-	4	.08
F	<i>Lupinus</i> spp.	-	5	-	2	.01
F	<i>Machaeranthera canescens</i>	30	39	14	17	.19
F	<i>Penstemon caespitosus</i>	83	97	32	39	.93
F	<i>Penstemon cyananthus</i>	12	9	4	5	.23
F	<i>Phlox longifolia</i>	43	31	21	16	.10
F	<i>Senecio multilobatus</i>	11	5	5	3	.06
F	<i>Stellaria jamesiana</i>	-	44	-	18	.19
F	<i>Taraxacum officinale</i>	3	-	1	-	-
F	<i>Thalictrum fendleri</i>	8	12	5	5	.39
F	Unknown forb-perennial	7	2	3	1	.00
F	<i>Vicia americana</i>	50	35	27	14	.73
F	<i>Viola</i> spp.	-	3	-	1	.00
Total for Forbs		309	467	139	213	5.29

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16B , Study no: 7

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier utahensis	3	-
B	Artemisia tridentata vaseyana	7	.06
B	Cercocarpus montanus	21	3.56
B	Chrysothamnus nauseosus albicaulis	2	-
B	Chrysothamnus viscidiflorus viscidiflorus	10	.09
B	Juniperus scopulorum	13	12.57
B	Mahonia repens	48	4.49
B	Pachistima myrsinites	1	.03
B	Pinus edulis	3	.15
B	Prunus virginiana	2	.53
B	Pseudotsuga menziesii	1	.03
B	Quercus gambelii	55	18.79
B	Rosa woodsii	6	.45
B	Symphoricarpos oreophilus	66	4.33
B	Tetradymia canescens	2	-
Total for Browse		240	45.10

BASIC COVER --

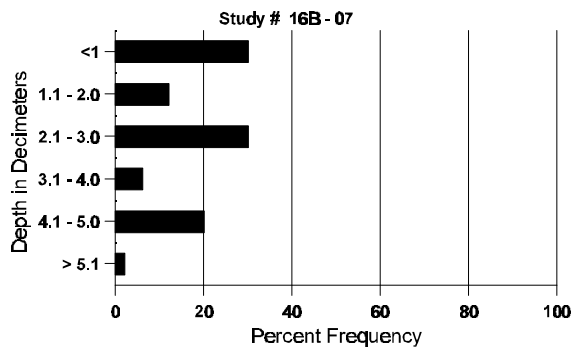
Herd unit 16B , Study no: 7

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	287	3.50	44.14
Rock	161	6.75	5.15
Pavement	191	17.75	15.89
Litter	377	63.00	54.85
Cryptogams	7	0	.04
Bare Ground	125	9.00	4.32

SOIL ANALYSIS DATA --
 Herd Unit 16B, Study no: 07

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.3	50.2 (17.6)	7.2	22.7	31.1	46.2	3.5	7.8	89.6	.6

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16B , Study no: 7

Type	Quadrat Frequency '97
Rabbit	5
Deer	4

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 7

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier utahensis</i>																		
S	89	1	-	-	-	-	-	1	-	-	2	-	-	-	133		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	2	2	-	3	-	-	2	-	-	9	-	-	-	600		9	
	97	1	-	-	-	-	-	-	-	-	-	1	-	-	20		1	
M	89	1	-	-	-	-	-	-	-	-	-	-	1	-	66	21	6	
	97	2	-	-	-	-	-	-	-	-	-	2	-	-	40	-	-	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		20%			00%			10%			-91%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	666	Dec:	-				
											'97	60		-				
<i>Artemisia tridentata vaseyana</i>																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	3	1	-	-	-	-	-	-	-	4	-	-	-	266	24	28	
	97	2	1	-	-	-	-	-	-	-	3	-	-	-	60	23	26	
D	89	5	1	-	-	-	-	-	-	-	5	1	-	-	400		6	
	97	4	-	-	-	-	-	-	-	-	1	-	-	3	80		4	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		20%			00%			00%			-73%							
'97		11%			00%			33%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	666	Dec:	60%				
											'97	180		44%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Cercocarpus montanus																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	2	1	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	2	2	-	1	-	-	-	-	2	-	3	-	333	31 22	5	
	97	9	9	1	2	3	-	-	-	-	18	6	-	-	480	35 34	24	
D	89	1	2	-	-	-	-	-	-	-	2	-	1	-	200		3	
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20		1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		55%			18%			36%			-26%							
'97		48%			04%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	733	Dec:	27%				
											'97	540		4%				
Chrysothamnus nauseosus albicaulis																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6 17	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	80		-				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus viscidiflorus																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
M	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266	14	12
	97	10	-	-	-	-	-	-	-	-	10	-	-	-	200	6	9
D	89	15	-	-	1	-	-	-	-	-	16	-	-	-	1066		16
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-79%						
'97		00%			00%			07%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	1332	Dec:	80%			
											'97	280		7%			
Juniperus scopulorum																	
S	89	3	-	-	2	-	-	-	-	-	5	-	-	-	333		5
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
Y	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	59	22
	97	5	3	-	-	-	-	1	-	-	6	-	-	3	180	-	-
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+17%						
'97		19%			00%			19%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	266	Dec:	-			
											'97	320		-			
Mahonia repens																	
S	89	21	-	-	-	-	-	6	-	-	27	-	-	-	1800		27
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
Y	89	132	-	-	14	-	-	10	-	-	156	-	-	-	10400		156
	97	75	-	-	-	-	-	-	-	-	75	-	-	-	1500		75
M	89	37	-	-	29	-	-	24	-	-	90	-	-	-	6000	7	7
	97	670	-	-	-	-	-	1	-	-	646	25	-	-	13420	4	5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			- 9%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	16400	Dec:	-			
											'97	14920		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Pachistima myrsinites</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	-	2	-	-	-	-	-	2	-	-	-	40	7	6	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				
<i>Pinus edulis</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	60		-				
<i>Prunus virginiana</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	3	-	-	-	-	-	-	-	-	2	1	-	-	60	31	47	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	60		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total				
		1	2	3	4							
<i>Pseudotsuga menziesii</i>												
S	89	1	-	-	-	-	-	-	1	66		1
	97	2	-	-	-	-	-	-	2	40		2
M	89	-	-	-	-	-	-	-	-	0	-	0
	97	-	-	-	-	-	1	-	1	20	-	1
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>							
'89		00%	00%	00%	Appeared							
'97		00%	00%	00%								
Total Plants/Acre (excluding Dead & Seedlings)					'89	0	Dec:	-				
					'97	20		-				
<i>Quercus gambelii</i>												
S	89	-	-	-	-	-	1	-	1	66		1
	97	9	-	-	-	-	-	-	9	180		9
Y	89	14	-	-	6	-	-	8	28	1866		28
	97	31	4	-	7	-	-	-	42	840		42
M	89	19	1	-	8	-	-	-	28	1866	101 31	28
	97	171	7	-	-	-	10	-	184	3760	42 26	188
D	89	1	-	-	-	-	-	1	1	133		2
	97	3	-	-	-	-	-	-	3	60		3
X	89	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	740		37
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>							
'89		02%	00%	02%	+17%							
'97		05%	00%	00%								
Total Plants/Acre (excluding Dead & Seedlings)					'89	3865	Dec:	3%				
					'97	4660		1%				
<i>Rosa woodsii</i>												
Y	89	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	2	40		2
M	89	-	-	-	-	-	-	-	-	0	-	0
	97	17	-	-	-	-	-	-	17	340	20 18	17
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>							
'89		00%	00%	00%	Appeared							
'97		00%	00%	00%								
Total Plants/Acre (excluding Dead & Seedlings)					'89	0	Dec:	-				
					'97	380		-				

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	11	-	-	-	-	-	-	-	-	11	-	-	-	220		11	
Y	89	43	-	-	3	-	-	3	-	-	49	-	-	-	3266		49	
	97	60	-	-	-	-	-	-	-	-	60	-	-	-	1200		60	
M	89	125	-	-	40	-	-	14	-	-	112	-	67	-	11933	15 14	179	
	97	127	-	-	32	-	-	-	-	-	159	-	-	-	3180	14 16	159	
D	89	11	-	-	1	-	-	-	-	-	4	-	8	-	800		12	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			31%			-72%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	15999	Dec:	5%				
											'97	4400		0%				
Tetradymia canescens																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	7 8	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				

Trend Study 16B-8-97

Study site name: Dairy Fork Burn .

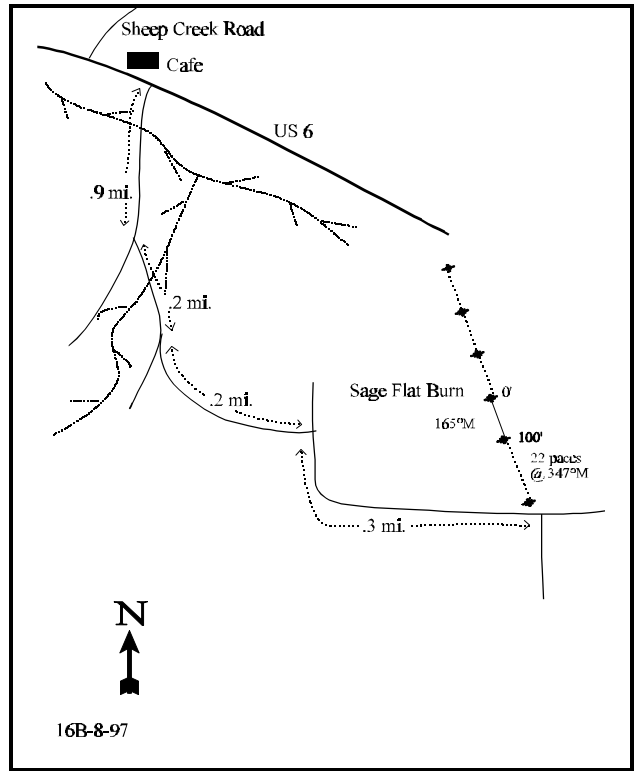
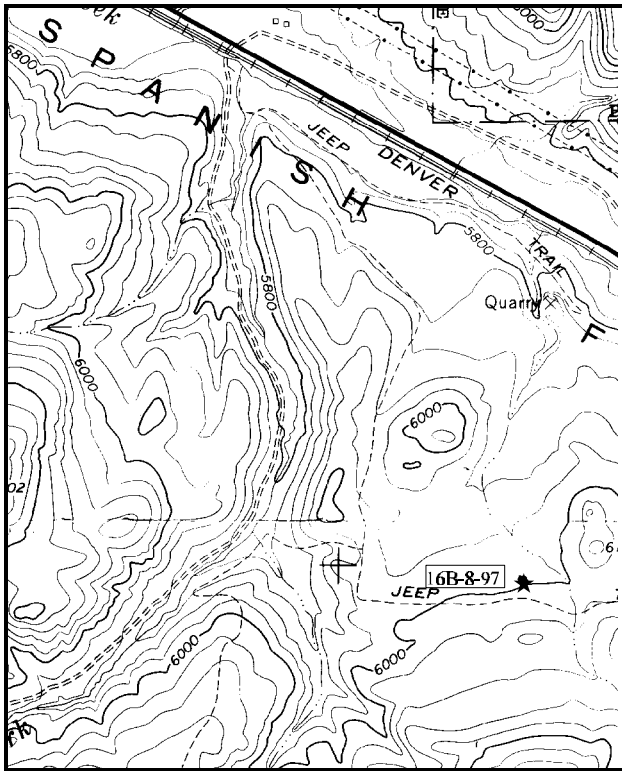
Range Type: Big sagebrush/burn

Compass bearing: frequency baseline 165M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Near Sheep Creek Cafe on Highway 6/50, take Dairy Fork Road on the south side of the highway 0.9 miles to a left hand fork. Take this fork, cross the creek and go 0.2 miles to another fork in the road. Take this fork east for 0.2 miles to a sagebrush flat/burn and a three-way intersection. Turn right (south) and follow road around upper edge of flat for 0.3 miles to a junction on the right and a witness post on the left. Stop here and walk north into the flat about 22 paces at an azimuth of 347°M to the 100-foot baseline stake.



Map Name: Mill Fork .

Diagrammatic Sketch

Township 10S, Range 5E, Section Not surveyed

UTM 4422920.713 N, 471997.434 E

DISCUSSION

Trend Study No. 16B-8 (28-8)

The East Dairy Fork Burn study samples a sagebrush flat surrounded by juniper. The site has an elevation of 6,000 feet with a gentle slope of 3% to 5% and north aspect. This Division property was burned and seeded in 1988. Sagebrush was largely eliminated within the flat. A 1978 line-intercept transect ran across the lower, north end of the flat, where a disc-chain was used as part of the seedbed preparation. A trend study was established in 1989 to monitor recovery on this big sagebrush (*Artemisia tridentata tridentata*) site. Pellet group data from 1997 indicate a quadrat frequency for elk pellet-groups at 33%, while deer pellet-groups numbered only 9%.

Soil at the site is a moderately deep clay textured soil with a slightly alkaline pH (7.4). Effective rooting depth (see methods) was estimated at almost 14 inches. The high clay content (dense compact soil) limited soil penetrometer readings. Soil temperature was relatively high at nearly 60° F at only 13 inches in depth. Phosphorus may also would be a limiting factor to plant development with only 8 ppm (10 ppm is thought to be minimal). There is a high amount of exposed mineral soil, (38% bare soil in 1989 and 44% in 1997) but erosion is minimal on the study site. Other areas of the flat without herbaceous cover display significant soil movement.

A few mature and young sagebrush survived the treatment. These showed good vigor and light use in 1989. Sagebrush cover in the burned area averaged 2% that year. The surrounding area had 12-15% sagebrush cover. No density plots were established in 1989, but density of sagebrush was estimated in 1997 at 300 plants/acre. Almost two-thirds of the plants were mature with remainder classified as 40% young. Vigor is mostly normal and utilization light. Currently, sagebrush cover averages less the one half of one percent. It should be noted that the dead sagebrush plants listed in the table were the original plant population before the burn treatment. Therefore, the 2,360 plants/acre would have been the population before the treatment.

Musk thistle dominated the treated area in 1989. However, the undesirable weed was infested with a weevil and there was little viable seed. The abundant rosettes (biannual) will begin growth early next year. Native and seeded grasses were diverse but not abundant. By 1997, nested frequency of grasses increased dramatically (95 to 701). Currently, the most abundant perennial grasses include crested wheatgrass, intermediate wheatgrass, smooth brome, and bottlebrush squirreltail which accounts for 89% of the grass cover. Nested frequency of forbs declined due to a significant reduction in the frequency of musk thistle, prickly lettuce, timber poison vetch, and Douglas chaenactis. A few of the seeded forbs are still present (small burnet and alfalfa).

1989 APPARENT TREND ASSESSMENT

Trend is up as the sagebrush and native and seeded perennials reoccupy the treated flat. The soil trend will also improve with the expected increase in perennial vegetative cover. Soil erosion is not serious on the study site, and was probably worse before the treatment.

1997 TREND ASSESSMENT

The soil trend is considered stable. Percent bare ground increased slightly from 38% to 44% and litter cover declined. Nested frequency of perennial grasses increased 6 fold. Erosion is not currently a problem on the site. Trend for sagebrush appears to be up. Young plants are common, use is light and there are no decadent plants. Trend for the herbaceous understory is up. Sum of nested frequency of grasses increased six fold while nested frequency of forbs declined due to a reduction in undesirable musk thistle and other weedy forbs.

TREND ASSESSMENT

soil - stable

browse - up for big sagebrush

herbaceous understory - up

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 8

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	11	*209	6	70	8.24
G	Agropyron intermedium	1	*108	1	38	5.00
G	Bromus inermis	1	*86	1	32	2.21
G	Bromus tectorum (a)	-	132	-	50	.88
G	Dactylis glomerata	9	10	6	4	.09
G	Oryzopsis hymenoides	1	6	1	3	.56
G	Poa fendleriana	1	-	1	-	-
G	Poa pratensis	2	*27	1	10	.53
G	Poa secunda	-	*5	-	5	.12
G	Sitanion hystrix	69	*118	33	52	2.71
Total for Grasses		95	701	50	264	20.38
F	Achillea millefolium	3	4	1	1	.63
F	Alyssum alyssoides (a)	-	6	-	3	.01
F	Astragalus cibarius	3	-	2	-	-
F	Astragalus convallarius	113	*62	53	26	.46
F	Astragalus tenellus	9	5	5	3	.04
F	Camelina microcarpa (a)	-	42	-	21	.13
F	Carduus nutans (a)	230	*106	91	46	3.23
F	Chaenactis douglasii	145	*25	67	11	.05
F	Cirsium spp.	-	3	-	1	.03
F	Comandra pallida	-	*36	-	14	.56
F	Collinsia parviflora (a)	-	2	-	1	.00
F	Descurainia pinnata (a)	-	2	-	1	.00
F	Epilobium paniculatum (a)	-	5	-	2	.01
F	Grindelia squarrosa	6	-	2	-	-
F	Lactuca serriola	217	*32	81	14	.14
F	Machaeranthera canescens	5	-	3	-	-
F	Medicago sativa	-	1	-	1	.03

T y p e	Species	Nestled Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Microsteris gracilis (a)	-	58	-	24	.36
F	Penstemon caespitosus	7	13	3	5	.74
F	Phlox longifolia	-	3	-	1	.00
F	Ranunculus testiculatus (a)	-	4	-	1	.00
F	Sanguisorba minor	5	9	4	4	.16
F	Sisymbrium altissimum (a)	-	5	-	3	.01
F	Taraxacum officinale	11	8	3	4	.07
F	Tragopogon dubius	23	*8	13	6	.05
F	Vicia americana	-	*24	-	9	.04
Total for Forbs		777	463	328	202	6.82

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

BROWSE TRENDS --

Herd unit 16B , Study no: 8

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Artemisia tridentata tridentata	13	.41
B	Juniperus osteosperma	1	.15
Total for Browse		14	0.56

BASIC COVER --

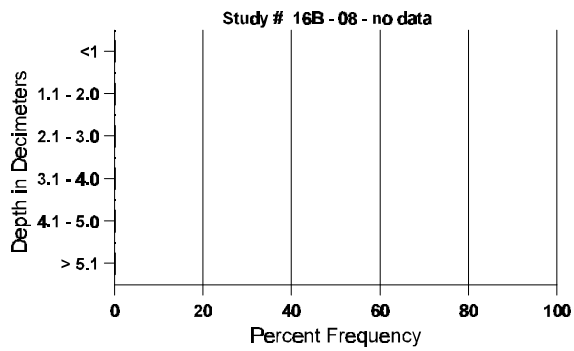
Herd unit 16B , Study no: 8

Cover Type	Nestled Frequency '97	Average Cover %	
		'89	'97
Vegetation	351	4.00	32.15
Rock	3	0	.00
Pavement	92	0	.22
Litter	379	58.25	24.80
Cryptogams	5	0	.16
Bare Ground	350	37.75	43.81

SOIL ANALYSIS DATA --
 Herd Unit 16B, Study no: 08

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.7	59.0 (13.2)	7.5	25.4	26.8	47.8	2.2	8.0	217.6	.4

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16B , Study no: 8

Type	Quadrat Frequency '97
Rabbit	12
Elk	33
Deer	9
Cattle	1

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 8

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata tridentata</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	9	-	-	-	-	-	-	-	-	8	-	1	-	180	49	43	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	2360		118	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			07%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	300		-			
<i>Juniperus osteosperma</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			

Trend Study 16B-11-97

Study site name: Hilltop .

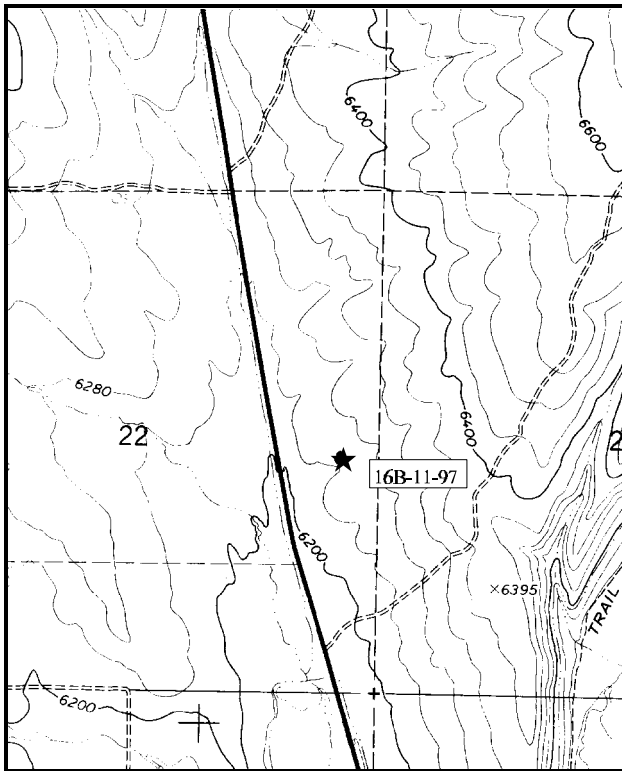
Range Type: Chained, cabled-reseeded P-J

Compass bearing: frequency baseline 163M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

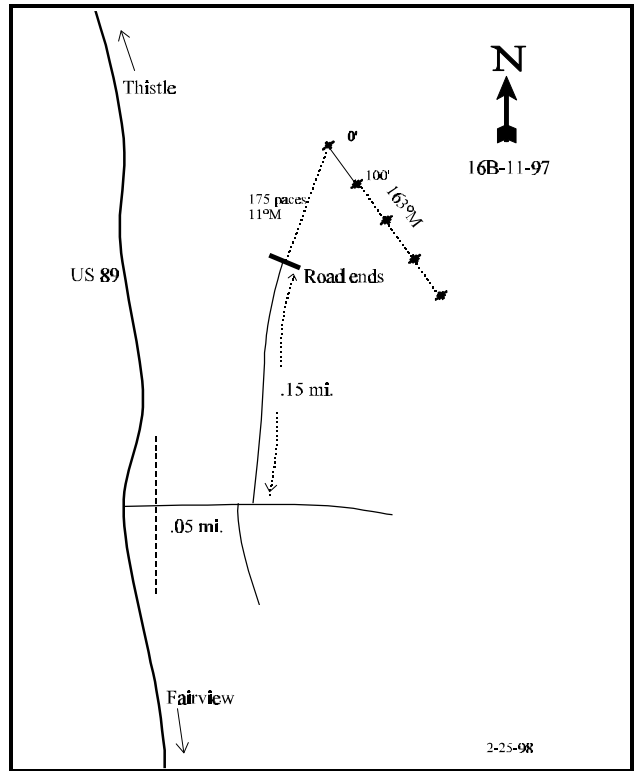
LOCATION DESCRIPTION

From the intersection of US-89 and SR-31 in Fairview, travel north on US-89 for 2.8 miles. Turn right (east) onto DWR property. Pass through a gate and go 0.05 miles to an intersection, turn left (north). Go 0.15 miles to the end of the road. The 0-foot baseline stake is 175 paces at an azimuth of 11 degrees magnetic from the end of the road.



Map Name: Fairview .

Township 135, Range 4E, Section 22



Diagrammatic Sketch

UTM 4391413.060 N, 461172.311 E

DISCUSSION

Trend Study No. 16B-11 (28-11)

The 250 acre Hilltop chaining on Division land was completed in 1978. Seeded grasses currently dominate the site. The trend study was established in the lower, southern end of the chaining. The site has a gentle 3% to 5% slope and a southwestern aspect with an elevation of 6,250 feet. Pellet group data indicates that a moderate number of deer use the site. Only one elk pellet group was observed along with recent cattle sheep sign noted.

The soil is moderately deep with an effective rooting depth (see methods) of nearly 14 inches. Effective soil depth varied along the baseline with more shallow measurements along the first 200 feet of the baseline (almost 10 inches) and noticeably deeper measurements along the last 200 feet (about 20 inches). Soil texture is a clay loam with a slightly alkaline pH (7.4). Organic matter is relatively high for this unit at 3.9%, second highest measurement in the unit. Phosphorus may be a limiting factor to plant development at only 8.8 ppm, where 10 ppm is considered limiting. There is considerable bare ground on the site and erosion is evident with the pedestaled bunchgrasses. However, soil movement is localized and perennial herbaceous cover is relatively high and well dispersed.

Browse is limited. Junipers in the chaining average 8 feet in height and have a density of 47 trees/acre using point center quarter data from 1997. Average diameter is 5 inches. There are also scattered clumps of oak. Big sagebrush is uncommon with an estimated density of 299 plants/acre in 1989 and only 100 in 1997. The change in density is mostly due to the larger, more representative sample used in 1997 which better estimates shrub populations which can have aggregated and/or discontinuous populations. Utilization is light to moderate. Establishment of seeded browse is poor. Mountain big sagebrush and four-wing saltbush were included in the aerial broadcast mix while cliffrose and bitterbrush were seeded with a dribbler. Elderberry, slenderbush eriogonum, and rubber rabbitbrush occur infrequently and are apparently heavily hedged in 1997.

Crested wheatgrass and intermediate wheatgrass are the primary forage plants. They combine to produce 90% of the grass cover. Native grasses are also present, but in low numbers. Indian ricegrass and bluebunch wheatgrass are the most common. Cheatgrass and Japanese brome are present but not abundant. Sheep reportedly had utilized some of the grasses in 1989. During the 1997 reading, the Russian wildrye found along the baseline was heavily utilized. Forbs are diverse yet not abundant and contain two noxious weeds, musk thistle and morning glory. Alfalfa is still found on the site but in very low numbers.

1989 APPARENT TREND ASSESSMENT

Shrubs have not yet colonized this 10 year old chaining. Objectives for the site include increasing browse densities. With the uneven cover created by the prominent bunchgrasses, there is ample room for seedling establishment. Future readings could help understand the impacts caused by spring sheep use. The vegetative trend is up, but slowly. Soil trend is downward due to the excessive amount of bare soil, soil movement, plant pedestaling and continuing erosion. Increased plant cover or litter would help improve the soil condition.

1997 TREND ASSESSMENT

Trend for soil is down due to an increase in percent bare soil from 27% to 35% and a decline in litter cover from 46% to 21%. There is a moderate amount of herbaceous vegetation on the site, but localized erosion is ongoing. Trend for browse is down slightly. Browse are lacking but the key species, mountain big sagebrush, shows increased decadence and poor vigor. Rubber rabbitbrush and slenderbush eriogonum also show heavy sheep use. Young plants are present in good numbers but no seedlings of any shrub were encountered during either of

the readings. Trend for the herbaceous understory is stable. Sum of nested frequency of perennial grasses declined slightly while frequency of perennial forbs increased. However, many of the forb species on the site are undesirable weeds and annuals like musk thistle, morning glory, and bur buttercup.

TREND ASSESSMENT

soil - down

browse - down slightly

herbaceous understory - stable

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 11

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	203	198	76	76	11.51
G	Agropyron intermedium	182	*129	71	50	3.53
G	Agropyron spicatum	3	*40	1	16	.91
G	Bromus japonicus (a)	-	4	-	2	.01
G	Bromus tectorum (a)	-	48	-	19	.33
G	Elymus junceus	7	-	3	-	-
G	Oryzopsis hymenoides	4	*23	2	9	.40
G	Poa secunda	4	4	2	2	.01
G	Sitanion hystrix	24	*8	10	3	.02
Total for Grasses		427	454	165	177	16.73
F	Alyssum alyssoides (a)	-	41	-	17	.40
F	Astragalus convallarius	3	-	1	-	-
F	Astragalus spp.	-	1	-	1	.00
F	Astragalus utahensis	-	4	-	2	.01
F	Carduus nutans (a)	-	40	-	19	.44
F	Chaenactis douglasii	-	1	-	1	.00
F	Chenopodium fremontii (a)	-	9	-	4	.04
F	Cirsium spp.	-	5	-	3	.04
F	Convolvulus arvensis	-	*16	-	7	.11
F	Descurainia pinnata (a)	-	11	-	4	.04
F	Lappula occidentalis (a)	-	3	-	3	.01
F	Medicago sativa	-	3	-	1	.09
F	Phlox hoodii canescens	11	16	5	6	.25
F	Phlox longifolia	2	4	1	2	.01
F	Ranunculus testiculatus (a)	-	163	-	56	.97

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Sisymbrium altissimum (a)	-	4	-	3	.04
F	Sphaeralcea coccinea	1	4	1	2	.03
F	Taraxacum officinale	-	2	-	1	.00
F	Tragopogon dubius	-	1	-	1	.00
F	Verbascum thapsus	-	*11	-	5	.48
F	Viguiera multiflora	-	3	-	2	.01
Total for Forbs		17	342	8	140	3.02

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

BROWSE TRENDS --

Herd unit 16B , Study no: 11

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Artemisia tridentata vaseyana	5	.46
B	Chrysothamnus nauseosus albicaulis	2	.38
B	Chrysothamnus viscidiflorus viscidiflorus	2	.15
B	Gutierrezia sarothrae	20	.37
B	Juniperus osteosperma	1	.63
B	Opuntia spp.	3	-
B	Quercus gambelii	1	.63
Total for Browse		34	2.63

BASIC COVER --

Herd unit 16B , Study no: 11

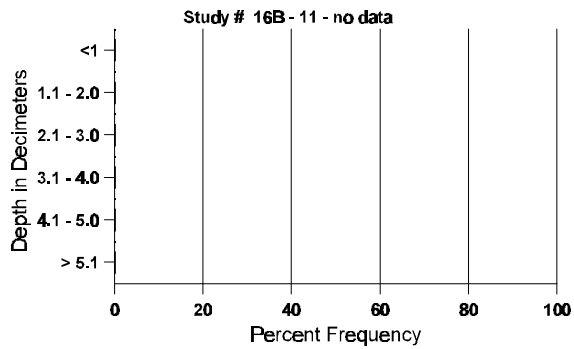
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	336	10.50	22.73
Rock	155	4.75	3.01
Pavement	289	11.25	5.28
Litter	378	46.75	20.90
Cryptogams	8	0	.04
Bare Ground	331	26.75	35.57

SOIL ANALYSIS DATA --

Herd Unit 16B, Study no: 11

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.8	55.6 (14.3)	7.4	38.7	25.1	36.2	3.9	8.8	134.5	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16B , Study no: 11

Type	Quadrat Frequency '97
Sheep	13
Rabbit	6
Elk	1
Deer	25
Cattle	3

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 11

A G R E	Y R	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.	
<i>Artemisia tridentata vaseyana</i>																		
Y	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	89	1	6	-	-	-	-	-	-	-	7	-	-	-	233	33	30	7
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	31	35	2
D	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	-	1	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		89%			00%			00%			-67%							
'97		20%			00%			20%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	299	Dec:	11%			
												'97	100		20%			
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	47	91	1
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20	20	34	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			+18%							
'97		50%			50%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	40		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	7	9	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	80		-			
<i>Eriogonum microthecum</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	8	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
<i>Gutierrezia sarothrae</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133	7	10	4
	97	26	-	-	-	-	-	-	-	-	26	-	-	-	520	10	12	26
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+82%							
'97		00%			00%			03%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	133	Dec:	0%			
												'97	720		3%			

AGE	YGR	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.		
Juniperus osteosperma																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	69	35	1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-39%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	20		-			
Opuntia spp.																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	7	20	1
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	6	19	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+45%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	60		-			
Quercus gambelii																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	98	47	2
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	80		-			

A G E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Sambucus cerulea																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	119	98	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>				
'89		00%			00%			00%						None				
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			

Trend Study 16B-12-97

Study site name: Oak Creek .

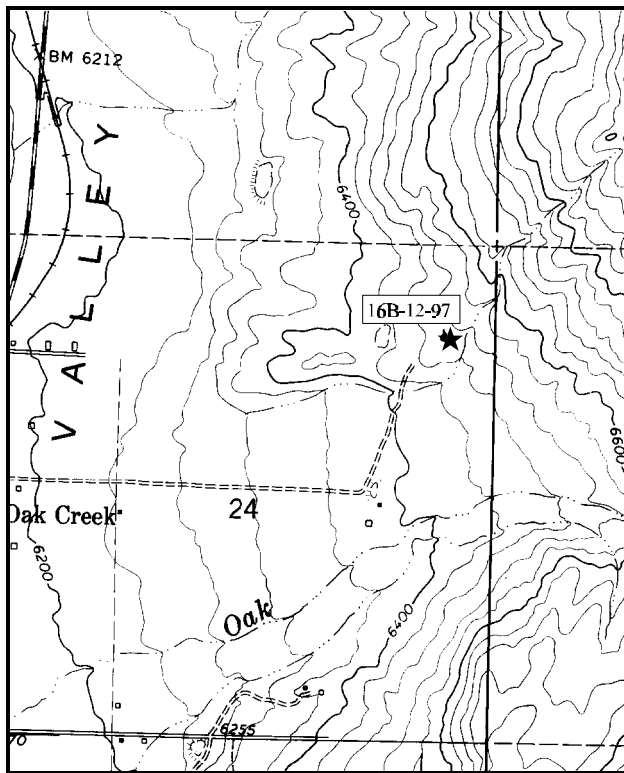
Range Type: Mixed mountain brush

Compass bearing: frequency baseline 174 M degrees. (Line 3 142°M, line 4°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (71ft), line 4 (59ft).

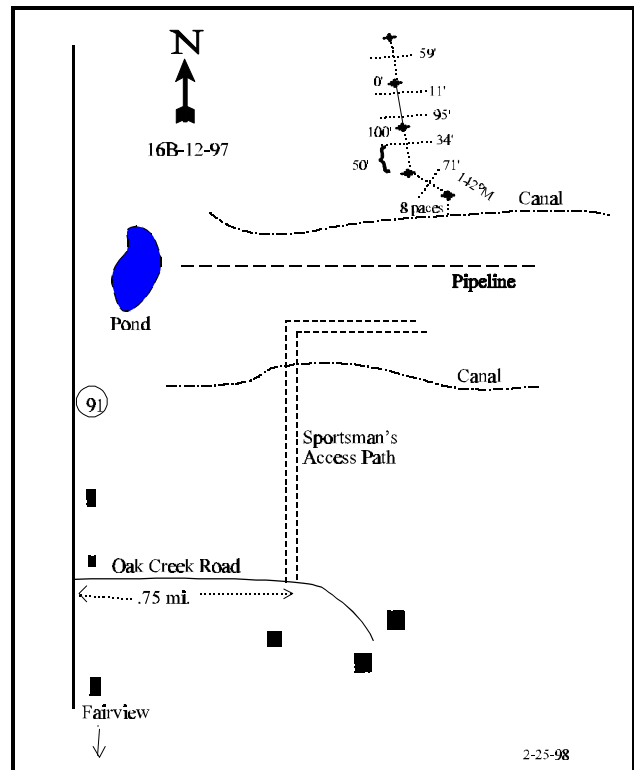
LOCATION DESCRIPTION

From Walkers Food and Fuel in Fairview, take SR-91 (Milburn Road) 2.8 miles. Turn right(east) on 27500 North which is also known as Oak Creek Road. Go 0.75 miles and stop at the locked gate/sportsmen's access route. From here, walk north between the fences, across the canal to the top of the hill where the fenced path turns and goes east. From this corner, walk 55 paces eastward along the path to a clump of oak brush next to the fence on the north side. At this point there is a red steel fence post 7 paces north of the fence which marks the beginning of the old line intercept transect. From this post, walk north crossing the canal. Eight paces past the canal is the 300-foot post.



Map Name: Fairview .

Township 13S, Range 4E, Section 24



Diagrammatic Sketch

UTM 4392075.991 N, 464330.356 E

DISCUSSION

Trend Study No. 16B-12 (28-12)

The original site at Oak Creek was a line-intercept transect established in 1978. It was mostly destroyed by pipeline construction and a new trend study was established nearby in the same juniper/mountain brush type in 1989. The area receives year-round deer use with some elk sign also encountered. This private land did not appear to be grazed by domestic livestock with any regularity in 1989. Some livestock use in the form of cattle, sheep, and horses was evident in 1997. Wildlife likely use this area as thermal cover during the winter and forage in nearby alfalfa fields.

The site is nearly level with a south-southwest aspect and an elevation of 6,500 feet. Soil depth is variable on the site with an effective rooting depth (see methods) that averages almost 13 inches. Soil texture is a clay loam with a neutral pH (7.3). The soil is rocky with pavement concentrated in the mostly bare shrub interspaces. The top soil is easily disturbed and soil movement is noticeable, yet erosion is localized due to the gentle terrain. Litter cover is relatively high (averaging 60%), but is usually associated with the shrubs and trees.

The overstory is comprised of juniper and oakbrush. They account for 37% and 52% respectively of the shrub cover. Density estimates of the mature juniper trees using point-quarter data is 253 per acre in 1997. Shrub density strip data estimates that nearly half of the population is made up of seedlings or young. Gambel oak grows in a variety of heights. Mature oak currently averages nearly 4 feet in height. Density changed from 2,499 stems/acre in 1989 to 6,020 in 1997. This change is reflective of the much larger sample size used in 1997 which better estimates shrub densities which often have aggregated and/or discontinuous distributions. Where oak and juniper occur, there is litter cover and some grasses. Between trees, the ground is bare of cover.

The key understory browse species are bitterbrush and true mountain mahogany. Currently, the bitterbrush population estimated density is 440 plants/acre with 82% being classified as mature. They are a prostrate, low growing form and average only 14 inches in height, however they have an average crown of 48 inches. Utilization was moderate to heavy in 1989, although light to moderate use was noted in 1997. Vigor is generally good and percent decadence low at 13%. The less common mountain mahogany, numbered only 20 young plants/acre in 1997. Mature plants were not encountered in the sample in 1997, but measured only for height and crown. Both species are moderately hedged. They have good vigor except when under the spreading oakbrush clones.

Grasses are scarce, although a fair stand of Kentucky bluegrass (moderately shade tolerant) was found under the oak. It provides little available forage. All grasses combined produce only 2% cover. Forbs are also scarce, yet 18 species were identified. Only the small longleaf phlox are very abundant.

1989 APPARENT TREND ASSESSMENT

Even with all the bare interspaces, erosion is not excessive due to the gentle slope. The soil trend is stable. Due to the increasing oak and juniper, there is a downward trend for the site as winter range. Another negative factor is the depleted understory.

1997 TREND ASSESSMENT

The soil trend is stable but in poor condition. Soil movement is noticeable but moderated by the lack of slope. Oak and juniper are increasing their dominance of the site and trend is down slightly for the more desirable understory species like bitterbrush. Overall trend for browse on this winter range is down slightly. Trend for

the herbaceous understory is down for perennial grasses and up slightly for perennial forbs. Overall trend is considered down slightly and in poor condition because combined, they only provide barely 3% cover.

TREND ASSESSMENT

soil - stable, but poor

browse - down slightly with the increasing dominance of juniper and oakbrush

herbaceous understory - down slightly and in poor condition

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 12

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron smithii	29	*8	13	6	.05
G	Agropyron spicatum	3	9	2	4	.04
G	Bromus tectorum (a)	-	47	-	17	.13
G	Carex spp.	-	6	-	4	.25
G	Oryzopsis hymenoides	38	*17	17	8	.19
G	Poa pratensis	141	*75	57	30	1.10
G	Poa secunda	-	5	-	3	.04
G	Sitanion hystrix	14	18	9	8	.26
Total for Grasses		225	185	98	80	2.08
F	Achillea millefolium	2	8	1	3	.04
F	Arabis spp.	5	1	3	1	.00
F	Artemisia ludoviciana	-	3	-	1	.00
F	Astragalus convallarius	4	11	3	7	.11
F	Chaenactis douglasii	1	*13	1	6	.10
F	Cirsium spp.	1	-	1	-	-
F	Cryptantha spp.	2	8	2	3	.06
F	Cymopterus longipes	-	3	-	1	.00
F	Cynoglossum officinale	1	-	1	-	-
F	Epilobium paniculatum (a)	-	3	-	1	.00
F	Erysimum spp.	-	-	-	-	.00
F	Hackelia patens	3	8	2	4	.02
F	Microsteris gracilis (a)	-	10	-	5	.02
F	Oenothera spp.	-	2	-	1	.03
F	Penstemon spp.	-	2	-	2	.03
F	Phlox longifolia	46	54	24	20	.25

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	<i>Polygonum douglasii</i> (a)	-	1	-	1	.00
F	<i>Ranunculus testiculatus</i> (a)	-	11	-	6	.05
F	<i>Senecio multilobatus</i>	5	-	3	-	-
F	<i>Streptanthus cordatus</i>	8	10	4	4	.19
F	<i>Taraxacum officinale</i>	-	3	-	2	.01
F	<i>Veronica biloba</i> (a)	-	45	-	20	.17
Total for Forbs		78	196	45	88	1.15

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

BROWSE TRENDS --

Herd unit 16B , Study no: 12

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	<i>Artemisia tridentata</i> <i>vaseyana</i>	4	.15
B	<i>Cercocarpus montanus</i>	1	.00
B	<i>Juniperus osteosperma</i>	24	16.18
B	<i>Pinus edulis</i>	2	.63
B	<i>Purshia tridentata</i>	12	3.96
B	<i>Quercus gambelii</i>	62	22.93
B	<i>Rosa woodsii</i>	1	-
B	<i>Symphoricarpos oreophilus</i>	2	.15
Total for Browse		108	44.02

BASIC COVER --

Herd unit 16B , Study no: 12

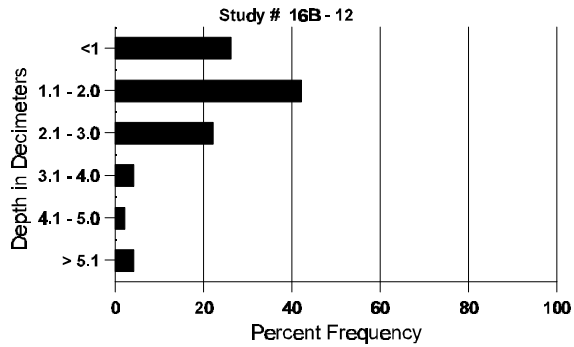
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	253	3.00	45.22
Rock	75	1.75	1.26
Pavement	135	11.75	5.31
Litter	379	63.00	60.33
Cryptogams	36	.75	1.39
Bare Ground	178	19.75	15.09

SOIL ANALYSIS DATA --

Herd Unit 16B, Study no: 12

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.6	57.6 (13.9)	7.3	41.7	26.1	32.2	2.8	7.8	60.8	.4

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16B , Study no: 12

Type	Quadrat Frequency '97
Sheep	1
Rabbit	12
Elk	4
Deer	9
Cattle	1

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 12

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total											
		1	2	3	4														
<i>Artemisia tridentata vaseyana</i>																			
Y	89	-	-	-	-	-	-	-	-	-	-	-	0		0				
	97	-	-	-	1	-	-	-	-	-	-	-	1	-	20	1			
M	89	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0			
	97	1	-	-	2	-	-	-	-	-	-	-	3	29	32	3			
D	89	-	-	-	-	-	-	-	-	-	-	-	0			0			
	97	-	1	-	-	-	-	-	-	-	-	-	1	-	20	1			
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>				<u>%Change</u>									
'89		00%		00%		00%				Appeared									
'97		20%		00%		00%													
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	0%						
										'97	100		20%						
<i>Cercocarpus montanus</i>																			
Y	89	1	1	-	-	1	-	-	-	-	-	3	-	-	-	100		3	
	97	1	-	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	1	1	-	-	-	-	-	-	-	2	-	-	-	66	25	47	2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	54	72	0
D	89	-	1	-	-	-	-	-	-	-	-	-	-	-	1	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>				<u>%Change</u>									
'89		67%		17%		17%				-90%									
'97		00%		00%		00%													
Total Plants/Acre (excluding Dead & Seedlings)										'89	199	Dec:	17%						
										'97	20		0%						

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Chrysothamnus viscidiflorus viscidiflorus																	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Died out						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-			
											'97	0		-			
Juniperus osteosperma																	
S	89	-	-	-	1	-	-	1	-	-	2	-	-	-	66		2
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
Y	89	7	-	-	2	-	-	1	-	-	10	-	-	-	333		10
	97	9	-	-	-	-	-	1	-	-	10	-	-	-	200		10
M	89	3	-	-	-	-	-	-	2	-	5	-	-	-	166	128 79	5
	97	9	1	-	-	-	-	6	1	-	17	-	-	-	340	- -	17
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+ 8%						
'97		04%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	499	Dec:	-			
											'97	540		-			
Pinus edulis																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	1	-	-	-	-	-	2	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	40		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Purshia tridentata</i>																		
Y	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	15	2	-	-	-	-	-	-	16	-	1	-	566	10 23	17	
	97	1	7	-	-	10	-	-	-	-	18	-	-	-	360	14 47	18	
D	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	1	-	-	2	-	-	-	-	2	-	-	1	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		80%			10%			05%			-34%							
'97		91%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	665	Dec:	10%				
											'97	440		14%				
<i>Quercus gambelii</i>																		
S	89	2	-	-	1	-	-	4	-	-	7	-	-	-	233		7	
	97	4	-	-	3	-	-	-	-	-	7	-	-	-	140		7	
Y	89	12	16	-	4	-	-	-	-	-	19	12	1	-	1066		32	
	97	70	-	-	3	-	-	-	-	-	73	-	-	-	1460		73	
M	89	4	7	1	-	6	-	-	-	-	11	7	-	-	600	58 28	18	
	97	209	-	-	8	-	-	4	-	-	221	-	-	-	4420	40 35	221	
D	89	13	8	-	-	4	-	-	-	-	3	22	-	-	833		25	
	97	7	-	-	-	-	-	-	-	-	6	-	-	1	140		7	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	880		44	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		55%			01%			01%			+58%							
'97		00%			00%			.33%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2499	Dec:	33%				
											'97	6020		2%				
<i>Rhus trilobata trilobata</i>																		
D	89	-	2	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	100%				
											'97	0		0%				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
<i>Rosa woodsii</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>					
'89		00%			00%			00%				Appeared					
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	20		-		
<i>Symphoricarpos oreophilus</i>																	
Y	89	8	-	-	-	-	-	-	-	-	-	3	5	-	-	266	8
	97	-	-	-	1	-	-	-	-	-	-	1	-	-	-	20	1
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	-	-	-	3	-	-	-	-	-	-	3	-	-	60	-	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>					
'89		00%			00%			00%				-70%					
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	266	Dec:	-		
												'97	80		-		

Trend Study 16B-13-97

Study site name: Oak Creek Ridge Aspen .

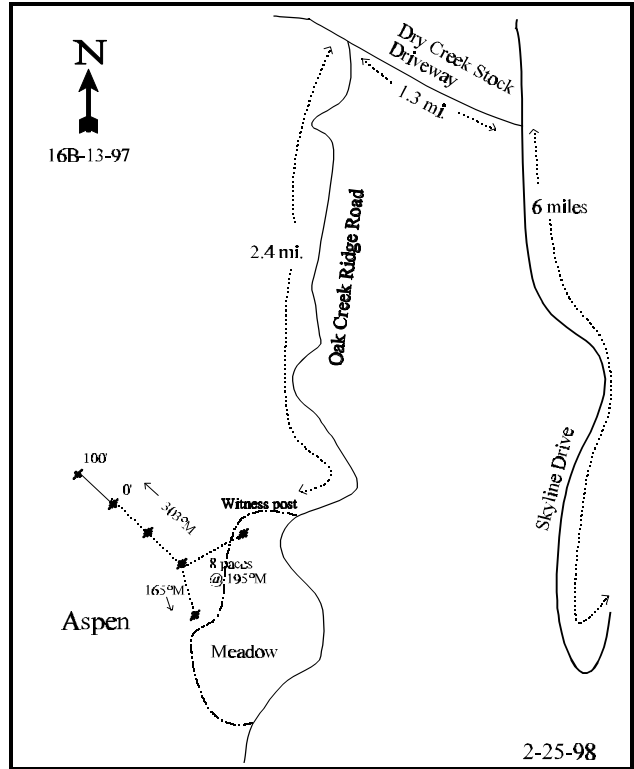
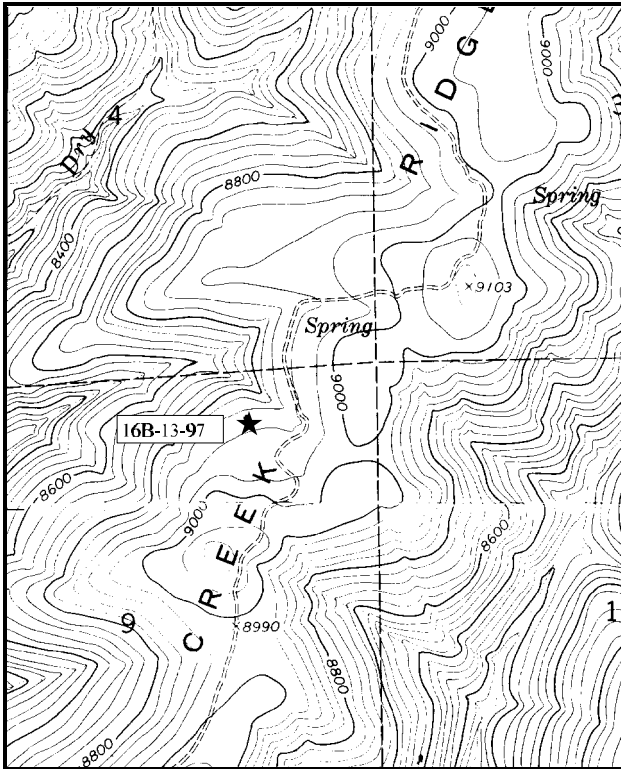
Range type: Quaking Aspen

Compass bearing: frequency baseline 303M degrees. (Line 4 165°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of highways 91 and 31 in Fairview, take highway 31 eastward 8.4 miles to Skyline Drive. Turn north on Skyline Drive and go approximately 6 miles, passing the Gooseberry Road. Turn west onto the Dry Creek Stock Driveway and go 1.3 miles to a fork. Take the left fork (south) through a fence and stay on the Oak Creek Ridge Road for 1.75+ miles passing numerous side roads. Here you will see a bare knoll. Go another 0.3 miles to a clearing with a water trough and a small fork. Stay left at this fork and go another 0.3 miles to a sign That reads “seeded area” on the west side of the road in a clearing. The witness post is back in the clearing. From this post the O-foot baseline stake is 8 paces away at an azimuth of 195°M.



Map Name: Fairview Lakes .

Diagrammatic Sketch

Township 13S , Range SE , Section 9

UTM 4395471.092 N , 468618.346 E

DISCUSSION

Trend Study No. 16B-13 (28-13)

One of two studies on Oak Creek Ridge, this study samples an aspen community in an area that is thought to be important spring elk range. This Forest Service land is permitted for cattle grazing. The allotment was rested for two seasons since the meadow was seeded in 1988. During the 1997 reading, pellet group frequency data suggests light use by elk, deer, and cattle.

The site is on a gentle slope (5-10%) with a northwest aspect and an elevation of 8,900 feet. The soil is relatively deep with few rocks in the profile. Effective rooting depth (see methods) is estimated at just over 20 inches. Soil texture is a clay with a neutral pH (6.8). Organic matter is prevalent in the rich soil. A humus rich layer extends down to a depth of 4 to 6 inches, followed by a clay horizon which extends down to the bottom of the shovel at about 20 inches. Compaction and erosion are not a problem. Gopher activity on the site is significant. Vegetation and litter cover are abundant and there is no erosion occurring.

The site samples a mid-aged aspen stand with few seedling or young trees. The population is mostly mature trees, all of which are either mostly unavailable or totally unavailable to browsing due to their height. Point quarter data from 1997 estimated there to be 481 trees/acre with an average diameter of 7 inches. Overhead canopy cover averages 72%. Understory shrubs consist of elderberry and a few snowberry. Elderberry density was estimated at 1,133 plants/acre in 1989 and only 240 in 1997. The change in density is almost entirely due to the much larger, more representative sample used in 1997 giving better estimates for species that are characteristically clumped or discontinuous in their respective distributions. However, it appears that the density of mature plants remained similar while density of young plants which numbered 900 plants/acre in 1989, declined to only 20. Use in 1997 was moderate to heavy. Only one snowberry plant was encountered in the shrub density strips in 1997.

The dense herbaceous understory is the key component to monitor on this site. Only two species of grass, slender wheatgrass and big mountain brome, were encountered in 1989. The larger sample used in 1997 also encountered some Kentucky bluegrass. These three grasses combined, produced less than 6% cover in 1997.

Forbs account for 86% of the vegetative cover on the site and represent the most significant vegetative component. Twenty-five species were encountered in 1997. Common species include; bedstraw, ballhead waterleaf, tuber starwort, and western coneflower. Utilization of the grasses and forbs is light.

1989 APPARENT TREND ASSESSMENT

Data from this study indicate a productive, diverse, and stable community. There is no erosion and the soil trend is stable. There is abundant herbaceous forage. Elk have been in the area all spring and summer, and there is sign of light and dispersed utilization in the aspen type. Proper livestock grazing management must be followed. Elk alone have not caused adverse impacts to the vegetative community in this area.

1997 TREND ASSESSMENT

The soil trend is stable with no erosion occurring due to the abundant vegetation and litter cover. Little browse is available on this site, but trend for the most abundant understory shrub (elderberry), is stable. Trend for the aspen is stable. However, this is not a particularly healthy aspen stand. Nearly all of the trees are mature with few seedlings and young. Dead trees number 160 per acre or one out of every 5 aspen trees. Trend for the herbaceous understory is down slightly for grasses but up for forbs. Overall trend is considered up since forbs

are the key component on the site as they contribute to 87% of the herbaceous understory.

TREND ASSESSMENT

soil - stable

browse - stable, but only contributes to less than 1% of the vegetative cover

herbaceous understory - up

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 13

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron trachycaulum	141	137	58	52	2.03
G	Bromus marginatus	301	*175	97	66	3.23
G	Poa pratensis	-	*48	-	14	.67
Total for Grasses		442	360	155	132	5.94
F	Achillea millefolium	-	*33	-	13	1.35
F	Agoseris glauca	-	*8	-	4	.04
F	Aster spp.	-	*16	-	6	.54
F	Chenopodium spp. (a)	-	15	-	6	.20
F	Cirsium spp.	-	2	-	1	.15
F	Claytonia lanceolata	-	*182	-	70	1.44
F	Collomia linearis (a)	-	15	-	5	.22
F	Descurainia californica (a)	125	-	59	-	-
F	Erigeron spp.	-	-	-	-	.00
F	Fritillaria atropurpurea	-	*22	-	7	2.68
F	Galium aparine (a)	-	249	-	75	8.15
F	Hackelia patens	66	*-	32	-	-
F	Helenium hoopesii	9	*39	4	17	1.65
F	Hydrophyllum capitatum	-	*188	-	77	4.03
F	Madia glomerata (a)	-	4	-	2	.01
F	Mertensia ciliata	-	*13	-	5	.12
F	Medicago sativa	2	-	1	-	-
F	Osmorhiza occidentalis	60	60	27	30	1.37
F	Polygonum douglasii (a)	-	3	-	2	.01
F	Rudbeckia occidentalis	175	*79	73	41	3.59
F	Senecio serra	4	-	2	-	.00
F	Stellaria jamesiana	242	243	89	78	7.25

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Taraxacum officinale	3	*48	2	22	.88
F	Thalictrum fendleri	6	1	3	1	.03
F	Unknown forb-annual	-	11	-	4	.48
F	Unknown forb-perennial	-	*75	-	23	1.80
F	Vaccinium caespitosum	-	3	-	2	.01
F	Vicia americana	107	82	46	34	1.31
F	Viguiera multiflora	13	*68	6	24	.37
F	Viola spp.	54	*91	28	44	1.10
Total for Forbs		866	1550	372	593	38.84

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

BROWSE TRENDS --

Herd unit 16B , Study no: 13

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Populus tremuloides	31	.21
B	Sambucus racemosa pubens microbotrys	10	.18
B	Symphoricarpos oreophilus	1	.15
Total for Browse		42	0.55

BASIC COVER --

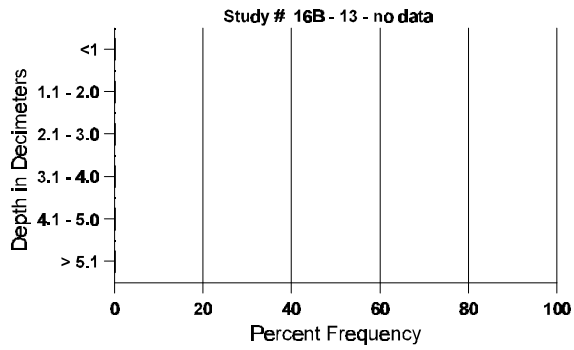
Herd unit 16B , Study no: 13

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	383	15.25	48.09
Rock	47	.25	.66
Pavement	46	0	.10
Litter	389	64.50	63.64
Cryptogams	2	0	.00
Bare Ground	127	20.00	8.44

SOIL ANALYSIS DATA --
 Herd Unit 16B, Study no: 13

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
20.1	38.6 (17.7)	6.8	24.0	27.8	48.2	6.7	22.3	182.4	.4

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16B , Study no: 13

Type	Quadrat Frequency '97
Rabbit	3
Elk	1
Deer	2
Cattle	2

BROWSE CHARACTERISTICS --

Herd unit 16B , Study no: 13

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total								
		1	2	3	4											
<i>Populus tremuloides</i>																
S	89	-	1	-	-	-	-	-	1	1						
	97	1	-	-	-	-	-	-	1	-	-	-				
Y	89	-	-	-	-	-	-	4	4	-	-	-	4			
	97	-	-	-	-	-	-	-	-	-	-	-	0			
M	89	-	-	-	-	-	-	11	11	-	-	-	366	393	158	11
	97	-	1	-	-	-	-	39	40	-	-	-	800	-	-	40
X	89	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	160			8
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'89		00%		00%		00%		+38%								
'97		03%		00%		00%										
Total Plants/Acre (excluding Dead & Seedlings)										'89	499	Dec:	-			
										'97	800		-			
<i>Sambucus racemosa pubens microbotrys</i>																
Y	89	21	6	-	-	-	-	-	27	-	-	-	900			27
	97	1	-	-	-	-	-	-	1	-	-	-	20			1
M	89	6	1	-	-	-	-	-	7	-	-	-	233	79	39	7
	97	3	5	2	-	-	-	-	10	-	-	-	200	31	14	10
D	89	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	20			1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'89		21%		00%		00%		-79%								
'97		42%		17%		08%										
Total Plants/Acre (excluding Dead & Seedlings)										'89	1133	Dec:	0%			
										'97	240		8%			
<i>Symphoricarpos oreophilus</i>																
Y	89	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'89		00%		00%		00%		Appeared								
'97		00%		00%		00%										
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-			
										'97	20		-			

Trend Study 16B-14-97

Study site name: Oak Creek Ridge Seeding .

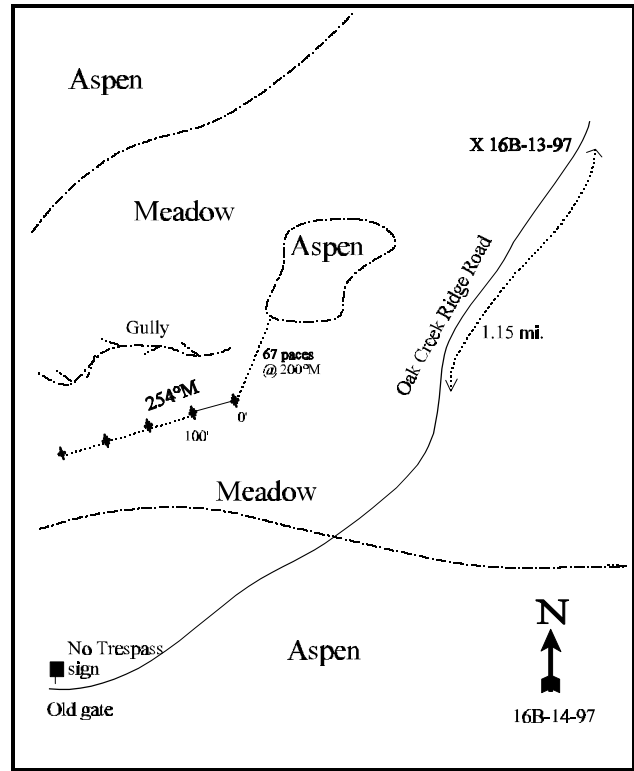
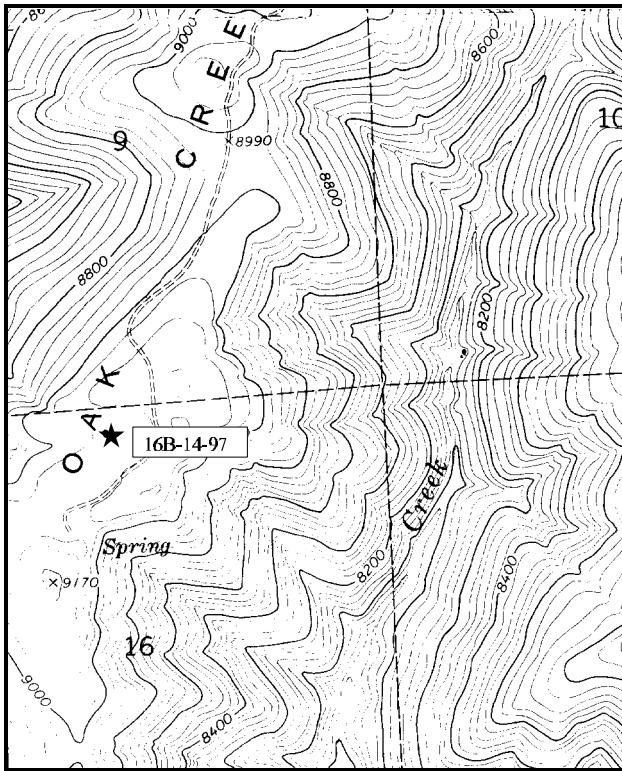
Range type: Dry Meadow

Compass bearing: frequency baseline 254 M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of highways 91 and 31 in Fairview, take highway 31 eastward 8.4 miles to Skyline Drive. Go north on Skyline Drive for approximately 6 miles and turn left towards the Dry Creek Stock Driveway. Go 0.35 miles to an intersection, continue straight for mile to the fence marking the boundary of the Oak Creek Ridge Allotment. Drive 2.4 miles to the witness post for study #16B-13. Continue on the main road 1.15 miles to a large meadow. This is the last meadow on the ridge. The O' baseline stake is about 100 yards into the meadow and is marked by browse tag #9089. (From the edge of the aspen patch the O-foot baseline stake is 67 paces away at an azimuth of 200°M.) Do not confuse the transect with a U.S.F.S. study that runs southwest/northeast and is marked by orange and green fenceposts.



Map Name: Fairview Lakes .

Diagrammatic Sketch

Township 13S, Range 5E, Section 16

UTM 4393902.179 N, 468205.917 E

DISCUSSION

Trend Study No. 16B-14 (28-6)

The Oak Creek Ridge Seeding study samples one of the seeded meadows on Oak Creek Ridge. Located on the end of the ridge, it is the largest seeded meadow and appeared to have better grass establishment than some of the other meadows when first sampled in 1989. Previously, these aspen openings had an abundance of tarweed. These areas were treated in the fall of 1988 to remove the weeds, then seeded. This meadow is also monitored by a Forest Service photo point transect. The study is on a 5% slope with a westerly aspect and an elevation of 9,050 feet. Pellet group data indicates moderately low elk and cattle use, with light use by deer. A nearby landowner reported that 140 head of cattle used the site for over 90 days in 1996.

The soil is fairly deep with an effective rooting depth (see methods) of nearly 25 inches. Soil texture is a clay with a slightly acid pH (6.5). Due to the patchy distribution of the newly seeded grasses and the abundance of annuals, ground cover was limited in 1989. There was little litter, but basal vegetative cover was moderately high at 13%, leaving 84% bare soil. There were definite signs of erosion across the meadow and down the adjacent gully in 1989. Sheet erosion and small rills occurred on the gentle slope. During the 1997 reading, percent bare ground declined to 42% and litter increased to 12%. There is a substantial amount of gopher activity.

The meadow is surrounded by mature aspen stands which have an understory of native grasses and coneflower. No browse was encountered on the study site. This area should climatically fall into the tall forb community type. In 1989, the seeded species were not yet well-established. There was ample space for germination and the spread of the rhizomatous species. The intermediate wheatgrass were large and robust. Some of the grasses had been recently grazed. In 1997, seeded species are more abundant. Sum of nested frequency of grasses have doubled. Intermediate wheatgrass, smooth brome, and orchard grass are dominant, combining to produce 97% of the grass cover.

Like the nearby Oak Creek Aspen site, forbs are the dominant vegetation type. Twenty-four species were encountered in 1997. They combine to produce nearly 30% cover or 75% of the total vegetative cover. Unfortunately, the composition is extremely poor. Tarweed has rebounded and currently accounts for 61% of the forb cover or 46% of the total vegetation cover. Other common species include thistle, pacific aster, and hounds tongue. Seeded forbs are uncommon.

1989 APPARENT TREND ASSESSMENT

Trends appear upward as the seeded grasses increase to provide additional litter and soil protection. With adequate precipitation and proper grazing management, the grasses should out-compete the annuals.

1997 TREND ASSESSMENT

The soil trend is up since treatment with percent bare ground declining from 84% to 42%. Litter cover has also increased and the abundant herbaceous cover appears to adequately protect the soil from severe erosion. However, the ratio of bare soil to protective ground cover is only 1:2. For good protection, this ratio should be at least 1:3. This should improve with time. Browse are absent and not an important component of this summer range. Trend for the herbaceous understory is up for grasses but down for forbs due to the dominance of tarweed. It currently accounts for nearly half (46%) of the vegetative cover. Overall trend is considered down slightly.

TREND ASSESSMENT

soil - up, but still fairly poor protective cover

browse - absent and not an important aspect on this summer range

herbaceous understory - down slightly and dominated by tarweed

HERBACEOUS TRENDS --

Herd unit 16B , Study no: 14

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron intermedium	87	99	42	42	2.26
G	Agropyron spicatum	-	*12	-	5	.22
G	Bromus inermis	-	*100	-	40	3.39
G	Bromus japonicus (a)	1	-	1	-	-
G	Bromus spp.	1	2	1	1	.03
G	Dactylis glomerata	-	*116	-	51	3.59
G	Lolium perenne	26	*-	12	-	-
G	Phleum pratense	42	*8	22	4	.07
Total for Grasses		157	337	78	143	9.57
F	Achillea millefolium	2	*6	1	3	.33
F	Agoseris glauca	-	*49	-	17	.57
F	Aster spp.	-	*19	-	6	1.97
F	Chenopodium album	-	3	-	1	.00
F	Cirsium spp.	1	*124	1	57	2.29
F	Claytonia lanceolata	-	*174	-	59	1.50
F	Cynoglossum officinale	10	*113	8	54	2.35
F	Descurainia californica	14	-	10	-	-
F	Epilobium spp.	2	-	2	-	-
F	Eriogonum caespitosum	4	6	1	3	.16
F	Erigeron spp	-	3	-	1	.00
F	Galium aparine (a)	-	3	-	1	.00
F	Geranium spp.	-	3	-	1	.00
F	Hedysarum boreale	6	-	3	-	-
F	Lactuca serriola	8	-	4	-	-
F	Linum lewisii	7	2	5	2	.16
F	Madia glomerata (a)	25	*363	16	98	17.90
F	Mertensia ciliata	-	3	-	1	.00
F	Melilotus officinalis	8	*-	5	-	-

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Medicago sativa	-	1	-	1	.15
F	Oenothera flava	11	*3	8	1	.00
F	Penstemon spp.	-	-	-	-	.00
F	Polygonum douglasii (a)	-	81	-	25	.27
F	Senecio multilobatus	1	-	1	-	-
F	Stellaria jamesiana	-	2	-	2	.01
F	Taraxacum officinale	-	7	-	3	.21
F	Tragopogon dubius	1	9	1	4	.07
F	Unknown forb-annual	-	3	-	1	.15
F	Vicia americana	-	*12	-	4	.02
F	Viguiera multiflora	-	*23	-	8	.61
F	Viola spp.	6	*40	5	24	.39
Total for Forbs		106	1052	71	377	29.19

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16B , Study no: 14

T y p e	Species	Average Cover % '97
B	Symphoricarpos oreophilus	.00
Total for Browse		0.00

BASIC COVER --

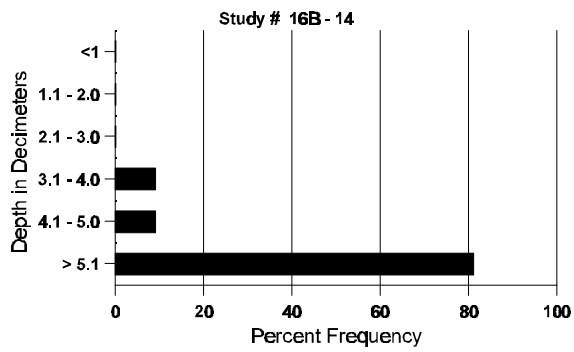
Herd unit 16B , Study no: 14

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	384	13.25	39.88
Rock	104	1.50	.70
Pavement	173	0	.58
Litter	356	1.50	11.58
Cryptogams	-	0	0
Bare Ground	366	83.75	42.25

SOIL ANALYSIS DATA --
Herd Unit 16B, Study no: 14

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
24.8	47.9 (17.7)	6.5	24.0	32.4	43.6	3.5	35.3	214.4	.4

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 16B , Study no: 14

Type	Quadrat Frequency '97
Elk	12
Deer	1
Cattle	9

TREND SUMMARY

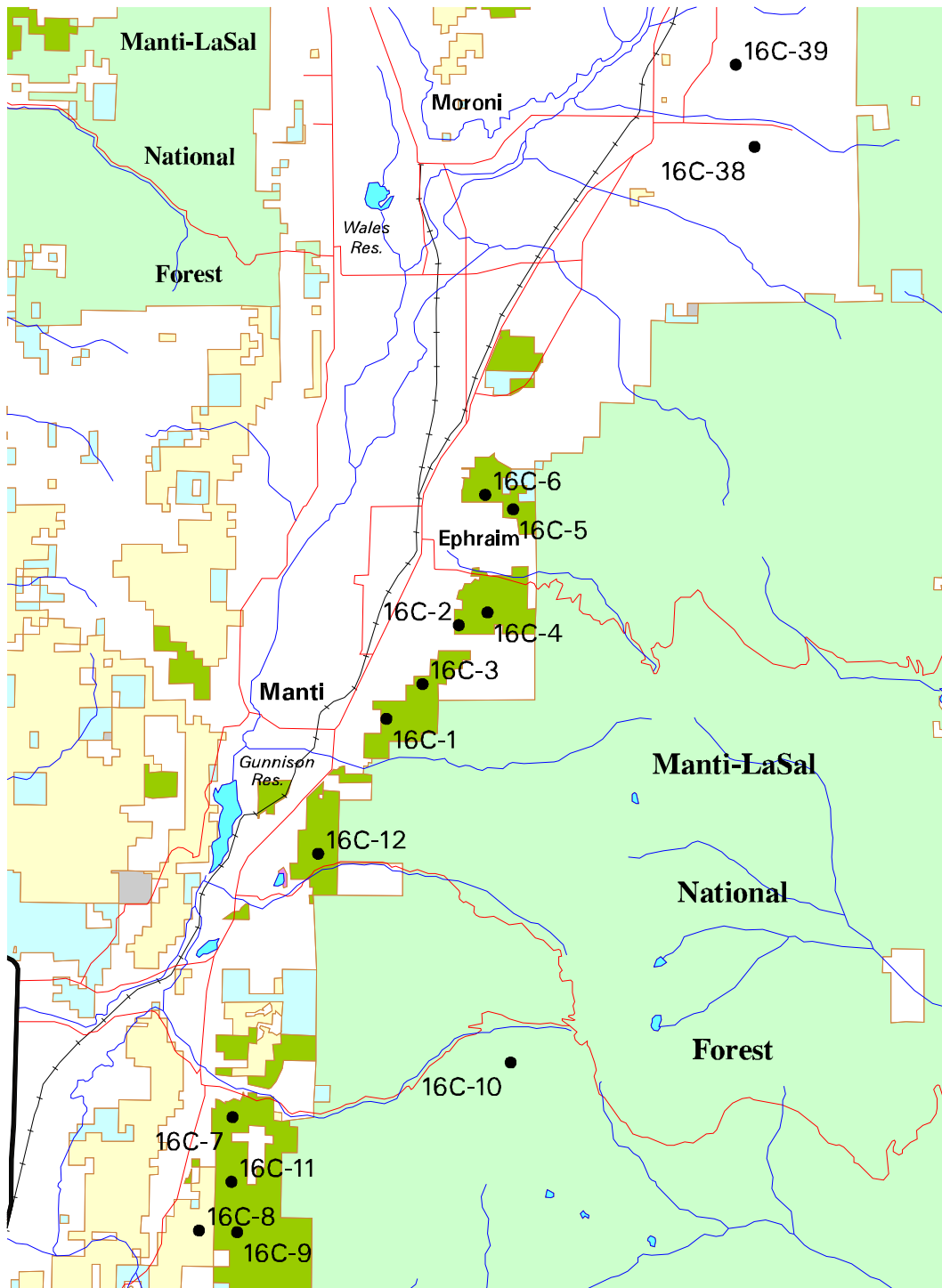
WILDLIFE MANAGEMENT UNIT - 16B - MANTI-NEBO, MANTI NORTH

Twelve trend studies were established in 1989 and reread in 1997. Many of these sites were placed on or near old line intercept studies placed in 1978. Three sites, Long Ridge South (16B-2), Rocky Hollow 16B-3) and Mill Fork (16B-6) sample big sagebrush-grass range types. All of these sites have stable soil trends and stable to improving browse trends. Three pinyon-juniper chainings were sampled by sites at Dry Creek Chaining (16B-4), Jackson Unit (16B-5) and Hilltop Chaining (16B-11). Soil trends are slightly down at the Dry Creek Chaining, down on the Hilltop chaining but up slightly on Jackson Unit. Browse trends are slightly down on Jackson Unit and Hilltop but stable on Dry Creek. Pinyon and juniper trees are reestablishing on all of these sites. The study site on Dairy Fork Burn samples a treated basin big sagebrush flat. Trends are stable to improving in all categories. Three sites on the unit sample mixed mountain brush community types. These are; Long Ridge South (16B-1), East Dairy Fork (16B-7) and Oak Creek (16B-12). Soil conditions are poor on the East Dairy Fork and the Oak Creek site due to the dominance of trees and shrubs. This leaves little herbaceous understory plants to protect the soil. The browse trends are slightly down on the Long Ridge South and Oak Creek but slightly up on the East Dairy Fork site. One aspen site is included in this unit. The Oak Creek Aspen study site samples a mostly mature aspen stand with a forb dominated understory. Browse is limited and the browse trend is stable. The herbaceous understory trend is up. One study site at Oak Creek Seeding samples a treated meadow which was once dominated by tarweed. Seeded grasses are now well established but tarweed has become abundant once again to give a slightly downward herbaceous trend. A trend summary table follows.

Site	1997		
	Soil	Browse	Grasses & Forbs
16B-1 Long Ridge South	+	-	+
16B-2 Long Ridge North	0	+	+
16B-3 Rocky Hollow	0	0	+
16B-4 Dry Creek Chaining	-	0	-
16B-5 Jackson Unit	+	-	0
16B-6 Mill Fork	0	+	0
16B-7 East Dairy Fork	0	+	+
16B-8 Dairy Fork Burn	0	0	+
16B-11 Hilltop chaining	-	-	0
16B-12 Oak Creek	0	-	-
16B-13 Oak Creek Aspen	0	0	+
16B-14 Oak Creek Seeding	+		-











+ = upward trend, - = downward trend, 0 = stable trend

Management Unit 16C



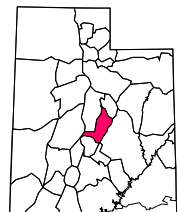
Map Scale 1:332,640 (1" = 5.25 mi)

Legend

- | | | |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|  Forest Service |  Private Land |  Road |
|  BLM |  State Wildlife Res. |  Water Course |
|  State of Utah |  Water Body | |
|  Military Res. |  Transect Location | |



Unit Location



WILDLIFE MANAGEMENT UNIT - 16 - MANTI-NEBO

SUB UNIT - 16C - MANTI-NEBO, MANTI SOUTH

Boundary Description

Sanpete, Emery, and Sevier counties - Boundary begins at the junction of Highway SR-10 and Highway SR-31 at Huntington; then south on SR-10 to Interstate 70; west on I-70 to Highway US-89 at Salina; north on US-89 to SR-31 at Fairview; southeast on SR-31 to SR-10 at Huntington and beginning point.

With the way that the unit has been realigned and subdivided, the report on 16C is dealing mostly with old herd unit number 29 and the northwest portion of herd unit 42 (Salina). The eastern side of this subunit is mostly old herd unit number 31 and the northeastern portion of herd unit 42 (Salina). Deer numbers have been increasing since the die-off in the winter of 1992-93; however, the fawn-doe ratios are still somewhat lower than of those in the late 1980's and early 1990's. There has been an overall conspicuous decline in the quality of winter range with a slow decline of sagebrush densities in association with increasing decadence. There has been improvement in the last few years with the end of the extended drought, but the progress is mostly with increased vigor, less decadence, and commonly lower densities which have decreased intraspecific competition among the sagebrush communities. Numerous Division lands within the winter range, especially chainings, are generally in good condition and are able to help supplement the areas that have poor winter ranges.

Trend Study 16C-1-97

Study site name: Manti Face Chaining .

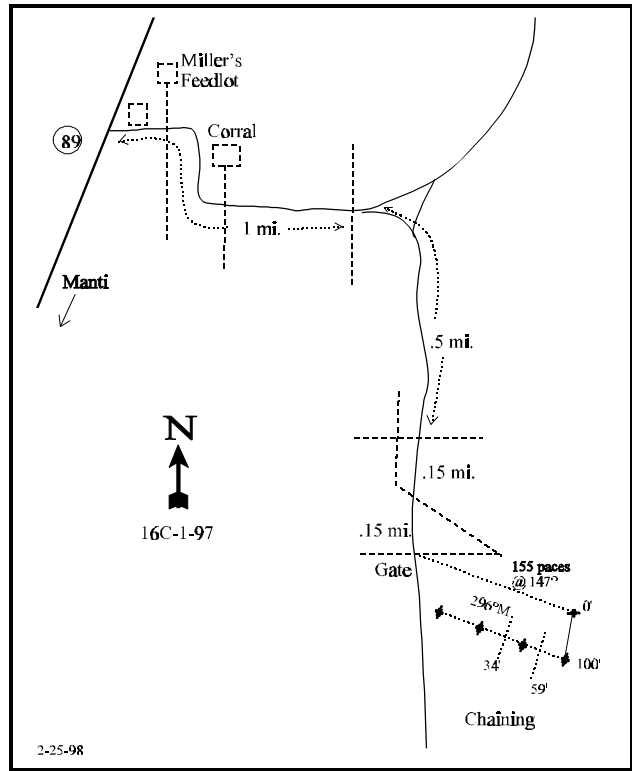
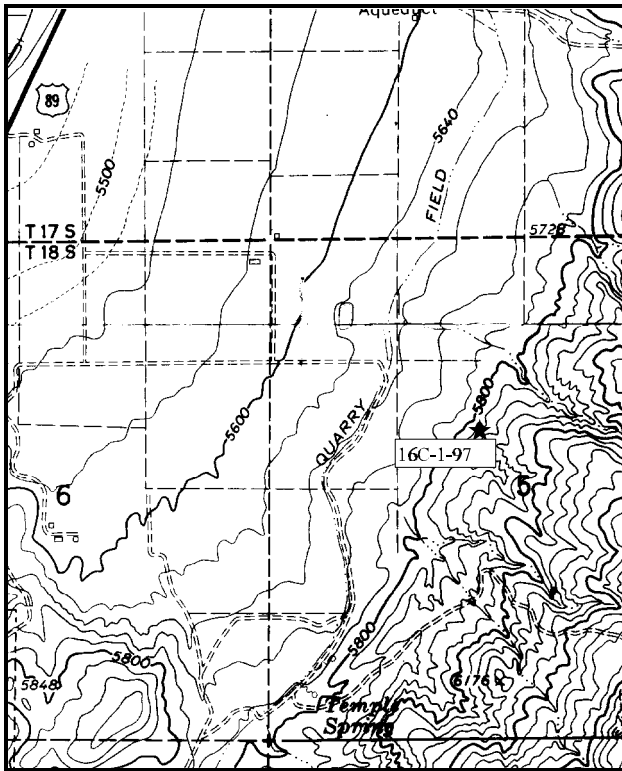
Range type: Chained, cabled reseeded P.J.

Compass bearing: frequency baseline 192 M degrees. (Line 2-4 296°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

LOCATION DESCRIPTION

Go north out of Manti on 89 about 1 mile or so to a feedlot on the right (east) side of the road. Turn right on south side of these corrals. Go up this county road 1 mile, following the main road around the upper corrals, to an old fence line. Just past the fence, bear right off the main road onto a faint road. Follow this road 0.5 miles to the first DWR fence. Go through this small section of DWR land 0.15 miles to another fence. Go 0.15 miles to another DWR fence. Stop at this gate. From here, the study site is up the hill in the chaining, 155 paces at 139°M to the O' baseline stake, which is marked by browse tag #9043.



Map Name: Ephraim .

Diagrammatic Sketch

Township 18S , Range 3E , Section 5

DISCUSSION

Trend Study No. 16C-1 (29-1)

The Manti Face Chaining study is located on Division property northeast of Manti. The chained slopes are adjacent to cultivated fields. Because it was done when chainings were treated as large rectangular areas, protective cover is lacking on the treated area and there is limited sign of deer and elk use. The property is not grazed by livestock.

The study is on a moderately steep (28%) west-facing slope with an elevation of 5,900 feet. Textural analysis shows the soil as a clay loam. It is reported to be somewhat excessively drained. Effective rooting depth (see methods) is almost 10 inches with a pH that is neutral to slightly alkaline (7.3). Rocks occur throughout the soil profile. Erosion pavement is abundant and currently has a cover value of 27%, with the amount of bare soil at about 13%. The percentage of litter cover is low, but there is good vegetative cover and litter buildup associated with the bunch grasses. The soil description indicates that the soil has rapid runoff and a very severe erosion hazard. Considering this, soil condition appears to have improved since the treatment. Current soil loss is considered negligible.

There is limited browse forage available on the chaining. Seeded species are relatively uncommon. A few large and robust four-wing saltbush were observed, along with an occasional small bitterbrush found within the planting rows left by the seed dribblers mounted on the decks of crawler tractors. They have good vigor and moderate utilization. The small and lightly used native black sagebrush have a stable population. They show a downward change in their density, but this is more reflective of the much larger sampling design giving better estimates of shrub densities, for there were no dead plants found within the population to explain the decrease any other way. Juniper appeared to be rapidly reinvading the treated area according to personnel in 1989. However, in 1997 it appears that the population had decreased to only 183 trees/acre with one-third classified as dead. The population density was determined by the point-centered quarter method. There was a mature population of broom snakeweed on the treatment area that has shown a decrease in its numbers from 1,765 to 700 plants/acre in 1997.

Seeded grasses dominate the chained site by providing 72% of the grass cover. Native species (bottlebrush squirreltail, bluebunch wheatgrass, and Indian ricegrass) only contribute 23% of the grass cover. Crested wheatgrass and intermediate wheatgrass are the most abundant. Seeded forbs were fairly common in 1989, especially the alfalfa and small burnet, but now only contribute 6% of the forb cover. The extended drought has had a strong negative effect on their respective densities. These preferred species have been grazed. Native and seeded forbs are relatively unimportant on this site at this time as they only provide about 24% of the herbaceous cover. Seventy-six percent of the forb cover is contributed by bur buttercup, a noxious weed that is allelopathic. The majority of the forb species are undesirable, weedy species.

1989 APPARENT TREND ASSESSMENT

For deer winter range, browse is lacking. The productive herbaceous vegetation provides attractive green-up in the spring and good forage for elk. It is clearly an improvement from pre-treatment conditions, which should continue to be productive in terms of grass. To meet management objectives, browse needs to increase, indicating an upward trend for winter range values and site diversity. The soil trend is improving due to increasing vegetative cover.

1997 TREND ASSESSMENT

Even though percent bare soil has increased to 13%, it is still relatively low for a pinyon-juniper chained site where 90% of the total vegetative cover is contributed by herbaceous species. Trend for soil is considered stable. The browse component is still quite low where it makes up less than 10% of the total vegetative cover and over 90% of that is contributed by juniper. Preferred browse is almost nonexistent on this site, making up less than 2% of the browse cover. Browse trend is stable, but contributes little browse for wintering big game. The herbaceous understory is stable, with sum of nested frequency values showing grasses almost the same. Nested frequency values for forbs have increased, but it is mostly because of only one species, bur buttercup. Total forb cover only make up less than 24% of the herbaceous cover.

TREND ASSESSMENT

soil - stable

browse - stable, but preferred browse only makes up 10% of the browse cover

herbaceous understory - stable

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 1

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	125	*182	51	71	5.77
G	Agropyron intermedium	118	128	44	51	4.05
G	Agropyron spicatum	47	43	19	15	1.23
G	Bromus inermis	1	-	1	-	-
G	Bromus japonicus (a)	-	5	-	2	.15
G	Bromus tectorum (a)	-	81	-	30	.71
G	Elymus junceus	18	26	10	10	1.39
G	Festuca ovina	21	14	10	6	.25
G	Oryzopsis hymenoides	1	6	1	2	.41
G	Poa secunda	129	*158	50	59	1.60
G	Sitanion hystrix	130	*28	63	13	.39
Total for Grasses		590	671	249	259	15.98
F	Alyssum alyssoides (a)	-	1	-	1	.00
F	Arabis spp.	1	-	1	-	-
F	Arenaria kingii	-	3	-	1	.00
F	Astragalus spp.	3	-	1	-	-
F	Camelina microcarpa (a)	-	31	-	13	.09
F	Chaenactis douglasii	-	6	-	2	.01
F	Chenopodium fremontii	-	1	-	1	.00

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Chorisporea tenella (a)	-	3	-	1	.03
F	Convolvulus arvensis	-	*13	-	6	.40
F	Cryptantha spp.	14	21	9	11	.22
F	Descurainia pinnata (a)	-	14	-	7	.03
F	Draba spp. (a)	-	3	-	1	.00
F	Erodium cicutarium (a)	-	1	-	1	.00
F	Galium aparine (a)	-	1	-	1	.00
F	Lappula occidentalis (a)	-	3	-	1	.00
F	Lactuca serriola	3	3	1	1	.00
F	Medicago sativa	23	12	11	6	.29
F	Penstemon pachyphyllus	3	-	1	-	-
F	Phlox hoodii canescens	7	8	4	3	.04
F	Ranunculus testiculatus (a)	-	297	-	91	3.84
F	Sanguisorba minor	8	-	4	-	-
F	Sisymbrium spp. (a)	7	-	3	-	-
F	Streptanthus cordatus	3	1	1	1	.00
F	Tragopogon dubius	19	14	9	8	.07
Total for Forbs		91	436	45	157	5.08

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

BROWSE TRENDS --

Herd unit 16C , Study no: 1

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Artemisia nova	12	.03
B	Atriplex canescens	2	-
B	Ephedra spp.	2	.03
B	Gutierrezia sarothrae	2	.09
B	Juniperus osteosperma	11	2.03
B	Purshia tridentata	2	.03
Total for Browse		31	2.22

BASIC COVER --

Herd unit 16C , Study no: 1

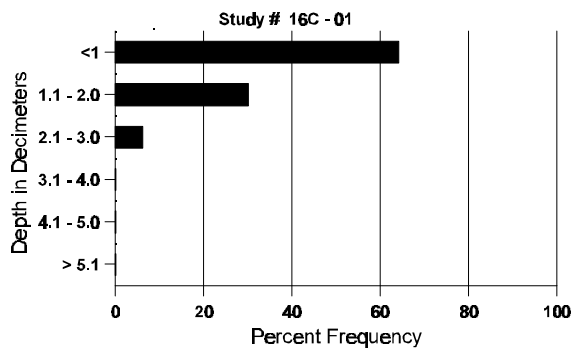
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	357	13.50	28.21
Rock	258	7.00	7.33
Pavement	330	47.00	26.63
Litter	381	25.25	31.50
Cryptogams	67	.25	.55
Bare Ground	263	7.00	13.08

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 01

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.6	59.8 (12.4)	7.3	38.0	34.4	26.6	3.3	9.2	150.4	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16C , Study no: 1

Type	Quadrat Frequency '97
Rabbit	17
Elk	23
Deer	36
Cattle	1

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 1

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total				
		1	2	3	4							
<i>Artemisia nova</i>												
S	89	1	-	-	-	-	-	-	1	33		1
	97	-	-	-	-	-	-	-	-	0		0
Y	89	-	1	1	-	-	-	-	-	2		2
	97	11	1	-	-	-	-	-	-	12		12
M	89	14	3	-	-	-	1	-	-	17	7 13	18
	97	8	5	-	-	-	-	-	-	13	12 20	13
D	89	4	-	1	-	-	-	-	-	2		5
	97	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		16%		08%		12%		-40%				
'97		24%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)									'89	832	Dec:	20%
									'97	500		0%
<i>Atriplex canescens</i>												
M	89	-	-	-	-	-	-	-	-	0	-	0
	97	-	1	1	-	-	-	-	-	2	38 61	2
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		00%		Appeared				
'97		50%		50%		00%						
Total Plants/Acre (excluding Dead & Seedlings)									'89	0	Dec:	-
									'97	40		-

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4			
Ephedra spp.								
Y	89	-	-	-	-	-	-	-
	97	1	-	-	-	-	-	-
M	89	-	-	-	-	-	-	-
	97	-	-	1	-	-	-	-
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>
'89		00%		00%		00%		Appeared
'97		00%		50%		00%		
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec: -
						'97	40	-
Gutierrezia sarothrae								
S	89	-	-	-	-	-	-	-
	97	2	-	-	-	-	-	-
Y	89	5	-	-	-	-	-	-
	97	22	-	-	-	-	-	-
M	89	40	-	-	-	-	-	-
	97	13	-	-	-	-	-	-
D	89	8	-	-	-	-	-	-
	97	-	-	-	-	-	-	-
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>
'89		00%		00%		06%		-60%
'97		00%		00%		00%		
Total Plants/Acre (excluding Dead & Seedlings)						'89	1765	Dec: 15%
						'97	700	0%

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Juniperus osteosperma																		
S	89	5	-	-	-	-	-	-	-	-	5	-	-	-	166		5	
	97	2	-	-	-	-	-	-	-	-	1	1	-	-	40		2	
Y	89	8	-	-	1	-	-	-	-	-	9	-	-	-	300		9	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7	
M	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133	54 44	4	
	97	2	1	-	2	-	-	-	-	-	5	-	-	-	100	15 35	5	
D	89	1	-	-	-	-	-	-	-	-	-	-	1	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	120		6	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			07%			-48%							
'97		08%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	466	Dec:	7%				
											'97	240		0%				
Pinus edulis																		
S	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	0		-				
Purshia tridentata																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	-	1	1	-	-	-	-	-	-	2	-	-	-	40	6 14	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		50%			50%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				

Trend Study 16C-2-97

Study site name: Willow Creek .

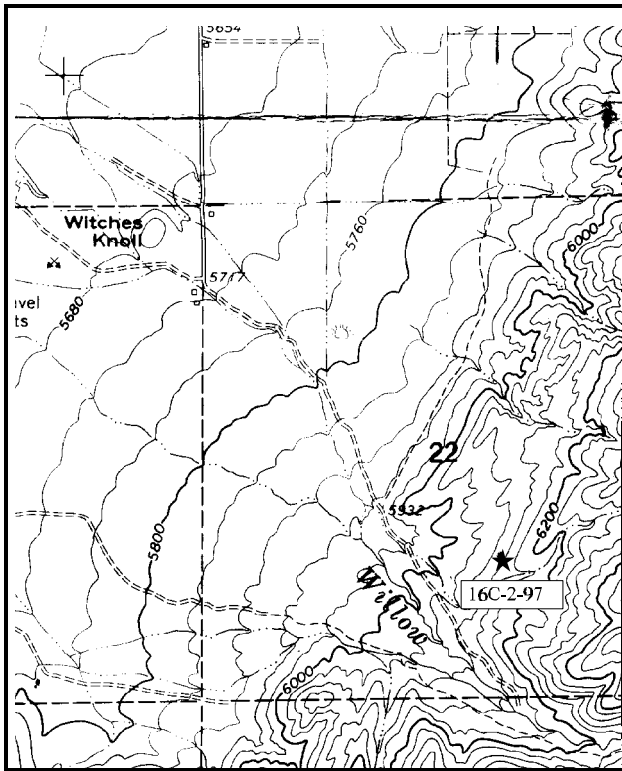
Range type: Chained, cabled reseeded P.J.

Compass bearing: frequency baseline 210M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

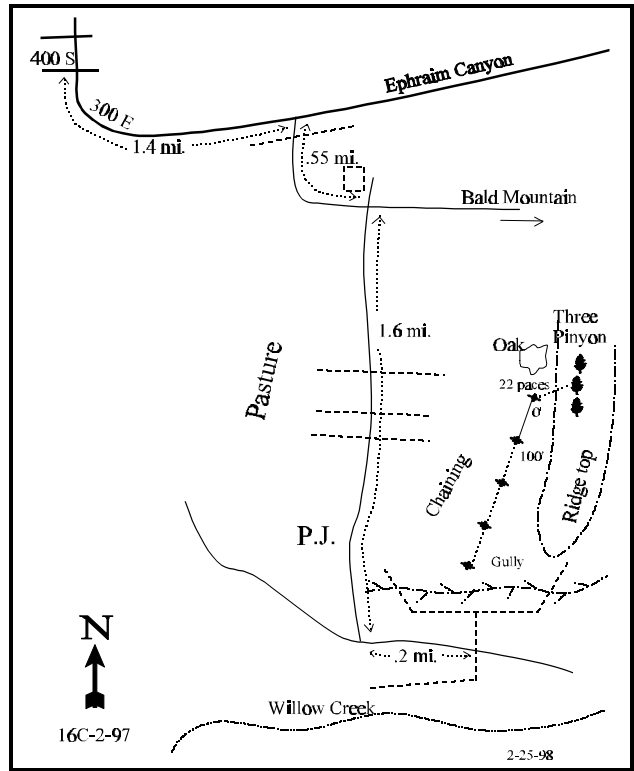
LOCATION DESCRIPTION

From the intersection of 400 S. and 300 E. in Ephraim, take 300 East south for 1.4 miles, (making a 90° turn), to the Bald Mountain road. Take the Bald Mountain road south and east for 0.55 miles to an intersection. Turn south and go 1.6 miles along the foothills to an intersection just north of Willow Creek. Turn left (east) and go 0.2 miles to a fence corner on the left side of the road. Park here. Cross the fence, cross the gully and go up the white shale ridge to the northeast. From the gully, go about 188 paces to a high point on the ridge where 3 large pinyons grow. Enroute you will pass the 400-foot stake which is near the ridge-top. The O' baseline stake, however, is 22 paces downhill from the 3 pinyons just south of an oak clump.



Map Name: Ephraim .

Township 17S , Range 3E , Section 22



Diagrammatic Sketch

UTM 4352134.543 N, 451190.536

DISCUSSION

Trend Study No. 16C-2 (29-2)

The Willow Creek study is located within a chaining on the lower slopes of Bald Mountain, southeast of Ephraim. It is located near the top of a low ridge with a western aspect and moderately steep slope of 35%. Elevation is 6,150 feet. The Bald Mountain 700 acre treatment and seeding was completed in 1969. Sheep grazing has been part of a special study and there is some trespass, but overall livestock use of this Division land is light. There is abundant sign of wintering big game, especially deer.

The soil is a well-drained, shallow, shaley clay loam of the Atepic-Badland Association. The substratum is a layer of very strongly calcareous shaley silty clay loam. Runoff is usually rapid and the hazard from erosion is severe. It is classified as an Upland Shallow Shale (Juniper-Pinyon) range site. There were moderately large patches of bare soil (28% cover) and rock-pavement cover (17%) in the past, presently percent bare soil is down to about 19% with rock-pavement cover showing no change. Litter and vegetative cover were not uniform. The gullying and sheet erosion are normal for this soil. Currently, percent bare soil is moderately low with a more protective and uniform cover of vegetation and litter.

Browse diversity is relatively high for a chained area. Although the most numerous species tend to be less desirable increasers such as broom snakeweed, low rabbitbrush, and juniper, there are a significant number of valuable winter browse species. The most common was bitterbrush, numbering approximately 533 plants/acre in 1989. It had a population of mostly mature, heavily hedged, but vigorous shrubs. Now they number 840 plants/acre with increased vigor and none classified as decadent. Found in lesser numbers are true mountain mahogany, mountain big sagebrush, rubber rabbitbrush, cliffrose, green ephedra, and serviceberry. A majority of the shrubs sampled are mature with moderate to heavy hedging. There are scattered clumps of oakbrush through the area. The point-centered quarter method estimated a tree density similar to that determined by the density plots, 150 juniper/acre and 66 pinyon/acre. Populations of all browse appear to be stable or slowly increasing.

Grasses are abundant. Seeded species, especially the wheat grasses and wildrye, dominate the understory. Grass sum of nested frequency and quadrat frequency were moderately high in 1989, but now have noticeably decreased for crested wheatgrass, intermediate wheatgrass, and Russian wildrye. The grasses are large and vigorous with abundant litter, but the bunch grasses do not provide as much soil protection as rhizomatous species.

Forbs were thought to be an important vegetative component in the past, but now they only provide 19% of the herbaceous cover and almost 50% of that is contributed by bur buttercup. Alfalfa is the second most productive forb, second to bur buttercup.

1989 APPARENT TREND ASSESSMENT

This chaining hardly looks 20 years old. Juniper release and/or reinvasion has been slow. There is a vigorous, diverse stand of browse and also a fairly productive herbaceous understory. Overall, the site appears to have a stable trend with a desirable mix of vegetation. Considering the soil limitations of this site, the seeding was quite successful and a beneficial conversion from a predominately juniper community. However, the soil trend is downward due to continued erosion.

1997 TREND ASSESSMENT

The trend for soil is now improving with a noticeable lower value for percent bare soil for the site. With 56% of the total vegetative cover coming from herbaceous species, this composition gives much better protection from high intensity summer storms. There is a good mixture of shrubs, but all together they only contribute to about 50% of the total browse cover. The two most abundant preferred species are bitterbrush and true mountain mahogany, which both have improving trends. The trend for the herbaceous understory is stable. Perennial grass sum of nested frequency has remained fairly stable. Over 40% of the of the herbaceous cover is contributed by a noxious weed that is an allelopathic winter annual (bur buttercup).

TREND ASSESSMENT

soil - up (improving)

browse - up, improving for the two preferred species

herbaceous understory - stable, but a large proportion of the composition is characteristically weedy in habit

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 2

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	190	*116	78	48	4.50
G	Agropyron intermedium	159	*122	60	46	2.95
G	Agropyron spicatum	20	32	7	15	2.37
G	Bromus inermis	8	9	4	4	.04
G	Bromus tectorum (a)	-	92	-	31	1.39
G	Elymus junceus	17	9	9	5	.90
G	Festuca ovina	40	35	17	15	1.71
G	Oryzopsis hymenoides	6	*37	3	17	.65
G	Poa secunda	31	*84	13	32	1.50
G	Sitanion hystrix	-	2	-	1	.01
Total for Grasses		471	538	191	214	16.05
F	Agoseris glauca	-	3	-	1	.03
F	Alyssum alyssoides (a)	-	118	-	49	.34
F	Astragalus utahensis	-	*13	-	5	.34
F	Balsamorhiza sagittata	-	5	-	3	.02
F	Camelina microcarpa (a)	-	6	-	2	.01
F	Chaenactis douglasii	-	*8	-	4	.02
F	Cirsium spp.	1	-	1	-	-
F	Convolvulus arvensis	3	8	1	3	.06

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Cryptantha spp.	-	4	-	2	.18
F	Cymopterus spp.	-	2	-	1	.00
F	Descurainia pinnata (a)	-	4	-	2	.01
F	Machaeranthera canescens	-	4	-	2	.06
F	Medicago sativa	33	*16	14	7	.78
F	Microsteris gracilis (a)	-	9	-	4	.02
F	Petradoria pumila	-	1	-	1	.03
F	Phlox hoodii canescens	4	9	2	3	.18
F	Phlox longifolia	3	6	1	3	.01
F	Ranunculus testiculatus (a)	-	183	-	65	1.70
F	Tragopogon dubius	-	5	-	2	.06
Total for Forbs		44	404	19	159	3.88

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16C , Study no: 2

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier utahensis	1	.03
B	Artemisia tridentata vaseyana	3	.03
B	Cercocarpus montanus	18	.93
B	Chrysothamnus nauseosus albicaulis	5	.81
B	Chrysothamnus viscidiflorus stenophyllus	23	.76
B	Cowania mexicana stansburiana	1	-
B	Eriogonum microthecum	1	.03
B	Gutierrezia sarothrae	9	.06
B	Juniperus osteosperma	9	4.97
B	Opuntia spp.	4	.15
B	Pinus edulis	5	1.99
B	Purshia tridentata	30	5.79
B	Quercus gambelii	1	.00
Total for Browse		110	15.58

BASIC COVER --

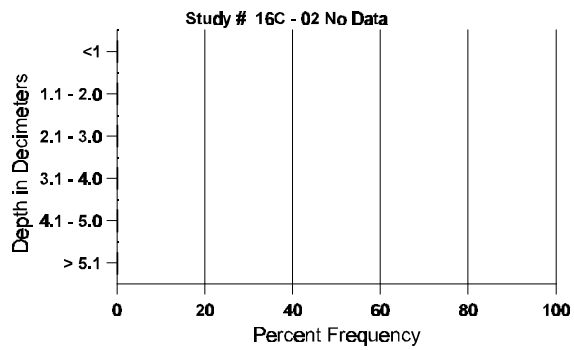
Herd unit 16C , Study no: 2

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	329	8.00	33.14
Rock	160	9.00	6.12
Pavement	234	8.00	10.93
Litter	370	47.25	33.43
Cryptogams	82	0	1.17
Bare Ground	254	27.75	19.32

SOIL ANALYSIS DATA --
 Herd Unit 16C, Study no: 02

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.9	59.0 (14.9)	7.4	48.0	25.4	26.6	7.4	9.2	150.4	.5

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16C , Study no: 2

Type	Quadrat Frequency '97
Rabbit	19
Elk	8
Deer	56

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 2

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier utahensis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	13	17	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			
<i>Artemisia tridentata vaseyana</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	2	-	-	-	-	-	-	3	-	-	-	60	18	26	3
D	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			- 9%							
'97		33%			67%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	100%			
												'97	60		0%			
<i>Atriplex canescens</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	22	19	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Cercocarpus montanus																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	4	-	-	1	-	-	-	-	-	-	-	-	100			5
M	89	-	-	3	-	-	-	-	1	-	-	-	-	133	8	9	4
	97	2	9	3	-	1	1	-	-	-	-	-	320	25	34	16	
X	89	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	20			1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			75%			00%			+68%						
'97		48%			19%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	133	Dec:	-		
												'97	420		-		
Chrysothamnus nauseosus albicaulis																	
Y	89	1	-	-	-	-	-	-	-	-	-	-	33			1	
	97	-	-	-	1	-	-	-	-	-	-	-	20			1	
M	89	2	1	-	-	-	-	-	-	-	-	-	100	22	24	3	
	97	3	1	-	-	-	-	-	-	-	-	-	80	35	37	4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		25%			00%			00%			-25%						
'97		20%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	133	Dec:	-		
												'97	100		-		
Chrysothamnus viscidiflorus stenophyllus																	
S	89	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	1	-	-	-	-	-	-	-	-	-	-	20			1	
Y	89	9	-	-	-	-	-	-	-	-	-	-	300			9	
	97	14	-	-	-	-	-	-	-	-	-	-	280			14	
M	89	28	-	-	1	-	-	-	-	-	-	-	966	14	17	29	
	97	40	-	-	-	-	-	-	-	-	-	-	800	15	20	40	
D	89	4	-	-	-	-	-	-	-	-	-	-	133			4	
	97	-	-	-	-	-	-	-	-	-	-	-	0			0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			05%			-23%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	1399	Dec:	10%		
												'97	1080		0%		

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<i>Cowania mexicana stansburiana</i>																		
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	13	14	1
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40	24	18	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			+18%							
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	40		-				
<i>Ephedra viridis</i>																		
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	17	15	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	21	40	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	0		-				
<i>Eriogonum microthecum</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	5	7	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	20		-				
<i>Gutierrezia sarothrae</i>																		
Y	89	8	-	-	-	-	-	-	-	-	8	-	-	-	266			8
	97	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
M	89	34	-	-	-	-	-	-	-	-	34	-	-	-	1133	9	11	34
	97	25	-	-	-	-	-	-	-	-	25	-	-	-	500	11	13	25
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	1	20			1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-51%							
'97		00%			00%			03%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1399	Dec:	0%				
											'97	680		3%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Juniperus osteosperma</i>																		
Y	89	5	-	-	-	-	-	-	-	-	5	-	-	-	166		5	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	33	59	1
	97	3	-	-	-	-	-	1	1	-	5	-	-	-	100	-	-	5
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-10%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	199	Dec:	-			
												'97	180		-			
<i>Opuntia spp.</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120	4	5	6
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	140		-			
<i>Pinus edulis</i>																		
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	-	-	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+34%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-			
												'97	100		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
<i>Purshia tridentata</i>																
Y	89	-	1	-	-	-	-	-	-	1	-	-	-	33		1
	97	3	-	-	-	-	-	-	-	3	-	-	-	60		3
M	89	-	8	3	-	-	-	-	-	11	-	-	-	366	8 23	11
	97	6	13	17	3	-	-	-	-	38	-	1	-	780	18 38	39
D	89	1	3	-	-	-	-	-	-	3	-	1	-	133		4
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'89		75%			19%			06%			+37%					
'97		31%			40%			02%								
Total Plants/Acre (excluding Dead & Seedlings)										'89	532	Dec:	25%			
										'97	840		0%			
<i>Quercus gambelii</i>																
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1
Y	89	-	1	-	-	-	-	-	-	-	1	-	-	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	1	-	-	-	-	-	-	-	1	-	-	-	20	20 26	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'89		100%			00%			00%			-39%					
'97		00%			00%			00%								
Total Plants/Acre (excluding Dead & Seedlings)										'89	33	Dec:	-			
										'97	20		-			

Trend Study 16C-3-97

Study site name: North Manti Face .

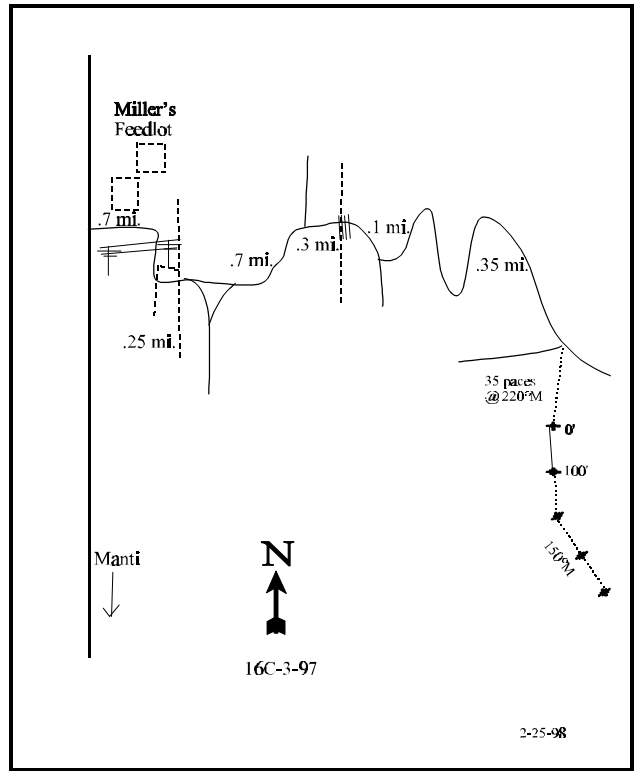
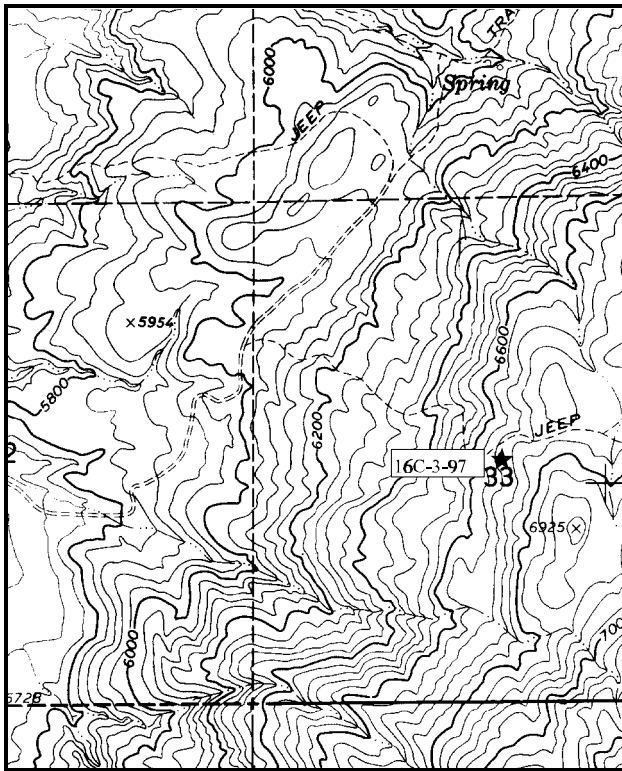
Range type: Big Sagebrush - Grass

Compass bearing: frequency baseline 180M degrees. (Line 3-4 150°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Manti temple visitors' center in Manti, proceed north on 89 for 1.5 miles. Just south of Miller's feedlot turn east on a dirt road (Miller's Lane) and go 0.7 miles to a gate. Proceed down the road another 0.25 miles to a fence. Continue on 0.7 miles to a fork in the road, go right. At 0.3 miles past the fork you'll cross a cattle guard onto DWR property. 0.1 miles further on you'll come to another fork in the road. Stay left here switchbacking up the mountain for 0.35 miles to another fork. Stop here and walk 35 paces at 220°M to the O-foot baseline stake, which is marked by browse tag #9044.



Map Name: Ephraim .

Diagrammatic Sketch

Township 17S, Range 3E, Section 33

UTM 4349220.478 N, 449399.208 E

DISCUSSION

Trend Study No. 16C-3 (29-3)

The North Manti Face trend study samples a mountain big sagebrush range type with a substantial amount of preferred mountain brush species along with a significant amount of juniper (contributes 60% of the browse cover). Like many of the trend studies in Management Unit 16, it is located on Division land. The area is important winter range for elk and especially deer which had a pellet-group quadrat frequency of 67%. There is excellent protective cover on and around the site. Parts of the area have been terraced, yet it supports chiefly native vegetation. The site has a west aspect with a steep slope of 40%. The elevation is 6,760 feet.

The SCS classifies the soil as somewhat excessively drained, very cobbly loam in the Fontreen series. It is moderately deep, but may be restricted by rocks below 36 inches. Fifty-eight percent of the vegetative cover is provided by herbaceous species which is very important to soil protection on the steep slopes. The amount of litter cover on the site is moderately low at about 23% to 26%. A majority of the surface was occupied by pavement (41%) and rock (18%) in 1989, a high amount, yet common for this easily eroded soil. Currently, cover for pavement (30%) and rock (11%) are reduced. Originally, sheet erosion was active and there were numerous rills and small gullies. Now it appears that erosion is minimal.

The key browse species is mountain big sagebrush. In 1989, the heavily hedged growth form was evident on the majority of the population, with 93% of the mature population showing heavy use. Now heavy use is apparent on only about 36% of the population. Density plot data from 1989 indicated a moderately dense population of 2,865 plants/acre. With the new sampling design which greatly increases the sample size, the density is now estimated at only 1,000 plants/acre. The change in density is mostly from the much larger sample size giving a more accurate population estimate, because the number of dead plants cannot explain the losses to the population. The percentage of the population that is classified as mature has remained fairly stable (58% to 52%). Percent decadence has also remained quite stable (37% to 36%). This is not excessive, for many of the state's sagebrush populations have percent decadency rates near or higher than this. No seedlings have been sampled at any time, but the percentage of young plants in the population has gone from 5% to 12%. This would be adequate to maintain the population, but this would not be enough to increase its density. Other palatable browse species on the site includes squaw-apple, white rubber rabbitbrush, four-wing saltbush, serviceberry, and snowberry. Most of these have been moderately to heavily browsed. The junipers show evidence of high lining. A zone of oakbrush occurs nearby, east and upslope of the study site. Broom snakeweed makes up only about 2% of the browse cover at this time and its density has shown a significant decrease to about 2,520 plants/acre.

The stand of bluebunch wheatgrass is an important soil stabilization factor on this slope providing 89% of the grass cover and 60% of the herbaceous cover. It has a quadrat frequency of almost 100%. Fifty-eight percent of the plant cover is contributed by the herbaceous understory, which helps most in mitigating the effects of high intensity summer rainfall. Forb cover is average for a sagebrush-juniper site with a moderately high diversity of species (29 species in 1997). The forb species contributing the most cover is Kings sandwort and rock goldenrod which together contribute to almost 50% of the forb cover.

1989 APPARENT TREND ASSESSMENT

With the important but variable ground cover provided by the bunch grasses on this steep and erodible slope, soil loss appears to continue. Soil trend seems to be on the down side. The vegetative trend is stable in terms of species diversity and age class distributions. The abundance of snakeweed is not necessarily an indication of a downward trend.

1997 TREND ASSESSMENT

There have been some changes in the characteristics of the ground cover. Combined cover value for rock and pavement has decreased from almost 60% down to about 40%. With the increase in percent bare soil, this would probably indicate that some soil has covered some of the surface rock. Percent litter has increased slightly, but percent bare soil has increased from 5% to 8%. The ratio of protective cover (vegetation and litter cover) with percent bare soil is good at 3.25:1, but the slope is steep at 40%. Soil trend would be considered to be stable to slightly down at this time. The browse trend would be considered slightly down for the sagebrush component, which makes up 29% of the browse cover. The next highest preferred browse only makes up 3% of the browse cover. Obviously, sagebrush makes up the majority of the preferred winter browse on this site, yet its density is only about 1,000 plants/acre. As explained earlier, most of the downward population estimate is more reflective of the greatly improved sampling design, not actual losses. Juniper makes up 60% of the browse cover. This kind of detrimental competition is going to have an adverse effect on the sagebrush population. Browse trend is down even though heavy use has gone down significantly from 93% to 36%, yet those classified with poor vigor has increased from 2% to 18%. Percent decadency is still moderately high at 36%. The trend for perennial herbaceous species is slightly down with sum of nested frequency for grasses and forbs both showing slightly downward trends.

TREND ASSESSMENT

soil - stable to slightly down

browse - slightly down for sagebrush

herbaceous understory - slightly down for perennial grasses and forbs

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 3

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	287	268	98	96	10.96
G	Bromus japonicus (a)	-	42	-	13	.16
G	Bromus tectorum (a)	-	35	-	15	.15
G	Oryzopsis hymenoides	-	1	-	1	.03
G	Poa fendleriana	60	*23	26	10	.15
G	Poa secunda	105	*137	47	56	.85
Total for Grasses		452	506	171	191	12.31
F	Alyssum alyssoides (a)	-	8	-	3	.01
F	Antennaria rosea	-	3	-	1	.00

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Arabis spp.	-	3	-	1	.00
F	Arenaria kingii	-	*111	-	43	1.11
F	Astragalus megacarpus	24	20	10	9	.27
F	Astragalus utahensis	-	7	-	3	.01
F	Camelina microcarpa (a)	-	9	-	4	.02
F	Calochortus nuttallii	-	4	-	2	.01
F	Cirsium spp.	18	*5	12	3	.06
F	Crepis acuminata	12	6	6	4	.02
F	Cryptantha spp.	16	*4	7	1	.03
F	Cymopterus spp.	-	1	-	1	.00
F	Descurainia pinnata (a)	-	4	-	1	.03
F	Erigeron spp.	-	4	-	2	.04
F	Eriogonum jamesii	13	13	5	5	.36
F	Eriogonum umbellatum	-	2	-	1	.03
F	Haplopappus acaulis	6	3	2	1	.15
F	Helianthus annuus (a)	1	-	1	-	-
F	Lappula occidentalis (a)	-	2	-	1	.00
F	Leucelene ericoides	21	41	7	14	.98
F	Penstemon spp.	50	*11	23	5	.10
F	Petroradia pumila	46	47	16	22	1.78
F	Phlox hoodii canescens	182	*29	68	13	.14
F	Phlox longifolia	10	18	4	7	.06
F	Ranunculus testiculatus (a)	-	160	-	56	.62
F	Streptanthus cordatus	-	1	-	1	.00
F	Tragopogon dubius	1	-	1	-	-
F	Vicia americana	-	3	-	1	.03
Total for Forbs		400	519	162	205	5.91

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16C , Study no: 3

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier utahensis	1	.00
B	Artemisia nova	2	-
B	Artemisia tridentata vaseyana	37	3.92
B	Atriplex canescens	2	.15
B	Chrysothamnus depressus	17	.54
B	Chrysothamnus nauseosus consimilis	5	.09
B	Chrysothamnus viscidiflorus viscidiflorus	4	.01
B	Gutierrezia sarothrae	37	.25
B	Juniperus osteosperma	5	8.07
B	Peraphyllum ramosissimum	1	.38
B	Symphoricarpos oreophilus	1	.00
Total for Browse		112	13.45

BASIC COVER --

Herd unit 16C , Study no: 3

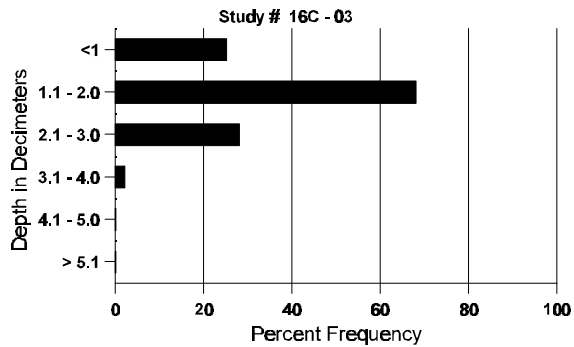
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	341	13.00	31.28
Rock	287	18.00	10.76
Pavement	345	41.25	30.36
Litter	381	23.00	25.97
Cryptogams	96	0	.58
Bare Ground	222	4.75	8.14

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 03

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
8.7	56.4 (13.5)	7.4	32.0	27.4	40.6	7.4	9.4	201.6	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16C , Study no: 3

Type	Quadrat Frequency '97
Rabbit	18
Elk	6
Deer	67

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 3

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4			
Amelanchier utahensis								
M	'89	-	-	-	-	-	-	0
	'97	-	-	1	-	-	-	20
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>
		'89		'89		'89		Appeared
		'97		'97		'97		
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec: -
						'97	20	-

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia nova</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	-	-	-	-	-	-	-	2	-	-	-	40	12	33	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		50%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			
<i>Artemisia tridentata vaseyana</i>																		
Y	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	89	-	1	24	-	-	-	-	-	-	25	-	-	-	1666	23	27	25
	97	2	12	12	-	-	-	-	-	-	26	-	-	-	520	21	33	26
D	89	-	-	16	-	-	-	-	-	-	15	-	-	1	1066			16
	97	3	9	6	-	-	-	-	-	-	9	-	-	9	360			18
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	220			11
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		02%			93%			02%			-65%							
'97		42%			36%			18%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	2865	Dec:	37%			
												'97	1000		36%			
<i>Atriplex canescens</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40	38	38	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus depressus																	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
M	89	1	-	-	-	-	-	-	-	1	-	-	-	66	3	6	1
	97	24	13	-	-	2	-	-	-	39	-	-	-	780	15	11	39
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	2	1	-	-	-	-	-	3	-	-	-	60			3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+85%						
'97		40%			02%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	132	Dec:	0%			
											'97	860		7%			
Chrysothamnus nauseosus consimilis																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	2	-	-	-	40			2
M	89	-	1	1	-	-	-	-	-	1	1	-	-	133	19	14	2
	97	3	-	-	-	-	-	-	-	3	-	-	-	60	32	39	3
D	89	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	97	-	1	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		33%			67%			00%			-40%						
'97		17%			00%			17%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	199	Dec:	33%			
											'97	120		17%			
Chrysothamnus viscidiflorus viscidiflorus																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	4	-	-	-	-	-	-	-	4	-	-	-	80			4
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	3	-	-	-	-	-	-	-	3	-	-	-	60	9	11	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	140		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	6	-	-	2	-	-	-	-	-	8	-	-	-	160		8	
Y	89	7	-	-	-	-	-	-	-	-	7	-	-	-	466		7	
	97	80	-	-	-	-	-	-	-	-	80	-	-	-	1600		80	
M	89	40	-	-	-	-	-	-	-	-	40	-	-	-	2666	7 7	40	
	97	45	-	-	-	-	-	-	-	-	45	-	-	-	900	9 9	45	
D	89	6	-	-	-	-	-	-	-	-	3	-	-	3	400		6	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			06%			-29%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	3532	Dec:	11%				
											'97	2520		1%				
Juniperus osteosperma																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66	79 98	1	
	97	4	-	-	-	-	-	1	-	-	5	-	-	-	100	- -	5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			+34%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	100		-				
Peraphyllum ramosissimum																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	-	-	4	-	-	-	-	-	-	4	-	-	-	266	24 16	4	
	97	-	-	-	-	-	-	-	-	1	1	-	-	-	20	18 29	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			80%			00%			-94%							
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	332	Dec:	-				
											'97	20		-				

A G E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	1	-	-	-	-	-	-	-	-	-	1	20	6	15	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>				
'89		00%			00%			00%						Appeared				
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			

Trend Study 16C-4-97

Study site name: Bald Mountain .

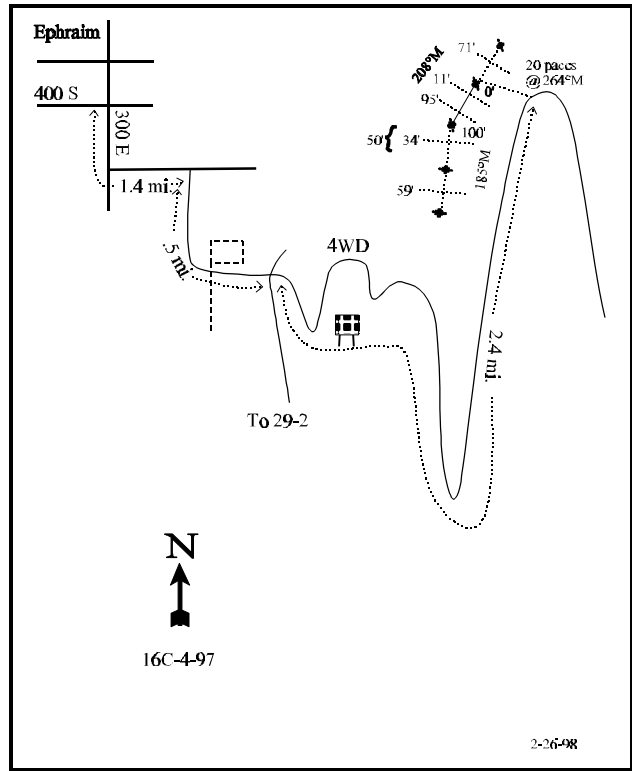
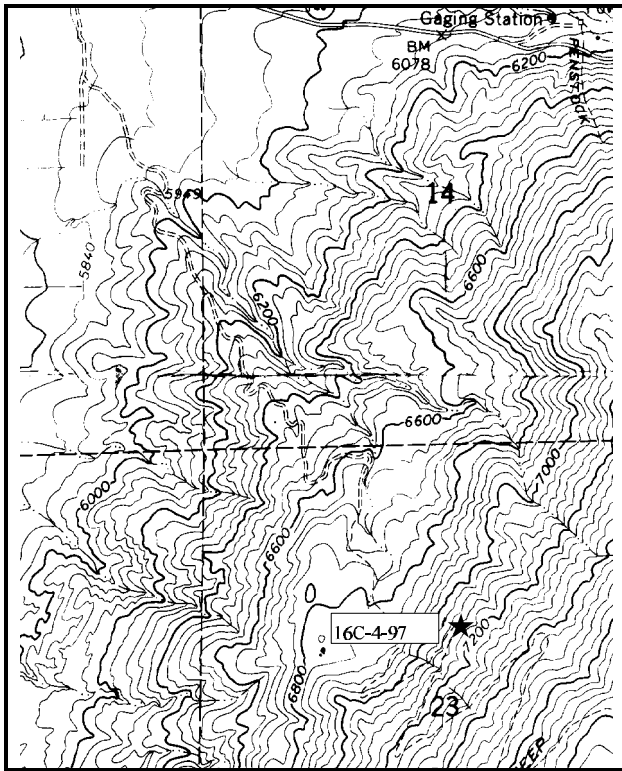
Range type: Mixed Mountain Brush

Compass bearing: frequency baseline 208 M degrees. (Lines 2-3 185°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of 400 South and 300 East in Ephraim, go south on 300 East for 0.6 miles to where the road makes a 90° turn to the east. Stay on this main road heading east for another 0.8 miles. Turn south at this point and go 0.5 miles to a 4-way intersection. Go straight through the intersection for 2.4 miles and stop on a large switchback in the road. From the edge of the road, the O' baseline stake is 20 paces away at 264°M. The O' baseline stake is marked by browse tag #9075.



Map Name: Ephraim .

Diagrammatic Sketch

Township 17S, Range 3, Section 23

UTM 4352761.295 N, 452608.125 E

DISCUSSION

Trend Study No. 16C-4 (29-4)

The Bald Mountain trend study is located on the slopes of Bald Mountain and samples a relatively higher elevation winter range within the mixed mountain brush type. This site is composed mostly of pinyon, juniper, oak, and sagebrush which are located above the Bald Mountain chainings on Division of Wildlife Resources property. Browsing pressure was classified as high during the 1989 sampling period with the majority of the preferred species showing heavy use. Now this heavy use is classified as much lighter. This area is utilized by wintering elk and especially deer.

The site is located on a 48% west-facing slope at an elevation of 7,050 feet. The steep slope contributes to the severe hazard of erosion for the very stony loam soil. A surface cover of 10-25% for stones and cobbles is normal for this Lizzant-Kitchell soil association. The surface layer is shallow, but the soil has a deep root zone. Combined rock and pavement cover was 31% in 1989, now it is at about 20%. This would indicate there has been some event which has allowed soil movement to cover some of the surface rock. The amount of vegetative cover is fairly good (36%), but only 19% of the vegetative cover is composed of herbaceous species which are more protective against soil losses from high intensity summer storms. Erosion does not appear to be excessive, but is continually occurring on the steeper portions of the site.

The overstory consists mostly of pinyon, juniper, and oakbrush. These three species dominate the site as they contribute 43% of the total plant cover. The oak shows mostly light use and has a density of 44 stems/acre. There are a significant number of young pinyon and juniper in an uneven-aged stand. The point-centered quarter method estimates that there are 164 pinyon/acre and 19 juniper/acre. The browse understory is the important component, including mountain big sagebrush (the key species) which contributes 22% of the total browse cover. Mountain big sagebrush were heavily hedged (70%) in 1989, now only 21% of them are classified as heavily browsed. Percent decadence was also very high at that time with 95% classified as decadent. Currently only 45% were evaluated as decadent. Individuals have noticeably better vigor and growth in the open where there is less competition from trees. There are few seedlings and young. Average sagebrush cover is about 7%. Other preferred species are serviceberry, true mountain mahogany, snowberry, and squawapple. The latter two species are more common, vigorous, and moderately utilized. They have fairly stable populations with a combined density of about 3,000 plants/acre.

Grasses are sparse and are found mainly under shrubs. Muttongrass is the most common, followed by crested wheatgrass, bluebunch wheatgrass, and other occasional species. Total grass cover together is only 6%, while total cover for forbs is one-fourth that of grasses.

1989 APPARENT TREND ASSESSMENT

The soil trend appears normal and considering the soil type, trend is considered stable. The overstory of pinyon, juniper, and oak appears to be increasing to the detriment of mountain big sagebrush. There are other browse plants available with stable and healthy populations. In the long term, the overall vegetative trend is downward, especially at present levels of utilization. This site should get some protection in years of heavy snowfall, allowing recruitment of young plants into the populations of palatable browse species.

1997 TREND ASSESSMENT

The soil trend for the site is considered slightly downward, because percent bare soil has increased significantly from 14% to 22%. In addition, the most protective plant cover which is provided by herbaceous species only makes up 19% of the total plant cover. The herbaceous species should make up at least 50% of the total plant cover to adequately protect from excessive soil losses during high intensity summer storms. The browse trend is believed to be stable. The most abundant preferred species is mountain big sagebrush which has about the same density, yet percent decadency has decreased from 95% down to 45% which is an exceptional improvement. Before, 70% were classified as heavily browsed, now only 21% are so classified. All the other preferred species also show less heavy use and fewer plants classified as decadent. The overall trend for perennial herbaceous species is down, with the sum of nested frequency values declining for both grasses and forbs.

TREND ASSESSMENT

soil - slightly down

browse - stable

herbaceous understory - down for perennial grasses and forbs

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 4

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	-	*30	-	13	.84
G	Agropyron spicatum	69	*24	30	10	.46
G	Bromus inermis	-	2	-	1	.03
G	Oryzopsis hymenoides	-	2	-	1	.00
G	Poa fendleriana	169	*110	67	40	3.87
G	Poa secunda	13	22	6	9	.54
G	Sitanion hystrix	6	11	2	4	.25
Total for Grasses		257	201	105	78	6.01
F	Allium spp.	1	-	1	-	-
F	Arabis spp.	-	1	-	1	.03
F	Arenaria kingii	-	8	-	3	.04
F	Astragalus convallarius	-	2	-	1	.03
F	Astragalus spp.	-	3	-	2	.01
F	Carduus nutans	-	3	-	1	.03
F	Calochortus nuttallii	-	1	-	1	.00
F	Chenopodium album	-	2	-	1	.00
F	Chaenactis douglasii	11	3	5	1	.00
F	Cirsium spp.	11	12	5	6	.08
F	Collinsia parviflora (a)	-	52	-	19	.09

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	<i>Crepis acuminata</i>	-	2	-	1	.00
F	<i>Cymopterus</i> spp.	9	13	3	5	.03
F	<i>Eriogonum umbellatum</i>	-	16	-	9	.19
F	<i>Hackelia patens</i>	-	3	-	1	.00
F	<i>Machaeranthera canescens</i>	35	*3	19	2	.01
F	<i>Penstemon humilis</i>	92	*30	46	14	.80
F	<i>Phlox longifolia</i>	51	*32	24	13	.14
F	<i>Ranunculus testiculatus</i> (a)	-	31	-	11	.05
F	<i>Streptanthus cordatus</i>	1	-	1	-	-
F	<i>Taraxacum officinale</i>	1	1	1	1	.00
F	Unknown forb-annual	-	1	-	1	.00
F	<i>Veronica biloba</i> (a)	-	6	-	2	.01
F	<i>Viola</i> spp.	-	3	-	1	.00
Total for Forbs		212	228	105	97	1.60

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

BROWSE TRENDS --

Herd unit 16C , Study no: 4

T y p e	Species	Strip Frequency '97	Average Cover % '97
B	<i>Amelanchier alnifolia</i>	5	.03
B	<i>Artemisia tridentata</i> <i>vaseyana</i>	42	7.05
B	<i>Cercocarpus montanus</i>	9	.86
B	<i>Chrysothamnus nauseosus</i> <i>albicaulis</i>	1	-
B	<i>Chrysothamnus viscidiflorus</i> <i>viscidiflorus</i>	1	.15
B	<i>Ephedra viridis</i>	1	.03
B	<i>Juniperus osteosperma</i>	3	.91
B	<i>Peraphyllum ramosissimum</i>	32	2.78
B	<i>Pinus edulis</i>	19	8.65
B	<i>Purshia tridentata</i>	1	-

Type	Species	Strip Frequency '97	Average Cover % '97
B	Quercus gambelii	24	7.52
B	Symphoricarpos oreophilus	37	3.75
Total for Browse		175	31.75

BASIC COVER --

Herd unit 16C , Study no: 4

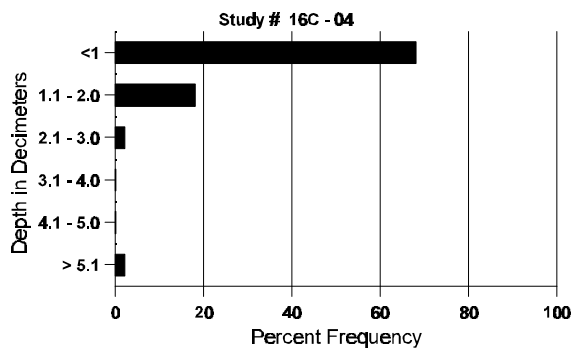
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	289	10.75	35.77
Rock	249	10.25	13.61
Pavement	234	21.00	5.78
Litter	382	43.50	43.58
Cryptogams	24	.75	.13
Bare Ground	252	13.75	22.21

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 04

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.8	55.6 (13.9)	7.4	28.0	33.4	38.6	5.6	12.9	124.8	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16C , Study no: 4

Type	Quadrat Frequency '97
Sheep	4
Rabbit	6
Elk	7
Deer	28

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 4

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total								
		1	2	3	4											
Amelanchier alnifolia																
S	89	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	2	-	-	-	-	-	-	-	2	-	40	2
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	1	-	-	-	-	-	-	-	2	-	40	2
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	2	-	-	1	-	-	-	-	-	-	-	3	-	60	12 13 3
D	89	-	-	1	-	-	-	-	-	-	-	-	1	-	66	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'89		00%			100%			00%			+34%					
'97		00%			00%			00%								
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	100%		
											'97	100		0%		

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
M	89	-	-	1	-	-	-	-	-	-	1	-	-	-	66	20 12	1
	97	8	13	6	2	-	-	1	-	-	30	-	-	-	600	24 33	30
D	89	1	5	12	-	-	1	-	-	-	16	-	-	3	1266		19
	97	11	9	7	1	-	-	-	-	-	17	-	-	11	560		28
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	760		38
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		25%			70%			15%			- 8%						
'97		36%			21%			18%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	1332	Dec:	95%			
											'97	1220		46%			
<i>Cercocarpus montanus</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
M	89	-	-	1	-	-	-	-	-	-	1	-	-	-	66	22 25	1
	97	-	-	7	-	-	1	-	-	-	8	-	-	-	160	23 31	8
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			100%			00%			+63%						
'97		00%			89%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-			
											'97	180		-			
<i>Chrysothamnus nauseosus albicaulis</i>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	15 23	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		100%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	20		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
Chrysothamnus viscidiflorus viscidiflorus																		
M	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66	12	8	1
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	9	18	1
D	89	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-85%							
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	132	Dec:	50%				
											'97	20		0%				
Ephedra viridis																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	20		-				
Juniperus osteosperma																		
Y	89	-	-	-	-	-	-	1	-	-	1	-	-	-	66			1
	97	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66	85	79	1
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-55%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	132	Dec:	-				
											'97	60		-				

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Peraphyllum ramosissimum</i>																		
Y	89	1	-	-	1	-	-	4	-	-	6	-	-	-	400		6	
	97	4	-	-	-	-	-	-	-	4	-	-	-	80		4		
M	89	-	3	16	1	1	4	1	-	26	-	-	-	1733	16	30	26	
	97	17	11	9	8	-	-	2	-	46	-	-	1	940	17	31	47	
D	89	-	1	4	-	-	-	-	-	5	-	-	1	400		6		
	97	1	1	-	-	-	-	-	-	-	-	-	2	40		2		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	60		3		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		13%			66%			03%			-58%							
'97		23%			17%			06%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2533	Dec:	16%				
											'97	1060		4%				
<i>Pinus edulis</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	3	-	-	1	-	4	-	-	-	80		4		
Y	89	2	-	-	-	-	-	-	-	2	-	-	-	133		2		
	97	11	-	-	2	-	-	-	-	13	-	-	-	260		13		
M	89	1	-	-	2	-	-	-	-	3	-	-	-	200	113	89	3	
	97	2	-	-	1	-	-	3	-	6	-	-	-	120	-	-	6	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+12%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	333	Dec:	-				
											'97	380		-				
<i>Purshia tridentata</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	20		-				

AGE	Y	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	89	5	-	-	-	-	-	-	-	-	4	-	1	-	333		5	
	97	6	-	-	1	-	-	1	-	-	8	-	-	-	160		8	
Y	89	3	11	-	-	-	-	1	-	-	15	-	-	-	1000		15	
	97	53	-	1	23	-	-	-	-	-	77	-	-	-	1540		77	
M	89	4	5	-	1	-	-	-	1	-	11	-	-	-	733	75 30	11	
	97	73	-	-	21	-	-	1	-	-	95	-	-	-	1900	32 23	95	
D	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	4	-	-	1	-	-	-	-	-	4	-	-	-	120		6	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	260		13	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		63%			00%			00%			+49%							
'97		00%			.56%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1799	Dec:	4%				
											'97	3560		3%				
Symphoricarpos oreophilus																		
S	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	89	9	3	3	-	-	-	2	-	-	17	-	-	-	1133		17	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7	
M	89	4	12	1	3	3	-	1	-	-	24	-	-	-	1600	8 11	24	
	97	59	-	-	14	-	-	2	-	-	75	-	-	-	1500	15 23	75	
D	89	-	3	4	-	-	-	-	-	-	6	-	-	1	466		7	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		44%			17%			02%			-48%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	3199	Dec:	15%				
											'97	1660		1%				

Trend Study 16C-5-97

Study site name: Cane Valley .

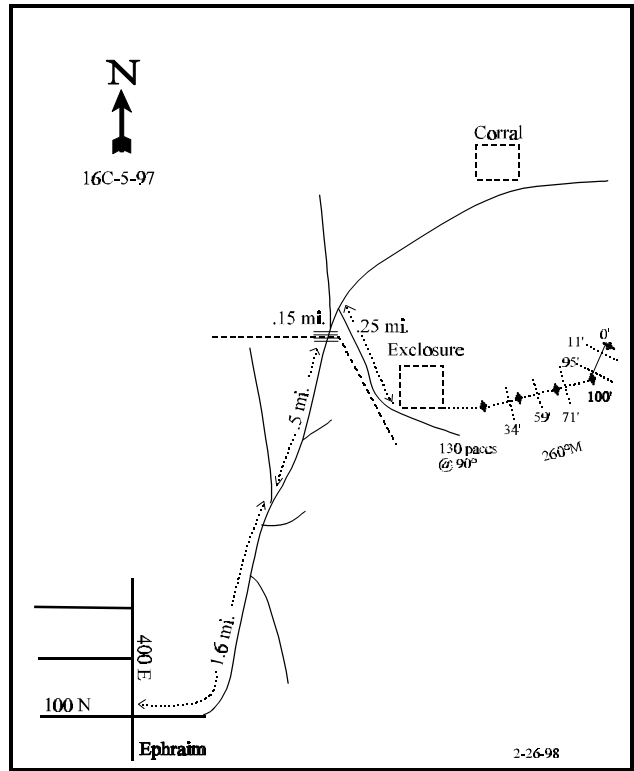
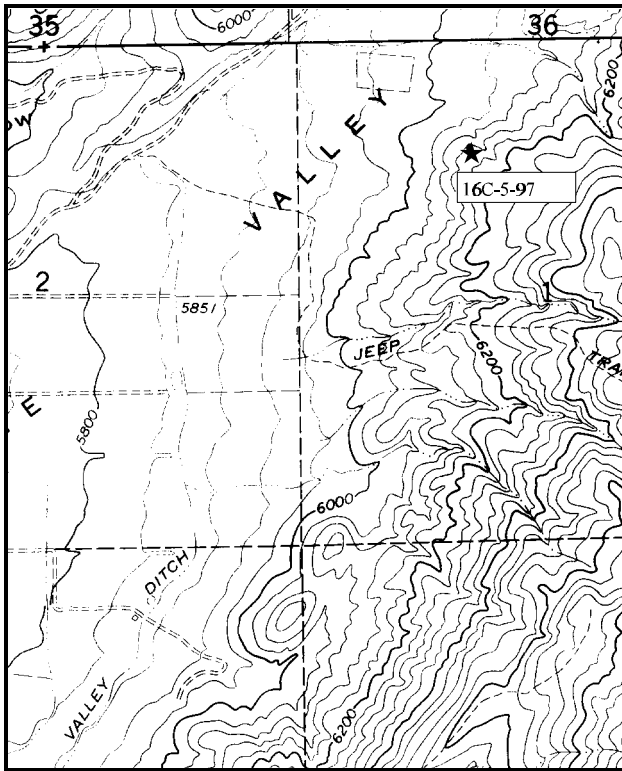
Range type: Chained, cabled reseeded P.J.

Compass bearing: frequency baseline 220 M degrees. (lines 2-4 260°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (71ft), line 3 (59ft), line 4 (34ft).

LOCATION DESCRIPTION

From the intersection of 400 E. and 100 N. in Ephraim, proceed up 100 N. for 1.75 miles. The pavement will end and the road will head in a northerly direction. At 1.75 miles the road will fork, stay right. Proceed up road for an additional 0.50 miles until you come to a cattleguard where a fence crosses the road. At this point the road forks twice. Take the road to the right for 0.15 miles. Turn right and follow along the fence in a southeasterly direction for 0.25 miles to an enclosure on the east side of the road. From the southeast corner of the enclosure, the last stake of the baseline is 130 paces due east (90°M).



Map Name: Ephraim .

Diagrammatic Sketch

Township 17S, Range 3E, Section 1

UTM 4357862.598 N, 453877.392 E

DISCUSSION

Trend Study No. 16C-5 (29-5)

The juniper slopes above Cane Valley were two-way chained and aerial seeded in 1982. The treatment was on 650 acres of Division land with the trend study located in the center. The chaining is currently dominated by perennial grasses as characterized by the fact that 55% of the total plant cover is contributed by perennial grasses. Big game use appears to be moderately heavy for both deer and elk. Pellet groups are abundant. Use of forage seems to be light. Sheep are grazed on the adjacent private land. Chukar partridge, mourning doves, and rabbits were commonly observed. The study site is on a west-facing 30% slope with an elevation of 6,100 feet on the foothills above Cane Valley. There is a spring about 200 yards north of the site.

Like the chaining at Willow Creek, this treatment is in a Upland Shallow Shale juniper-pinyon range site. The dominant natural vegetation is juniper, usually with an understory of 20% (by weight) grasses, 5% forbs and 10% shrubs. The soil is moderately deep (12-18 inches) over shale bedrock and has a shaley clay loam texture. The hazard of erosion is commonly severe on the Atepic Association soils. Sheet erosion before the treatment was active on the site, now with the abundant herbaceous cover, there is little sign of erosion. There are large gullies on both sides of the study that are not currently active. Vegetative and litter cover values are common for a chaining, 28% and 33% respectively. Percent bare soil has increased from 13% to 21%, but there still does not appear to be any signs of significant erosion.

There was a poor establishment of seeded browse on this site. A few four-wing saltbush and rubber rabbitbrush were observed. Young juniper appear to be quickly increasing in size. Juniper cover makes up 48% of the browse cover and 13% of the total vegetative cover. Density is estimated at about 380 trees/acre. The majority of the trees are classified as young. The most numerous browse species is low rabbitbrush. Broom snakeweed was at relatively higher densities earlier, now it is fairly uncommon.

Herbaceous species provide most of the palatable forage on this site, contributing to 72% of the total vegetative cover. Grasses are moderately dense and diverse, alone providing 55% of the total plant cover. The most common species initially was the native bottlebrush squirreltail, bluebunch wheatgrass, and Indian ricegrass. Currently, intermediate wheatgrass and bluebunch wheatgrass dominate the site. Together they provide 41% of the total plant cover. Small burnet and alfalfa are the only seeded forbs to occur in measurable numbers. A few Cicer milkvetch were found. The most common perennial forb species are rock goldenrod and Hoods phlox. The two biennial forbs, prickly lettuce and yellow salsify, which were quite common shortly after the chaining now occur in very low numbers.

1989 APPARENT TREND ASSESSMENT

The treated area provides abundant herbaceous forage for spring and fall use, but there are restricted limits to cover with little preferred browse for winter range. The site appears to be quickly returning to dominance of juniper cover. The lack of good quantities of preferred browse indicates a downward trend for deer winter range. Soil trend is down as excessive erosion continues.

1997 TREND ASSESSMENT

The trend for soil is stable. There is no sign of erosion at this time, especially with the very high proportion of cover provided by the herbaceous species. The trend for preferred browse is down because there is little preferred browse on the site. Most cover (forage) provided by browse species is from low rabbitbrush (51%) and juniper (48%). Trend for herbaceous understory is stable, with nearly no change in the sum of nested

frequency values for perennial grasses and forbs.

TREND ASSESSMENT

soil - stable

browse - down, 99% of the browse cover is from undesirable species

herbaceous understory - stable for perennial grasses and forbs

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 5

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	5	*18	3	10	.85
G	Agropyron intermedium	18	*117	8	38	3.94
G	Agropyron spicatum	61	*118	26	44	7.21
G	Bromus japonicus (a)	-	2	-	1	.00
G	Bromus tectorum (a)	-	33	-	15	.15
G	Dactylis glomerata	3	*23	3	11	.64
G	Elymus junceus	1	2	1	1	.15
G	Oryzopsis hymenoides	47	30	22	16	.95
G	Poa fendleriana	7	1	3	1	.03
G	Poa secunda	30	15	16	7	.58
G	Sitanion hystrix	230	*31	84	17	.56
Total for Grasses		402	390	166	161	15.09
F	Alyssum alyssoides (a)	-	7	-	4	.02
F	Antennaria rosea	-	6	-	3	.01
F	Arabis spp.	1	3	1	1	.00
F	Arenaria kingii	-	*34	-	16	.10
F	Astragalus spp.	5	12	2	5	.05
F	Astragalus utahensis	-	5	-	2	.01
F	Camelina microcarpa (a)	-	5	-	2	.01
F	Carduus nutans (a)	-	-	-	-	.03
F	Chaenactis douglasii	-	5	-	3	.04
F	Chenopodium fremontii (a)	-	3	-	1	.00
F	Cirsium spp.	7	1	3	1	.00
F	Convolvulus arvensis	8	-	2	-	-
F	Cryptantha spp.	33	*8	17	6	.03
F	Erigeron spp.	-	1	-	1	.00

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Eriogonum spp.	3	4	1	2	.03
F	Haplopappus acaulis	5	*21	2	10	.61
F	Lactuca serriola	12	-	4	-	-
F	Machaeranthera canescens	8	-	4	-	-
F	Medicago sativa	-	-	-	-	.01
F	Penstemon spp.	8	2	4	2	.01
F	Petroragia pumila	1	*30	1	13	1.82
F	Phlox hoodii canescens	107	97	47	43	1.09
F	Ranunculus testiculatus (a)	-	111	-	42	.65
F	Sanguisorba minor	19	*3	10	2	.03
F	Sphaeralcea coccinea	3	3	2	2	.01
F	Streptanthus cordatus	5	-	3	-	-
F	Trifolium douglasii	-	*11	-	5	.07
F	Tragopogon dubius	31	*3	19	1	.00
Total for Forbs		256	375	122	167	4.70

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 16C , Study no: 5

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier utahensis	1	-
B	Artemisia tridentata vaseyana	2	-
B	Ceratoides lanata	5	.06
B	Chrysothamnus depressus	2	-
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus stenophyllus	46	3.88
B	Gutierrezia sarothrae	3	-
B	Juniperus osteosperma	18	3.65
B	Purshia tridentata	2	-
Total for Browse		80	7.60

BASIC COVER --

Herd unit 16C , Study no: 5

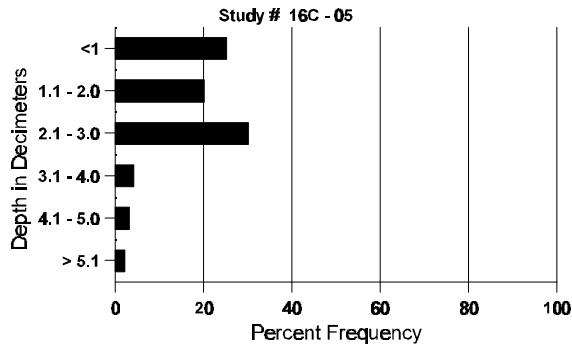
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	328	11.50	27.65
Rock	233	11.75	8.64
Pavement	261	15.25	6.38
Litter	391	48.50	33.02
Cryptogams	38	0	.27
Bare Ground	244	13.00	20.74

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 05

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.0	60.0 (14.7)	7.4	28.0	29.4	42.6	5.0	12.4	188.8	.4

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16C , Study no: 5

Type	Quadrat Frequency '97
Sheep	4
Rabbit	4
Elk	26
Deer	25
Cattle	1

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 5

A Y G R E	Y 89 97	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
		1	2	3	4	5	6	7	8	9	1	2	3	4					
Amelanchier utahensis																			
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	-	20		1		
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	7	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>							
'89		00%			00%			00%				Appeared							
'97		00%			00%			00%											
Total Plants/Acre (excluding Dead & Seedlings)												'89		0		Dec:		-	
												'97		20				-	

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<i>Artemisia tridentata vaseyana</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	-	-	-	-	-	-	-	2	-	-	-	40	12	11	2
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		50%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			
<i>Atriplex canescens</i>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	37	26	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	61	77	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	0		-			
<i>Ceratoides lanata</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	5	-	-	-	-	-	-	7	-	-	-	140	4	5	7
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		14%			71%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	140		-			
<i>Chrysothamnus depressus</i>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	4	9	1
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+18%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	40		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus nauseosus albicaulis</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	15	17
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	20		-		
<i>Chrysothamnus viscidiflorus stenophyllus</i>																	
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	28	-	-	-	-	-	-	-	-	28	-	-	-	560		28
M	89	16	-	-	-	-	-	-	-	-	16	-	-	-	533	8	10
	97	142	12	-	-	-	-	-	-	-	154	-	-	-	3080	11	16
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+84%						
'97		07%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	566	Dec:	-		
												'97	3640		-		
<i>Gutierrezia sarothrae</i>																	
M	89	10	-	-	-	-	-	-	-	-	10	-	-	-	333	9	12
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100	6	6
D	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-73%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	366	Dec:	9%		
												'97	100		0%		

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Juniperus osteosperma</i>																		
S	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133		4	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	7	-	-	-	-	-	-	-	-	7	-	-	-	233		7	
	97	11	-	-	-	-	-	1	-	-	12	-	-	-	240		12	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	71	52	1
	97	5	-	-	1	-	-	1	-	-	7	-	-	-	140	-	-	7
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>					<u>%Change</u>					
'89		00%			00%			00%					+30%					
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	266	Dec:	-				
											'97	380		-				
<i>Purshia tridentata</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	2	-	-	-	-	-	-	2	-	-	-	40	6	14	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>					<u>%Change</u>					
'89		00%			00%			00%					Appeared					
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				

Trend Study 16C-6-97

Study site name: Black Hill .

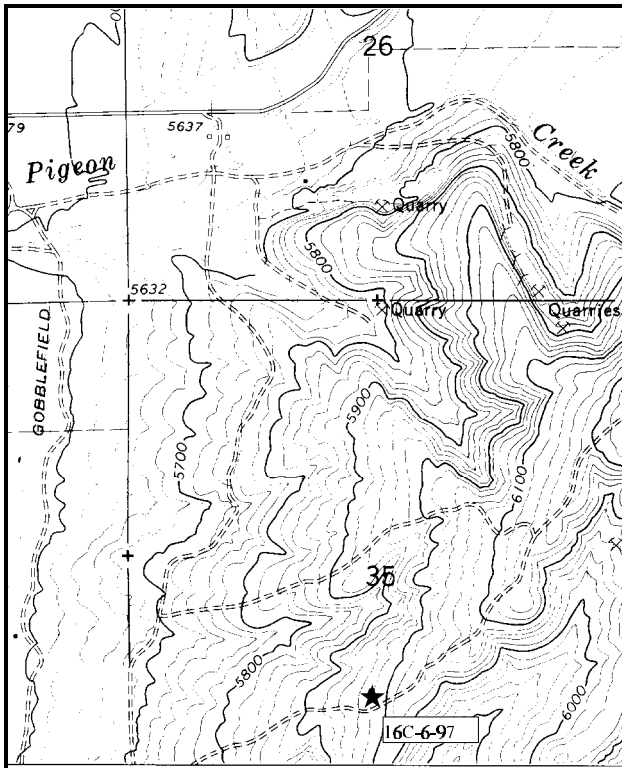
Range type: Chained cabled reseeded P.J.

Compass bearing: frequency baseline 190M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

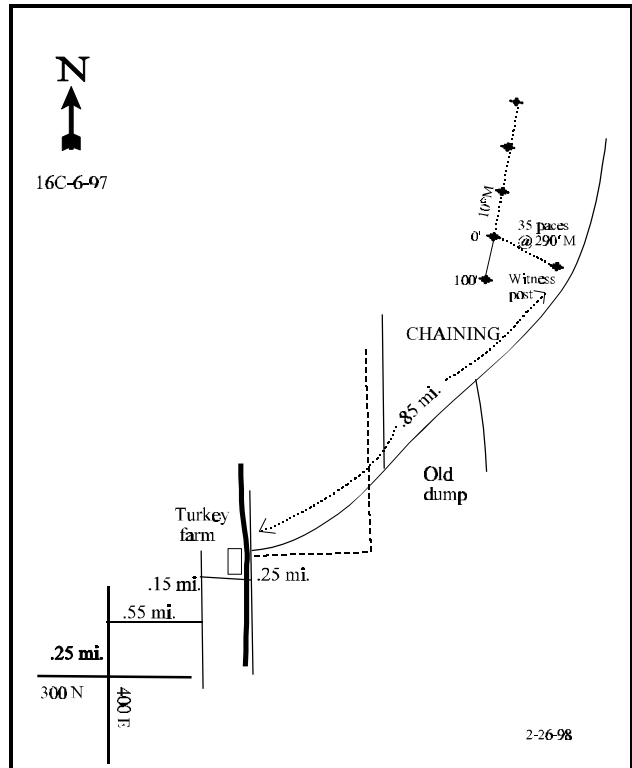
LOCATION DESCRIPTION

From the intersection of 300 North and 400 East in Ephraim, go north on 400 East for 0.2 miles. Just before the white brick home, turn east and go 0.55 miles. Here bear left and then right, going 0.15 miles to where the road crosses the Gobble field ditch on the south side of a turkey pen. Cross the ditch and turn left (north) for 0.25 miles. Turn right here and go 0.85 miles into the chaining where you will come to a 4 foot, green witness post on the west side of the road. Stop here and walk 35 paces westward at 290°M to the O foot baseline stake. This stake has 3 holes in it, but no browse tag.



Map Name: Chester .

Township 16S, Range 3E, Section 35



Diagrammatic Sketch

UTM 4358578.003 N, 452496.998 E

DISCUSSION

Trend Study No. 16C-6 (29-6)

The Black Hills study is located on the Black Hills northeast of Ephraim, just above the turkey farms, pastures, and alfalfa fields. The Black Hills drop sharply down to Cane Valley on the east, but slopes moderately to the west. The site is on a 16% west-facing slope with an elevation of 6,075 feet. A disk-chain was used to mechanically eliminate the weedy species on this site and then it was seeded. This treatment was done in 1987. Previously, the area was an open stand of juniper with a sparse understory of black sagebrush in association with cheatgrass. Patches of juniper were left on the ridge for cover and travel lanes for big game. Unlike the Cane Valley site located nearby, most big game sign on this area was that of deer, which had a pellet-group quadrat frequency of 40%. There was some sign of elk, but not much on this lower site.

The site is limited by the shallow soils and 10-12 inch annual precipitation. The soil is described as Amtoft flaggy loam. It is 12-18 inches deep over limestone on the study site, therefore the root zone is somewhat restricted. Effective rooting depth (see methods) is about 10 inches. The soil texture analysis indicates the soil is a clay-loam and the pH is 7.3, classified as neutral to mildly alkaline. Runoff is normal and the hazard of erosion is considered moderate. There is appreciable litter buildup associated with the grasses and from the mechanical treatment, providing litter cover of 63% and 41% respectively for 1989 and 1997. Rock and pavement has comprised 16% to 7% of the ground cover. Percent bare soil has varied from 15% (1989) to 13% (1997). Soil loss does not appear excessive.

Four-wing saltbush, which was seeded on the site, was represented by a few individuals none of which were sampled. Black sagebrush and Wyoming big sagebrush are found in almost equal numbers, 420 and 440 plants/acre respectively. Initially about half were moderately hedged, now they are mostly classified as lightly hedged. Use is generally heavier on black sagebrush than the Wyoming sagebrush. The junipers on the ridge are highlined. Juniper density on the study site is 69 plants/acre, with half being barely surviving chained trees. Low rabbitbrush is the most common shrub on the study site with a density of 2,920 plants/acre. It had very poor vigor, related to moisture stress in 1989, now it does not show these characteristics.

Grasses, seeded and native, dominant the vegetative community. The perennial grasses contribute 48% of the total vegetative cover. Large patches of wheat grasses are found, but limited in their distribution. Native bottlebrush squirreltail, Indian ricegrass, and muttongrass are moderately abundant. Cheatgrass is moderately common, in 1997 it contributed 11% of the grass cover. The seeded small burnet was quite abundant in 1989, now sum of nested frequency has gone from 88 down to only 15. Even with this decrease, it is still one of the most abundant perennial forbs on the site. Alfalfa and Lewis flax can still be found occasionally. Most of the other forbs encountered on this site are weedy species.

1989 APPARENT TREND ASSESSMENT

This recently treated area has not yet reached its potential, especially with the poor moisture conditions in the years since the treatment. But the site potential is limited, black sagebrush will likely become the predominant browse because of the shallow soils. Grasses and forbs are clearly an important component on this range for spring and fall big game use. Site management objectives should include the increase of the perennial species to more competitively exclude weedy annuals and cheatgrass. The soil trend is currently stable to improving with increasing ground cover.

1997 TREND ASSESSMENT

The trend for soil is up at this time with percent bare soil going down to 13%. Another reason for this direction in trend is that 75% of the vegetative cover is contributed by herbaceous species which better protect soils from high intensity summer storms. The two preferred browse species for this site are black sagebrush and Wyoming big sagebrush which are almost equal in abundance, 420 and 440 plants/acre respectively . The much better sampling design is responsible for the more accurate estimates of sagebrush density. Previously black sagebrush had an estimated density of 732 plants/acre with a couple of Wyoming sagebrush near the baseline. Now with the much larger sampling design, their respective densities are nearly the same. Percent decadence is low and vigor is good. Trend for browse is stable to slightly improving. The herbaceous understory is more difficult to determine because of the abundance of weedy species. The trend for perennial species is stable to slightly improving, but the weedy species should be monitored closely for just three species (cheatgrass, pale alyssum, and bur buttercup) contribute 21% of the total vegetative cover.

TREND ASSESSMENT

soil - up

browse - stable to slightly improving for the preferred species

herbaceous understory - stable to slightly improving for perennial species, but weedy species make up much of the herbaceous cover

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 6

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	16	*34	9	17	1.50
G	Agropyron elongatum	44	*-	17	-	-
G	Agropyron intermedium	49	*178	20	64	12.55
G	Agropyron spicatum	-	-	-	-	.00
G	Bromus inermis	-	3	-	1	.03
G	Bromus tectorum (a)	-	181	-	61	1.98
G	Elymus junceus	-	4	-	3	.21
G	Oryzopsis hymenoides	52	*90	24	34	1.21
G	Poa fendleriana	1	-	1	-	-
G	Poa pratensis	1	-	1	-	-
G	Poa secunda	9	*44	5	17	.16
G	Sitanion hystrix	46	39	22	21	1.14
Total for Grasses		218	573	99	218	18.80
F	Alyssum alyssoides (a)	-	271	-	87	1.96
F	Arabis spp.	-	3	-	1	.03
F	Astragalus spp.	3	-	1	-	-
F	Camelina microcarpa (a)	-	5	-	2	.01

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Chenopodium album	-	1	-	1	.00
F	Cirsium spp.	6	-	2	-	-
F	Cymopterus spp.	-	1	-	1	.00
F	Lactuca serriola	14	4	5	2	.01
F	Linum lewisii	1	2	1	1	.03
F	Mentzelia albicaulis (a)	-	3	-	1	.03
F	Medicago sativa	7	2	4	2	.04
F	Phlox longifolia	-	2	-	1	.00
F	Ranunculus testiculatus (a)	-	272	-	86	3.46
F	Sanguisorba minor	88	*15	40	5	1.12
F	Sisymbrium altissimum (a)	3	3	1	1	.41
F	Sphaeralcea coccinea	-	1	-	1	.03
F	Trifolium douglasii	-	3	-	2	.06
F	Tragopogon dubius	3	6	2	4	.04
Total for Forbs		125	594	56	198	7.27

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

BROWSE TRENDS --

Herd unit 16C , Study no: 6

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia nova	10	.39
B	Artemisia tridentata vaseyana	1	-
B	Artemisia tridentata wyomingensis	14	.45
B	Atriplex canescens	3	-
B	Chrysothamnus viscidiflorus stenophyllus	57	5.29
B	Gutierrezia sarothrae	5	.07
B	Juniperus osteosperma	7	2.51
Total for Browse		97	8.72

BASIC COVER --

Herd unit 16C , Study no: 6

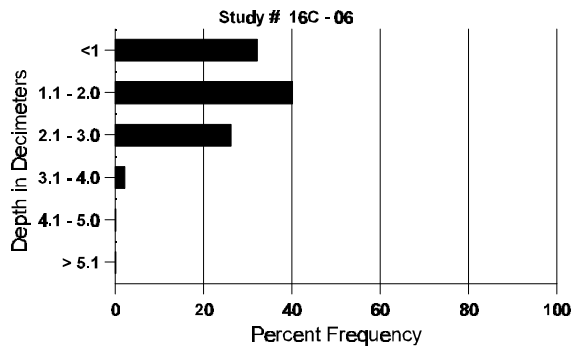
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	374	4.50	34.90
Rock	139	2.50	2.73
Pavement	237	13.75	4.38
Litter	378	63.25	40.56
Cryptogams	99	1.00	1.42
Bare Ground	210	15.00	12.78

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 06

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
8.5	61.6 (10.4)	7.3	36.7	34.7	28.6	4.5	13.1	160.0	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16C , Study no: 6

Type	Quadrat Frequency '97
Sheep	1
Rabbit	12
Elk	1
Deer	40

BROWSE CHARACTERISTICS --

Herd unit 16C, Study no: 6

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4				
<i>Artemisia nova</i>									
S	89	2	-	-	-	-	-	-	2
	97	-	-	-	-	-	-	-	0
Y	89	2	-	1	-	-	-	-	3
	97	3	-	-	-	-	-	-	3
M	89	4	6	1	-	-	-	-	11
	97	15	-	-	-	-	-	-	15
D	89	5	3	-	-	-	-	-	8
	97	3	-	-	-	-	-	3	3
X	89	-	-	-	-	-	-	-	0
	97	-	-	-	-	-	-	-	20
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
'89		41%		09%		05%		-43%	
'97		00%		00%		14%			
Total Plants/Acre (excluding Dead & Seedlings)						'89	732	Dec:	36%
						'97	420		14%
<i>Artemisia tridentata vaseyana</i>									
D	89	-	-	-	-	-	-	-	0
	97	1	-	-	-	-	-	-	20
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
'89		00%		00%		00%		Appeared	
'97		00%		00%		00%			
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec:	0%
						'97	20		100%

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata wyomingensis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	2	-	-	-	-	-	-	-	-	-	-	-	40			2	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	13	1	-	5	-	-	-	-	-	-	-	-	380	15	20	19	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		05%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	420		-			
<i>Atriplex canescens</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	3	-	-	-	-	-	-	-	-	-	-	-	60	41	21	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	60		-			
<i>Chrysothamnus nauseosus</i>																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	54	85	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total	
	1	2	3	4	5	6	7	8	9	1	2	3	4					
<i>Chrysothamnus viscidiflorus stenophyllus</i>																		
Y	89	2	-	-	-	-	-	-	-	-	1	-	1	-	66		2	
	97	20	-	-	-	-	-	-	-	-	20	-	-	-	400		20	
M	89	35	-	-	-	-	-	-	-	-	2	-	28	5	1166	15	22	35
	97	121	-	-	1	-	-	-	-	-	122	-	-	-	2440	14	23	122
D	89	18	-	-	-	-	-	-	-	-	1	-	12	5	600		18	
	97	4	-	-	-	-	-	-	-	-	3	-	-	1	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			93%			+37%							
'97		00%			00%			.68%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1832	Dec:	33%				
											'97	2920		3%				
<i>Gutierrezia sarothrae</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	7	-	-	-	-	-	-	-	-	7	-	-	-	140		7	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	8	-	-	-	-	-	-	-	-	8	-	-	-	160	10	9	8
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	300		-				

AGE	YGR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Juniperus osteosperma																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	2	-	-	-	-	-	-	-	-	1	-	1	-	66		2	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100	-	5	
D	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133		4	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			17%			-20%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	199	Dec:	67%				
											'97	160		0%				
Opuntia spp.																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	4 15	1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	4 18	0		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	0		-				

Trend Study 16C-7-97

Study site name: Mayfield Mtn. Face .

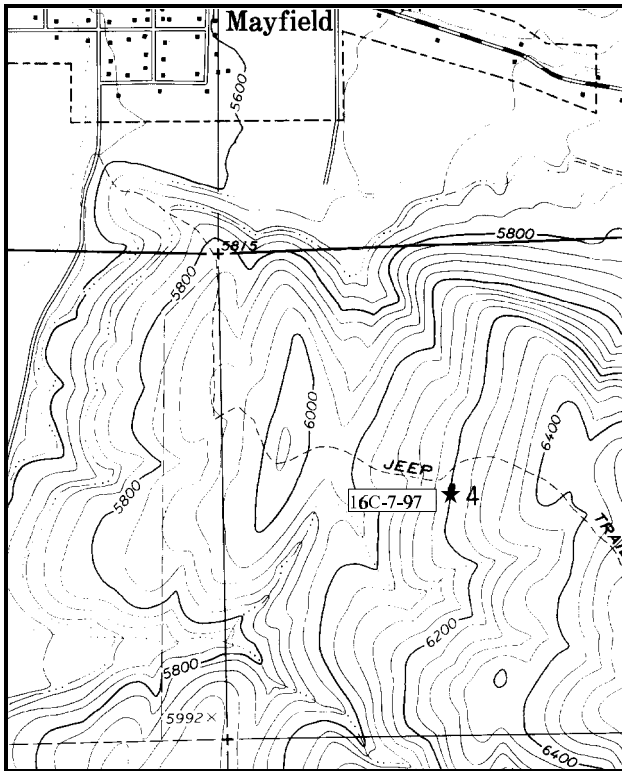
Range type: Chained Cabled Reseeded P.J.

Compass bearing: frequency baseline 154M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

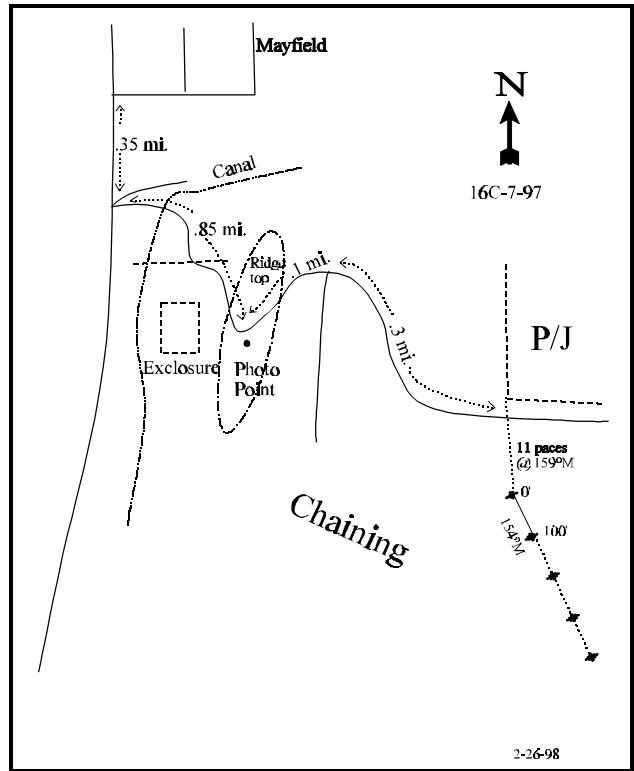
LOCATION DESCRIPTION

From the intersection of the main road and the Twelve mile Canyon Road in Mayfield, go south out of town on the main road into Arapien Valley. At 0.35 miles from this intersection, turn east up a steep four-wheel-drive road that goes up the hill, across a canal and through a fence. Take this road 0.85 miles to an old line-intercept photo point on the ridge top. 0.1 miles east of the ridge top you'll come to a fork in the road. Go straight (east) for 0.3 miles to a fence corner on the north side of the road. From the fence corner, walk 11 paces at 159°M to the 0 foot baseline stake.



Map Name: Mayfield .

Township 20S , Range 2E ,Section 4



Diagrammatic Sketch

UTM 4327808.688 N, 440010.144 E

DISCUSSION

Trend Study No. 16C-7 (29-7)

The Mayfield Face trend study is located on a fairly large, 30 year old chaining treatment. The area is critical big game winter-spring-fall range, especially for deer which in 1997 had a pellet group quadrat frequency of 47%. There is good cover in the adjacent unchained juniper woodlands.

The site has a west-facing moderately steep slope (15-20%) and an elevation of 6,200 feet. The soil is Fontreen very cobbly loam. The soil is very strongly calcareous, allowing calcium carbonate precipitates to form a hardened caliche. Soil texture is a clay-loam with a pH of 7.3 which gives it characteristics of a neutral to mildly alkaline soil. On the site but within localized areas, there appears to be a well developed hardpan about 10 or so inches below the surface. Effective rooting depth (see methods) is about 9 inches. The surface characteristics are moderately rocky with rock-pavement cover estimated at about 24%. The amount of litter cover is low for a chaining (26%). Litter remaining from the chaining and the large proportion of plant cover that is contributed by herbaceous species helps to control erosion on this site. Soil loss is nominal.

Juniper release and/or reinvasion of the site is sparse. The point-centered quarter method gave estimates of 35 juniper/acre and 10 pinyon/acre in 1989. Currently, these estimates are 31 and 9 trees/acre respectively. These trees are mostly available. Older trees within the unchained stand have been highlined. Black sagebrush is the most common shrub in the treated area and makes up 77% of the shrub cover. Initially because of a patchy distribution, density was estimated at 5,466 plants/acre. With the improved and much larger sampling design, the density is much more accurately determined at 2,540 plants/acre. The difference is more reflective of the sampling design giving improved population estimates, because the number of dead plants cannot explain the differences in density. The population appears to have a stable age class structure. Thirty-one percent of the black sagebrush were originally classified as being decadent, now only 11% are so classified. The sagebrush are in good vigor with light to moderate use. The few mountain big sagebrush that occur on site have been very heavily browsed, along with a few rare bitterbrush and four-wing saltbush.

Grasses remain the most dominant vegetative component on the site. Perennial grasses make up 52% of the total vegetative cover. Bluebunch wheatgrass and Sandberg bluegrass were the most frequently encountered species in 1989, now crested wheatgrass, Sandberg bluegrass, and bluebunch wheatgrass are the most common grasses. Crested wheatgrass, intermediate wheatgrass, and smooth brome have all increased substantially since the reading in 1989. The most common perennial forb was Hoods phlox. Currently there are about five forb species that occur in about equal numbers. There are still a few alfalfa plants, but they occur in low densities.

1989 APPARENT TREND ASSESSMENT

Slight soil movement is detectable, but not excessive. Soil trend is assessed as fairly stable. Compared to the unchained areas, this treatment was successful in providing abundant grass forage. Browse production is less than optimum and the more palatable species are very heavily hedged. The trend is stable to downward.

1997 TREND ASSESSMENT

The trend for soil is stable to slightly up for percent bare soil has decreased from 9% down to 5%. Another especially important factor is that the herbaceous understory cover makes up almost 70% of the total plant cover. Herbaceous cover is more protective of soil erosion from high intensity summer storms than any other form of plant cover. The browse trend would be considered stable. This is in spite of its estimated density being much lower (5,466 down to 2,540 plants/acre). Most of this difference can be accounted for by the significantly

larger sample size that is now utilized because the number of dead plants will not explain this significant change in numbers. The herbaceous understory trend for perennial species is considered stable because the sum of nested frequency values between years are almost unchanged. In the future, the proportion of annual species in the herbaceous understory should be monitored closely. Currently, annuals contribute 22% of the herbaceous cover, with over 90% of this coming from only one species, bur buttercup.

TREND ASSESSMENT

soil - stable to slightly up

browse - stable for the preferred species

herbaceous understory - stable for the perennial species, but the high amount of weeds should be monitored closely

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 7

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	94	*147	40	53	6.38
G	Agropyron intermedium	7	*36	6	15	.89
G	Agropyron spicatum	226	*135	81	53	6.23
G	Bromus inermis	27	35	14	16	.40
G	Bromus tectorum (a)	-	31	-	13	.40
G	Elymus junceus	-	7	-	3	.30
G	Oryzopsis hymenoides	1	7	1	2	.53
G	Poa secunda	196	205	82	73	4.19
Total for Grasses		551	603	224	228	19.34
F	Antennaria rosea	1	-	1	-	-
F	Arabis spp.	5	1	3	1	.00
F	Astragalus utahensis	2	2	1	1	.03
F	Camelina microcarpa (a)	-	1	-	1	.00
F	Calochortus nuttallii	-	5	-	3	.01
F	Cryptantha spp.	4	-	2	-	-
F	Descurainia pinnata (a)	-	9	-	5	.02
F	Holosteum umbellatum (a)	-	1	-	1	.00
F	Lactuca serriola	-	4	-	2	.01
F	Medicago sativa	2	5	1	2	.18
F	Phlox hoodii canescens	22	*6	10	2	.06
F	Ranunculus testiculatus (a)	-	317	-	95	5.05
Total for Forbs		36	351	18	113	5.38

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

BROWSE TRENDS --

Herd unit 16C , Study no: 7

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia nova	51	8.85
B	Artemisia tridentata vaseyana	10	.96
B	Chrysothamnus viscidiflorus stenophyllus	21	1.50
B	Gutierrezia sarothrae	19	.10
B	Juniperus osteosperma	1	-
Total for Browse		102	11.42

BASIC COVER --

Herd unit 16C , Study no: 7

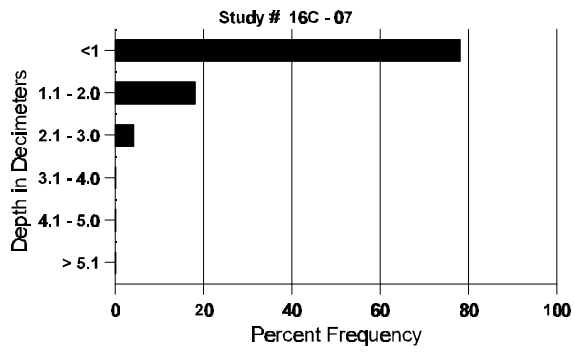
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	367	10.00	36.70
Rock	277	7.75	11.17
Pavement	295	46.00	12.71
Litter	377	27.25	25.64
Cryptogams	198	0	6.10
Bare Ground	189	9.00	5.19

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 07

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
8.7	61.0 (10.2)	7.3	30.0	37.4	32.6	4.9	11.9	144.0	.4

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 16C , Study no: 7

Type	Quadrat Frequency '97
Rabbit	19
Elk	4
Deer	47

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 7

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia nova</i>																		
S	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266		4	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
Y	89	6	5	-	-	-	-	-	-	-	7	-	4	-	733		11	
	97	20	-	-	-	-	-	-	-	-	20	-	-	-	400		20	
M	89	21	21	3	-	-	-	-	-	-	27	-	18	-	3000	14	16	45
	97	79	13	-	-	-	-	-	-	-	92	-	-	-	1840	15	28	92
D	89	18	7	1	-	-	-	-	-	-	21	-	5	-	1733		26	
	97	15	-	-	-	-	-	-	-	-	10	-	-	5	300		15	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	140		7	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		40%			05%			33%			-54%							
'97		10%			00%			04%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	5466	Dec:	32%			
												'97	2540		12%			
<i>Artemisia tridentata vaseyana</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	1	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	3	3	2	-	-	-	-	-	-	8	-	-	-	160	18	30	8
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		45%			18%			09%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%			
												'97	220		18%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus stenophyllus																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	97	35	-	-	-	-	-	-	-	-	35	-	-	-	700	11	12
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%			
											'97	760		3%			
Gutierrezia sarothrae																	
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	22	-	-	-	-	-	-	-	-	22	-	-	-	440		22
M	89	9	-	-	-	-	-	-	-	-	9	-	-	-	600	8	5
	97	26	-	-	-	-	-	-	-	-	26	-	-	-	520	9	11
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+38%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	600	Dec:	-			
											'97	960		-			
Juniperus osteosperma																	
Y	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-70%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-			
											'97	20		-			

Trend Study 16C-8-97

Study site name: Pole Canyon Chaining .

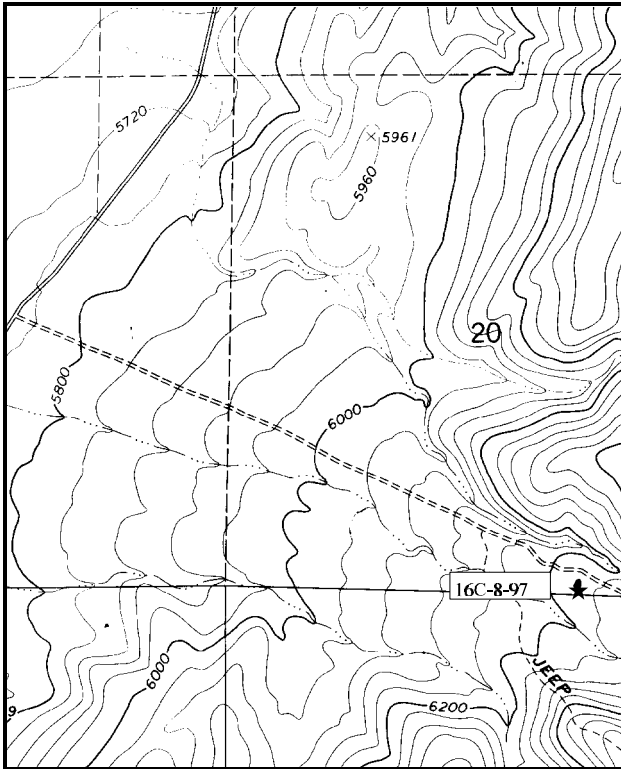
Range type: Chained, Cabled Reseeded P.J.

Compass bearing: frequency baseline 180M degrees. (Line 2-3 90°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

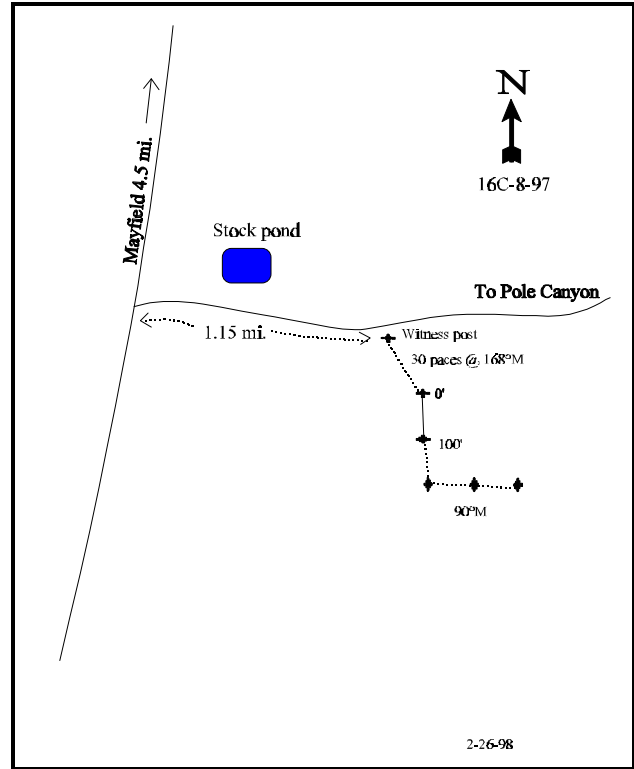
LOCATION DESCRIPTION

From Mayfield, go south down Arapien Valley for 4.5 miles to the Pole Canyon road. Turn east and go 1.1 miles to a witness post in a chaining. The witness post is 6 paces south of the road. From the witness post to the 0 foot baseline stake is 32 paces at 215°M. Browse tag #4091 marks the 0 foot baseline stake.



Map Name: Mayfield .

Township 20S , Range 2E , Section 20



Diagrammatic Sketch

UTM 4322206.054 N, 438353.186 E

DISCUSSION

Trend Study No. 16C-8 (29-8)

The Pole Canyon study is on chained pinyon/juniper land on the south end of the Mayfield Face. The treatment was done on this BLM more than 30 years ago. The same area was sampled by a line-intercept transect in 1978. The area is considered an important wintering area for deer. In 1997 pellet group quadrat frequency was moderately high at 53%. The two sampling dates (1989 and 1997) have shown the grasses being heavily to severely grazed by cattle. In the past, this area has been permitted to grazing in the South Hollow allotment from May 1 to June 30.

The site is on a fairly level alluvial fan at the mouth of Pole Canyon with an elevation of 6,160 feet. The area has a west aspect with slope ranging from 3%-5%. Like the previous study, the soil is a very strongly calcareous, cobbly loam in the Fontreen series. It is characteristically moderately deep, with a cobbly loam surface layer with 20-50% gravel and cobbles. Effective rooting depth (see methods) was measured to be a little over 10 inches. A soil texture analysis shows it to be a sandy-clay-loam with a pH of 7.4. This would indicate the soil reaction to have a neutral to mildly alkaline characteristic. Originally the cover value for rock and pavement was about 25%, now it is only about 11%. Litter cover has remained fairly consistent at about 45%. Percent bare soil has gone from 27% to 19%. In the past the area was more susceptible to sheet erosion and excessive soil movement. Active gullies were present north and south of the site. Now it is improved and not as susceptible to erosion.

For a chaining treatment done more than 30 years ago, the density of juniper and pinyon remains fairly low. The point-center quarter methods estimates their respective densities at 76 trees/acre and 26 trees/acre. Initially, the most numerous browse on the area was broom snakeweed. There was an estimated 8,733 plants/acre and an incredibly large number of seedlings. Now there are 14,940 plants/acre. White rubber rabbitbrush is the most common preferred browse that in 1989 numbered only about 932 plants/acre. Its population is now at 3,000 plants/acre. Along with the less common four-wing saltbush, these browse are lightly to sometimes moderately browsed. There are a few bitterbrush and serviceberry scattered throughout the chaining.

Crested wheatgrass is the most common grass. It provides 90% of the grass cover and nearly 50% of the total herbaceous cover. It is often heavily grazed. Total grass cover is low for a chaining at only about 7%. Forb abundance is low with a cover of only about 6%. No seeded forb species were observed. Low-growing natives and weedy increasers are common.

1989 APPARENT TREND ASSESSMENT

For a basically level site, there is an inordinate amount of soil erosion. Soil trend is down with the excessive erosion on the site. Browse forage is very limited. The herbaceous understory is depleted, and at least in 1989, the key grass species were grazed beyond the 60% utilization stated in the allotment objectives. Vegetative trend is downward.

1997 TREND ASSESSMENT

Erosion seems to be minimal at this time on this nearly level site. Percent bare soil has decreased from 27% down to 19%. Another positive characteristic relative to the trend is that almost 50% of the vegetative cover is contributed by herbaceous species which protect soils better from high intensity summer storms. The only useful browse of much consequence is white stemmed rabbitbrush which provides 25% of the browse cover. Its density is now up to 3,000 plants/acre, showing good vigor, reproductive potential, light to moderate use, and

percent decadence is about 2%. Other preferred browse are in very low densities on this site (four-wing saltbush, true mountain mahogany, and antelope bitterbrush) and provide little forage. For the browse, of major concern is the alarming increase in broom snakeweed which has increased from 8,733 to 14,940 plants/acre. This increaser shrub will continue to increase with continued heavy livestock grazing in May and June of each year. The only positive attribute of this population is that it is now mostly all classified as a mature population at 83%. This aspect of the browse population should be monitored closely. Trend for browse is considered stable now, but quality of browse is very limited. The herbaceous understory for perennial species is down for both grasses and forbs. With the excessive early season grazing pressure, coupled with extended drought, weedy annual species now make up almost 50% of the total herbaceous cover. This trend will probably continue with the pressure from spring livestock use.

TREND ASSESSMENT

soil - slightly up

browse - stable, but quality browse is very limited

herbaceous understory - down for perennial grasses and forbs, composition has too many weedy species

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 8

T y p e	Species	Nestd Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	278	262	97	95	5.89
G	Bromus tectorum (a)	-	91	-	36	.57
G	Poa fendleriana	4	3	2	1	.01
G	Poa secunda	3	-	1	-	-
G	Sitanion hystrix	5	2	2	1	.03
Total for Grasses		290	358	102	133	6.51
F	Alyssum alyssoides (a)	-	50	-	18	.22
F	Antennaria rosea	-	1	-	1	.00
F	Astragalus utahensis	10	18	4	8	.28
F	Castilleja linariaefolia	-	2	-	1	.03
F	Collinsia parviflora (a)	-	11	-	5	.02
F	Cryptantha spp.	18	13	11	7	.14
F	Descurainia pinnata (a)	-	27	-	14	.09
F	Erodium cicutarium (a)	-	9	-	5	.02
F	Haplopappus acaulis	2	-	1	-	-
F	Lactuca serriola	20	7	10	4	.04
F	Lithospermum spp.	7	3	3	1	.15
F	Machaeranthera canescens	13	*3	7	1	.00
F	Microsteris gracilis (a)	-	23	-	10	.10

T y p e	Species	Nest ed F r e q u e n c y		Q u a d r a t F r e q u e n c y		A v e r a g e C o v e r % '97
		'89	'97	'89	'97	
F	Ranunculus testiculatus (a)	-	299	-	89	4.55
F	Senecio multilobatus	2	-	1	-	-
F	Streptanthus cordatus	14	5	6	3	.01
F	Tragopogon dubius	1	-	1	-	-
F	Unknown forb-perennial	-	1	-	1	.01
Total for Forbs		87	472	44	168	5.71

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

BROWSE TRENDS --

Herd unit 16C , Study no: 8

T y p e	Species	Strip	Average
		Frequency '97	Cover % '97
B	Chrysothamnus nauseosus albicaulis	51	3.30
B	Chrysothamnus viscidiflorus viscidiflorus	6	.78
B	Gutierrezia sarothrae	77	4.39
B	Juniperus osteosperma	11	3.08
B	Pinus edulis	6	1.74
B	Purshia tridentata	1	.15
B	Quercus gambelii	1	-
Total for Browse		153	13.46

BASIC COVER --

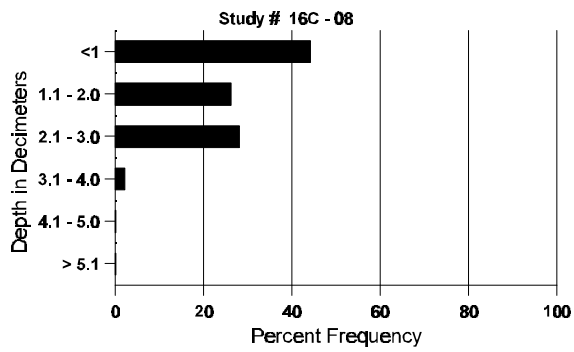
Herd unit 16C , Study no: 8

Cover Type	Nest ed F r e q u e n c y '97	A v e r a g e C o v e r %	
		'89	'97
Vegetation	356	4.00	30.03
Rock	164	5.75	4.93
Pavement	278	19.25	6.02
Litter	381	44.25	45.14
Cryptogams	81	0	1.67
Bare Ground	250	26.75	19.13

SOIL ANALYSIS DATA --
 Herd Unit 16C, Study no: 08

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.3	61.4 (11.7)	7.4	48.7	27.1	24.2	5.9	11.25	195.2	.5

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16C , Study no: 8

Type	Quadrat Frequency '97
Rabbit	19
Elk	3
Deer	53
Cattle	5

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 8

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Atriplex canescens</i>												
M	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	0	50	73	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		00%		None				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)							'89	0	Dec:	-		
							'97	0		-		
<i>Cercocarpus montanus</i>												
M	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	0	25	32	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		00%		None				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)							'89	0	Dec:	-		
							'97	0		-		
<i>Chrysothamnus nauseosus albicaulis</i>												
S	89	4	-	-	-	-	-	-	4	-	-	4
	97	2	-	-	-	-	-	-	2	-	-	2
Y	89	13	1	-	-	-	-	-	14	-	-	14
	97	71	14	-	-	-	-	-	83	-	2	85
M	89	13	-	-	-	-	-	-	13	28	25	13
	97	41	18	1	1	-	-	-	61	-	-	61
D	89	-	-	1	-	-	-	-	1	-	-	1
	97	2	1	-	1	-	-	-	4	-	-	4
X	89	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	20	-	-	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		04%		04%		00%		+69%				
'97		22%		.66%		01%						
Total Plants/Acre (excluding Dead & Seedlings)							'89	932	Dec:	4%		
							'97	3000		3%		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus viscidiflorus																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	7	1	-	-	-	-	-	-	-	8	-	-	-	160	32	38	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		10%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	200		10%				
Gutierrezia sarothrae																		
S	89	779	-	-	-	-	-	-	-	-	779	-	-	-	25966		779	
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6	
Y	89	40	-	-	-	-	-	-	-	-	40	-	-	-	1333		40	
	97	122	1	-	-	-	-	-	-	-	123	-	-	-	2460		123	
M	89	219	-	-	-	-	-	-	-	-	219	-	-	-	7300	10	9	
	97	621	-	-	-	-	-	-	-	-	621	-	-	-	12420	10	9	
D	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100		3	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	120		6	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+42%							
'97		.13%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	8733	Dec:	1%				
											'97	14940		0%				

AGE	YGR	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.		
Juniperus osteosperma																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100		3	
	97	12	-	-	-	-	-	-	-	-	12	-	-	-	240		12	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	91	71	
	97	5	-	-	-	-	-	2	-	-	7	-	-	-	140	-	-	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+65%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	133	Dec:	-				
											'97	380		-				
Pinus edulis																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
M	89	-	-	-	1	-	-	-	-	-	1	-	-	-	33	71	79	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+73%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	120		-				
Purshia tridentata																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	10	17	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	20		100%				

A G E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	1	-	-	-	-	-	-	-	-	-	-	1	20	85	17	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'89		00%			00%			00%				Appeared						
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	20		-			

Trend Study 16C-9-97

Study site name: Pole Canyon Oak .

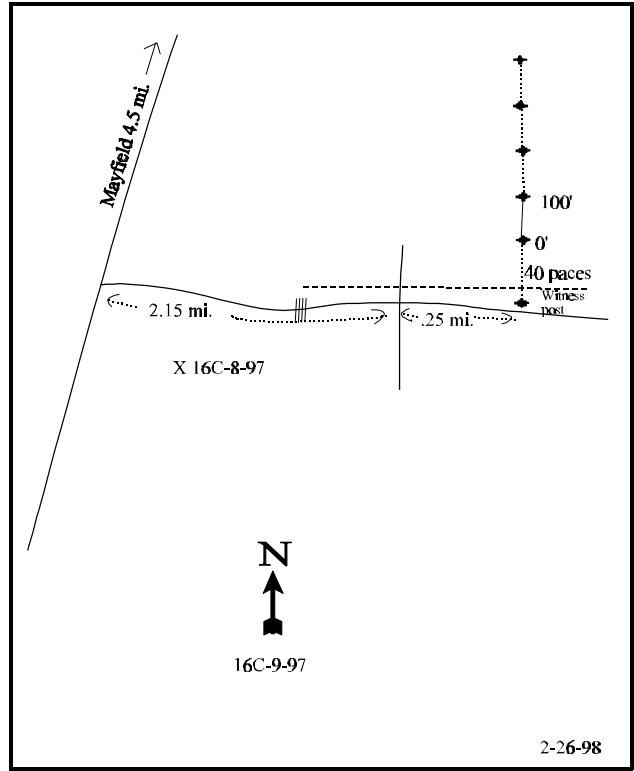
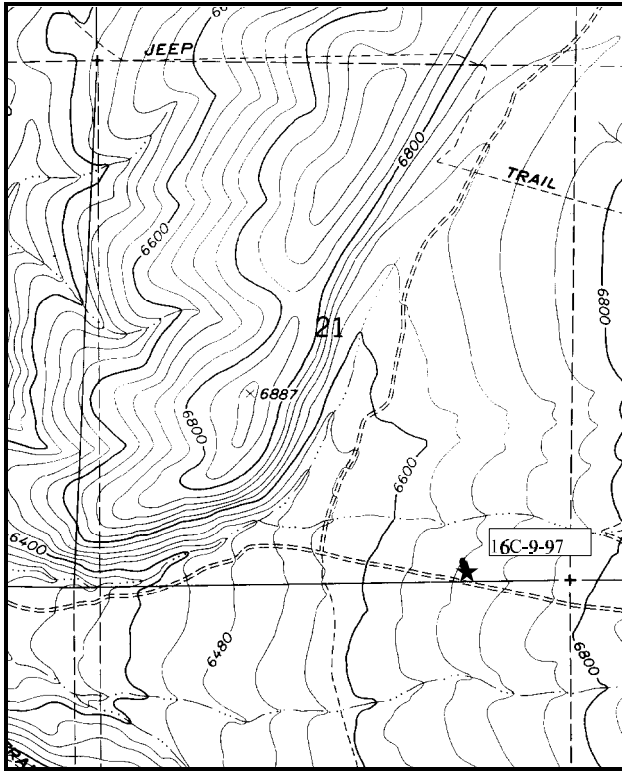
Range type: Mixed Mountain Brush

Compass bearing: frequency baseline 0 M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Go south from Mayfield through Arapien Valley for 4.5 miles to the Pole Canyon road. Turn east and go 2.15 miles; passing study number 16C-8, crossing a cattle guard and continue to a four-way intersection (South Hollow road). From the intersection, go east (straight) for another 0.25 miles to a witness post on the north side of the road. The O foot baseline stake (marked by browse tag #9042), is 40 paces due north.



Map Name: Mayfield .

Diagrammatic Sketch

Township 20S , Range 2E , Section 21

UTM 4322122.920 N , 440235.750 E

DISCUSSION

Trend Study No. 16C-9 (29-9)

The Pole Canyon oak study is located up Pole Canyon at the south end of South Hollow on Division property. It samples a mixed mountain brush type dominated by oak, pinyon, and juniper. Some of the area has been experimentally treated with herbicide in strips to remove the dense overstory of oak. The study is not within a treated area. It receives moderate use by deer as indicated by pellet group frequencies. There is also sign (pellet group and pat frequency) for both elk and cattle.

This site is on a west aspect with a 2-3% slope and an elevation of 6,600 feet. Soils are similar to those of site number 16C-8 (Pole Canyon chaining), which are a Fontreen cobbly loam in the Upland Stony Loam (Juniper-Pinyon) range site. The soil appears to be shallow, with rock and pavement on the surface. Effective rooting depth (see methods) is only about 9 inches. Soil textural analysis shows it to be a loam with a pH of 7.2, giving it a neutral soil reaction. Percent bare soil was 11%, now it is up to 14%. Litter cover is good. It was initially 67%, now it is about 60% which is still relatively quite high compared to most other nearby sites. Litter cover is especially abundant under the oak. Most of the areas of bare soil are the interspaces between trees and shrubs, where the majority of the erosion occurs.

The dominant overstory is oakbrush in association with a considerable number of juniper and pinyon. The point-centered quarter method estimated tree densities of 141 juniper and 89 pinyon trees/acre. These estimates are slightly higher than those done in 1989, which were respectively 119 and 61 trees/acre. The density strip estimates for tree density are not as accurate as the point-quarter method because of the relative spacing of trees. All age classes of trees are present, but most are trees in the 30-40cm diameter class for pinyon and 10-20cm diameter class for the juniper. Oak was dense and thought to be increasing. Now in 1997, it is shown to have slightly increased from about 3,265 to 4,980 stems/acre. These are relative numbers, for the point-quarter method more accurately estimates their respective densities. There is light to occasionally moderate use on oak that is available. There is a suitable diversity of browse species. These include: serviceberry, mountain big sagebrush, true mountain mahogany, and antelope bitterbrush. Mountain big sagebrush is the most common understory shrub. Total sagebrush cover averages about 2%, or about 7% of the browse cover. Its density was estimated at 1,233 plants/acre in 1989. Now its density is down to 960 plants/acre. Initially, 97% were classified as decadent with vigor being poor on 73% of the population. Currently this is down to 41% decadency with poor vigor in only 19% of the population. Originally this population had 100% classified as heavily browsed. Now there are none classified as heavily browsed. During the interim, the population has decreased by about 22%. The number of dead plants in the population can account for the change in the population since 1989. It appears that the population has now stabilized after the heavy use in the early 1980's which has since been in association with extended drought since 1986. The less common bitterbrush, true mountain mahogany, and serviceberry were also heavily hedged earlier. Currently however, they all have improved vigor and are less heavily hedged. There is some recruitment within these populations. The sagebrush shows the least amount of reproductive potential.

The understory is depleted, competing for sunlight and moisture. Total cover from the herbaceous understory is one of the lowest that has been measured at only about 4%. There is a variety of grasses, about 7 species, but mutton grass alone makes up 52% of the herbaceous cover. None of the other species are especially abundant. They grow mainly in the protection of woody plants, leaving the large shrub interspaces devoid of vegetation. A fair diversity of forbs was encountered, but except for longleaf phlox, none are very common.

1989 APPARENT TREND ASSESSMENT

The site appears to have good potential. The treatments in the area will demonstrate the possibilities for rehabilitation of this important winter range. Opening up the canopy by eliminating oakbrush cover should stimulate the herbaceous understory and reduce competition for a key browse species, big sagebrush. Current data indicators point to a downward vegetative trend on the undisturbed site. The soil condition is poor with sheet erosion causing plant pedestalling and root exposure. Soil trend is down.

1997 TREND ASSESSMENT

With total canopy cover at 35% (oak, pinyon, and juniper), the herbaceous understory will continue to stay very low or will decline even further. It now only makes up 10% of the total cover. The browse and tree cover is not efficient at protecting the soils from high intensity summer storms. The only mitigating characteristic of the site is that slope is only about 2-3%. Percent bare soil has increased since 1989 (11% to 14%). Trend for soil on this site would be considered slightly down with continued soil loss at a moderately low rate. Preferred browse consists of mountain big sagebrush, true mountain mahogany, and antelope bitterbrush. Together they make up only 18% of the total browse cover. In past years they were mostly classified as decadent, now they all have improved vigor and mostly light to moderate use. Gambel oak alone contributes to 43% of the browse cover. Individuals that are not out of reach show light to moderate use. For preferred browse it appears to be stable, but if canopy cover continues to increase, they will decline in vigor competing for sunlight and moisture. The herbaceous understory is a very minor component of this plant community for it only contributes a total of 4% cover. This is one of the lowest values we have recorded in pinyon-juniper woodland. The trend for the herbaceous understory is down, with the overall sum of nested frequency value for perennial species declining. Competition for both light and moisture takes a heavy toll on the herbaceous understory.

TREND ASSESSMENT

soil - slightly down

browse - stable for preferred browse, if canopy cover does not increase

herbaceous understory - down for perennial species, competition for light and moisture from the canopy species

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 9

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	9	14	4	6	.08
G	Bromus tectorum (a)	-	40	-	16	.82
G	Oryzopsis hymenoides	42	*15	21	8	.11
G	Poa fendleriana	143	*75	58	30	2.24
G	Poa pratensis	-	*11	-	4	.07
G	Poa secunda	21	*5	12	3	.06
G	Stipa comata	6	*15	2	8	.11
Total for Grasses		221	175	97	75	3.51

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Agoseris glauca	1	3	1	1	.03
F	Arabis spp.	-	5	-	2	.01
F	Astragalus consobrinus	2	-	1	-	-
F	Astragalus spp.	2	-	2	-	.00
F	Balsamorhiza sagittata	3	-	1	-	-
F	Castilleja chromosa	1	2	1	1	.00
F	Chaenactis douglasii	5	8	3	4	.02
F	Comandra pallida	-	*33	-	15	.10
F	Collinsia parviflora (a)	-	23	-	11	.05
F	Crepis acuminata	-	2	-	1	.03
F	Cymopterus spp.	66	*22	35	13	.09
F	Erigeron divergens	-	2	-	1	.00
F	Eriogonum umbellatum	7	9	4	5	.07
F	Lactuca serriola	-	1	-	1	.00
F	Machaeranthera spp	-	3	-	1	.00
F	Microsteris gracilis (a)	-	15	-	7	.03
F	Penstemon spp.	-	3	-	1	.03
F	Physaria chambersii	-	7	-	3	.04
F	Phlox longifolia	12	14	7	8	.11
F	Ranunculus testiculatus (a)	-	10	-	5	.02
F	Senecio multilobatus	5	7	2	3	.06
F	Taraxacum officinale	-	1	-	1	.01
F	Tragopogon dubius	1	-	1	-	-
F	Zigadenus paniculatus	1	2	1	1	.03
Total for Forbs		106	172	59	85	0.78

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

BROWSE TRENDS --

Herd unit 16C , Study no: 9

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	5	.21
B	Artemisia tridentata vaseyana	35	2.45
B	Cercocarpus montanus	7	1.54
B	Gutierrezia sarothrae	7	.04
B	Juniperus osteosperma	8	6.83
B	Opuntia spp.	1	-
B	Pinus edulis	5	7.35
B	Purshia tridentata	11	2.77
B	Quercus gambelii	46	16.01
Total for Browse		125	37.22

BASIC COVER --

Herd unit 16C , Study no: 9

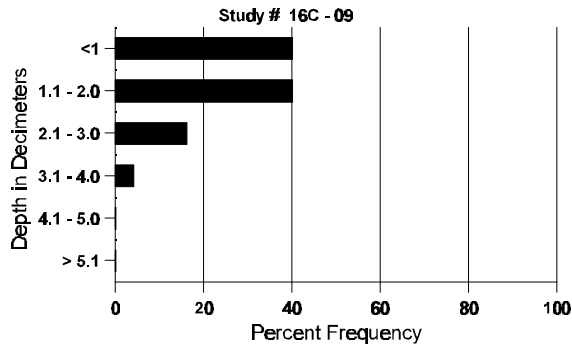
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	242	5.00	40.13
Rock	67	2.75	2.16
Pavement	155	13.75	5.42
Litter	390	67.00	59.63
Cryptogams	21	.50	.28
Bare Ground	170	11.00	14.36

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 09

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.1	54.4 (11.3)	7.2	46.7	28.7	24.6	3.5	9.9	108.8	.7

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16C , Study no: 9

Type	Quadrat Frequency '97
Rabbit	12
Elk	3
Deer	28
Cattle	1

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 9

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total							
		1	2	3	4										
<i>Amelanchier alnifolia</i>															
S	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	1	-	-	20		1
Y	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	1	-	1	-	-	-	20		1
M	89	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	97	3	-	-	1	-	-	-	4	-	-	-	80	43	23
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>				<u>%Change</u>					
'89		00%		00%		00%				Appeared					
'97		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-	
											'97	100		-	

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
M	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33	19 28	1
	97	21	2	-	3	-	-	-	-	-	26	-	-	-	520	29 33	26
D	89	-	-	36	-	-	-	-	-	-	9	-	-	27	1200		36
	97	19	1	-	-	-	-	-	-	-	11	-	-	9	400		20
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	380		19
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			100%			73%			-22%						
'97		06%			00%			19%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	1233	Dec:	97%			
											'97	960		42%			
<i>Cercocarpus montanus</i>																	
M	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33	60 55	1
	97	2	3	2	-	-	-	-	-	-	7	-	-	-	140	34 40	7
D	89	-	-	-	-	-	1	-	-	-	1	-	-	-	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			100%			00%			+53%						
'97		43%			29%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	50%			
											'97	140		0%			
<i>Chrysothamnus greenei</i>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	9 12	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			None						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	0		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus																		
M	89	-	-	3	-	-	-	-	-	-	3	-	-	-	100	3	2	3
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	89	-	-	4	-	-	-	-	-	1	-	-	3	133			4	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			43%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	233	Dec:	57%			
												'97	0		0%			
Gutierrezia sarothrae																		
Y	89	1	-	-	-	-	-	-	-	1	-	-	-	33			1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
M	89	32	-	-	-	-	-	-	-	32	-	-	-	1066	9	9	32	
	97	12	-	-	-	-	-	-	-	12	-	-	-	240	9	7	12	
D	89	2	-	-	-	-	-	-	-	1	-	-	1	66			2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			03%			-79%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	1165	Dec:	6%			
												'97	240		0%			
Juniperus osteosperma																		
Y	89	4	-	-	-	-	-	-	-	3	-	1	-	133			4	
	97	2	-	-	1	-	-	-	-	3	-	-	-	60			3	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	3	-	-	-	-	-	2	-	5	-	-	-	100	-	-	5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			25%			+17%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	133	Dec:	-			
												'97	160		-			

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Opuntia</i> spp.																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	-	-	-	2	-	-	-	-	-	2	-	-	40	7	12	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	40		-				
<i>Pinus edulis</i>																		
S	89	-	-	-	-	-	-	2	-	-	2	-	-	66			2	
	97	3	-	-	-	-	-	-	-	-	3	-	-	60			3	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	33			1	
	97	2	-	-	-	-	-	1	-	-	3	-	-	60			3	
M	89	-	-	-	-	-	-	-	1	-	1	-	-	33	177	171	1	
	97	2	-	-	-	-	-	1	-	-	3	-	-	60	-	-	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+45%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	120		-				
<i>Purshia tridentata</i>																		
Y	89	-	-	1	-	-	-	-	-	-	1	-	-	33			1	
	97	4	-	-	-	-	-	-	-	-	4	-	-	80			4	
M	89	-	-	6	-	-	-	-	-	-	6	-	-	200	13	18	6	
	97	5	15	3	-	-	-	-	-	-	23	-	-	460	13	49	23	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			00%			+57%							
'97		56%			11%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	233	Dec:	-				
											'97	540		-				

A Y G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	89	36	1	-	-	-	-	12	-	-	49	-	-	-	1633		49	
	97	9	-	-	6	-	-	-	-	-	15	-	-	-	300		15	
Y	89	68	1	-	1	1	-	-	-	-	71	-	-	-	2366		71	
	97	65	5	-	22	-	-	-	-	-	91	1	-	-	1840		92	
M	89	10	6	-	-	-	-	-	-	-	16	-	-	-	533	39 30	16	
	97	90	37	1	11	-	-	5	-	-	119	25	-	-	2880	55 44	144	
D	89	3	8	-	-	-	-	-	-	-	11	-	-	-	366		11	
	97	6	2	-	5	-	-	-	-	-	6	1	-	6	260		13	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	980		49	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		16%			00%			00%			+34%							
'97		18%			.40%			02%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	3265	Dec:	11%				
											'97	4980		5%				
Tetradymia canescens																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	0		-				

Trend Study 16C-10-97

Study site name: Julius Pasture .

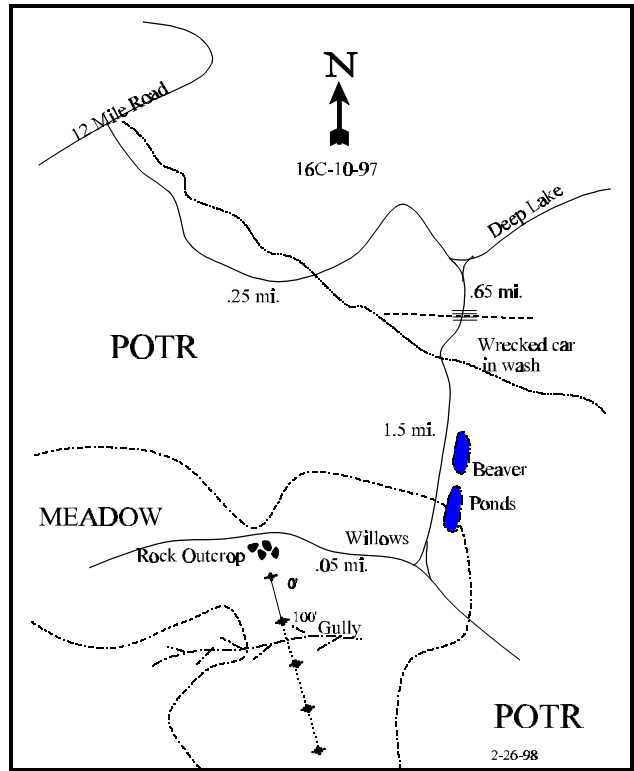
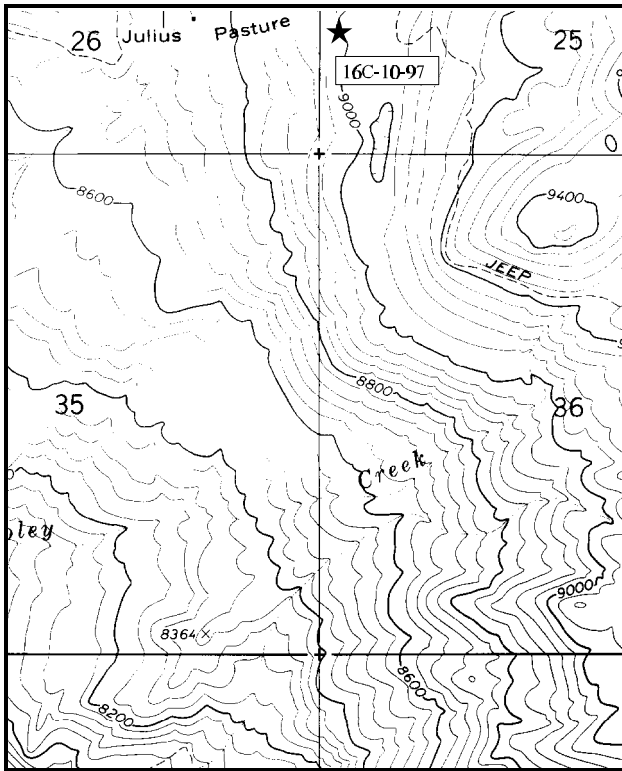
Range type: Dry Meadow

Compass bearing: frequency baseline 174M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the town of Mayfield, go east up Twelve mile Canyon for about 15 miles to the Cowboy Camp/Deep Lake road. Take this road south for 0.25 miles to a fork in the road. At this fork, turn right off the main road onto a four-wheel-drive road and go 0.65 miles to a pole fence and a cattle guard. Continue on for another 1.5 miles to another fork in the road. Turn right again and go 0.05 miles to a rock outcropping on the south side of the road. From the edge of the road, walk 13 paces (through the rock outcropping) to the O foot baseline stake which is marked by browse tag #9046.



Map Name: Woods Lake .

Diagrammatic Sketch

Township 19S, Range 3E, Section 25

UTM 4330511.386 N, 453759.518 E

DISCUSSION

Trend Study No. 16C-10 (29-10)

The Julius Pasture trend study was established on the mountain above Mayfield. The site is in a meadow surrounded by mature aspen. It has a gentle 5% slope with a west aspect and an elevation of 8,700 feet. Species composition is fairly consistent over the site. Elk are believed to use this area of the Twelve Mile drainage mainly in spring. The site is on Forest Service land and is within a cattle allotment. The study was initially established in the rested pasture of a rotation, however recent trespass was evident at that time. In 1997, the pellet group transect associated with the trend transect indicated that use was as follows: 1 deer days use/acre, 3 elk days use/acre, and for cattle, 35 cow days use/acre.

The soil is deep and dark with a fine loam texture. Soil textural analysis shows it to be a clay soil with a pH of 6.2, giving it a slightly acidic soil reaction. Effective rooting depth (see methods) is almost two feet with a moderately cool soil temperature of 46°F at about 20 inches in depth. The activity of burrowing rodents is common. Nearby beaver ponds and a spring supply abundant water. Grasses provide only 22% of the herbaceous cover while the forbs provide the remainder of the cover. Tar weed makes up 44% of the total herbaceous cover and is a major problem on this site from past abusive grazing practices. Percent bare ground has decreased from 32% to 27% at this time. Herbaceous cover is uniform with no large bare areas, so sheet erosion is not obvious. An active gully runs through the middle of the meadow as evidence of earlier problems. The heavy soil is subject to slumping as there are landslides adjacent to the site.

The aspens surrounding the meadow are mostly mature trees, although within the sampling belts, most were classified as young. Other browse observed near the site include mountain big sagebrush, snowberry, and serviceberry.

Herbaceous vegetation is the key component on this spring and summer range site. Grass abundance is moderate, contributing 22% of the herbaceous cover. The most common species is the sod-forming Kentucky bluegrass which makes up 50% of the grass cover. Kentucky bluegrass is an increaser species with moderate to heavy livestock use. Two productive forage species, slender wheatgrass and mountain brome, are also fairly common. Grass vigor is satisfactory, yet there was a noticeable decline in sum of nested frequency for the grasses. The majority of the loss was to one species, Kentucky bluegrass.

Forbs are an important forage resource for big game. On this site they provide 78% of the herbaceous understory cover, but 56% of the forb cover is provided by only one, very weedy undesirable species, tarweed. Basically, the forbs that are the most numerous are the weedy species (increasers). Together they contribute 82% of the forb cover. None are especially preferred forage species. Mulesears wyethia, a species that begins growth early in the spring and provides important early spring forage for elk, was not found within the immediate area of the study site, although it is abundant in other parts of the meadow. It is generally considered an increaser with cattle grazing as it is relatively unpalatable, especially as it dries later in the grazing season.

1989 APPARENT TREND ASSESSMENT

The lack of comparable baseline data and study sites makes it difficult to assess trend on this high elevation meadow. Further study is warranted. Changes in species composition would provide definite indicators of trend direction. Livestock trespass should be controlled. The abundance of tarweed and lack of prime forb species are downward trend indicators. Unless the adjacent slumping activity expands, soil on this site is stable.

1997 TREND ASSESSMENT

Percent bare soil has gone from 32% down to 27%. Almost all of the vegetative cover comes from herbaceous species which protect the soils best from high intensity summer storms. Trend for soil is considered stable. Because of the elevation, the browse component is not of particular importance as it is a spring-summer elk range. The herbaceous understory is critical for this area. It is too bad that most of it is composed of weedy increaser species. The sum of nested frequency for grasses has shown a noticeable decrease since 1989. The forbs have also shown a decrease, more importantly, the majority are made up of weedy species. Tarweed is one that shows a significant increase since 1989. By itself, it contributes 56% of the forb cover. The herbaceous understory has two downward trend indicators, decrease in sum of nested frequency and the most detrimental, the high amounts of weedy species in the composition. The trend for the herbaceous understory is down.

TREND ASSESSMENT

soil - stable

browse - not present and not critical, as it is a high elevation spring-summer range

herbaceous understory - down for perennial grasses and forbs, annual weeds make up the majority of the herbaceous understory cover

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 10

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron trachycaulum	146	156	62	59	3.15
G	Bromus carinatus	-	*28	-	12	.73
G	Bromus marginatus	93	*-	36	-	-
G	Carex spp.	15	13	5	5	.34
G	Dactylis glomerata	19	7	10	4	.24
G	Phleum pratense	5	*24	3	13	.97
G	Poa pratensis	285	*193	82	64	7.26
G	Stipa columbiana	-	4	-	2	.18
G	Stipa lettermani	41	50	15	19	1.61
Total for Grasses		604	475	213	178	14.49
F	Achillea millefolium	213	*141	74	59	3.75
F	Agoseris aurantiaca	14	26	8	13	.14
F	Allium spp.	3	7	2	2	.18
F	Arabis spp.	81	*11	33	7	.06
F	Aster foliaceus	69	*112	25	41	4.53
F	Cirsium spp.	29	*72	13	36	2.49
F	Collomia linearis (a)	-	12	-	4	.19

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Cynoglossum officinale	1	-	1	-	-
F	Epilobium paniculatum (a)	-	21	-	7	.06
F	Fragaria virginiana	27	*-	12	-	-
F	Madia glomerata (a)	218	*330	72	91	29.52
F	Microsteris gracilis (a)	-	7	-	5	.02
F	Polygonum douglasii (a)	-	155	-	56	4.08
F	Potentilla spp.	-	*22	-	8	.90
F	Rudbeckia occidentalis	26	18	12	7	1.16
F	Taraxacum officinale	159	*94	63	44	2.44
F	Tragopogon dubius	1	7	1	4	.07
F	Trifolium longipes	208	*66	67	21	2.71
F	Vicia americana	7	*33	3	15	.54
F	Viola spp.	7	3	3	1	.00
Total for Forbs		1063	1137	389	421	52.88

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

BROWSE TRENDS --

Herd unit 16C , Study no: 10

Type	Species	Strip Frequency '97	Average Cover % '97
B	Populus tremuloides	10	-
Total for Browse		10	0

BASIC COVER --

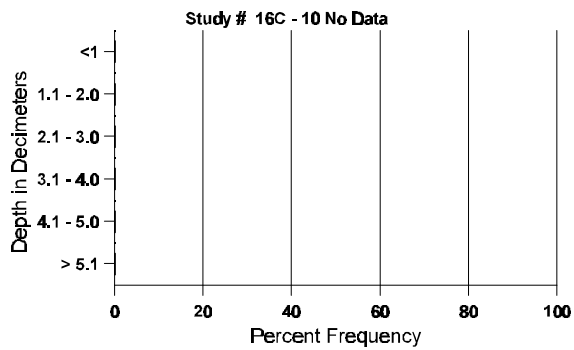
Herd unit 16C , Study no: 10

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	393	26.75	57.89
Rock	8	.25	.19
Pavement	17	0	.03
Litter	374	40.50	26.61
Cryptogams	21	.25	1.92
Bare Ground	308	32.25	26.81

SOIL ANALYSIS DATA --
 Herd Unit 16C, Study no: 10

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
21.7	46.0 (17.7)	6.2	29.3	25.2	45.6	3.1	10.1	137.6	.5

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16C , Study no: 10

Type	Quadrat Frequency '97
Elk	3
Deer	3
Cattle	15

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 10

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Populus tremuloides																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	11	9	-	-	-	-	-	-	-	-	-	-	-	400		20
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	1	20		1	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		43%			00%			05%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	0%		
												'97	420		5%		

Trend Study 16C-11-97

Study site name: Above South Hollow .

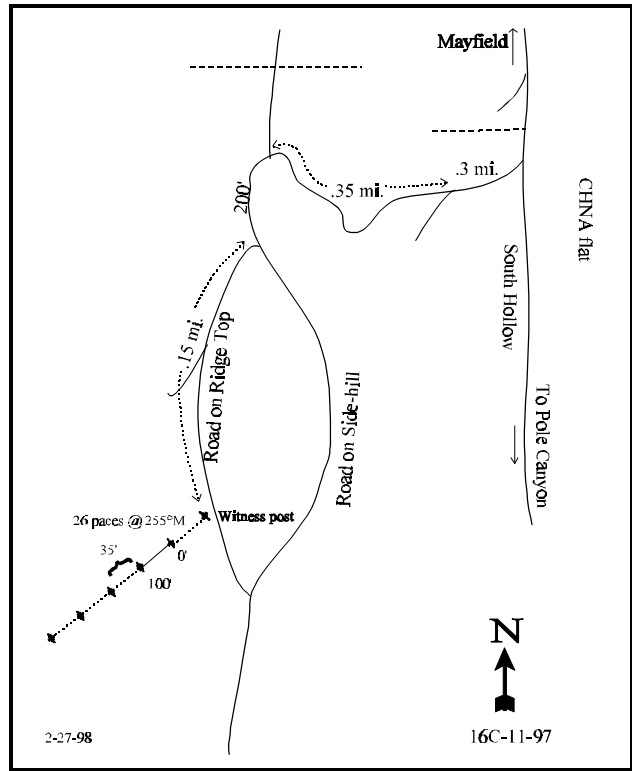
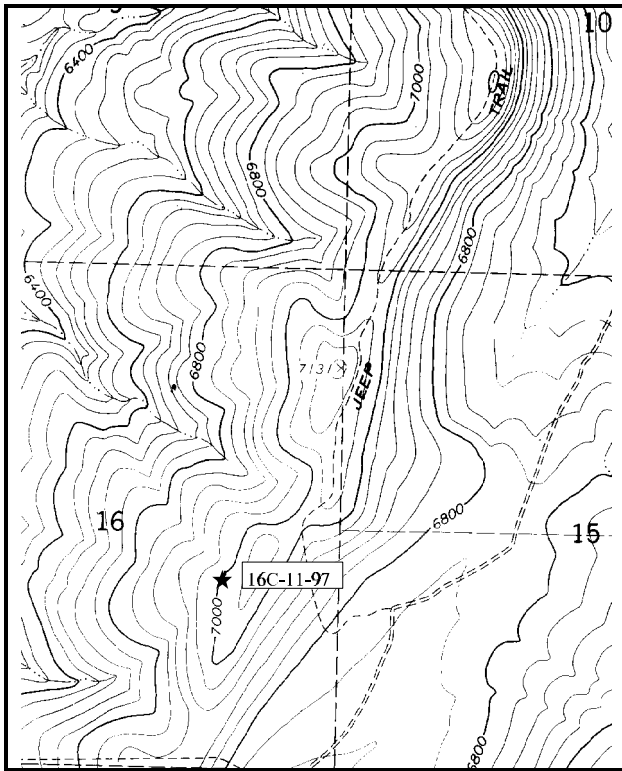
Range type: Chained Cabled Reseeded P.J.

Compass bearing: frequency baseline 255 M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Mayfield post office, go 1.75 miles up the Twelve mile Canyon road. Take the right hand fork south down South Hollow 3 miles to a large rabbitbrush flat. Take the fork past the fence west for 0.3 miles to another fork. Take the right fork up a steep dugway for 0.35 miles to a fenceline where the road forks again. Take the left fork south for 200 feet to another fork. Take the right fork up a very steep dugway for 0.15 miles to a witness post on the west side of the road. From here walk 26 paces at 255°M to the O foot baseline stake.



Map Name: Mayfield .

Diagrammatic Sketch

Township 20S, Range 2E, Section 16

DISCUSSION

Trend Study No. 16C-11 (29-11)

The Above South Hollow study samples another 30 year old chaining on the upper slope of the Mayfield Face west of South Hollow. Evidence of the treatment is found primarily in the prevalence of seeded grass species, as juniper and pinyon have become well-established on the site. Overhead canopy cover contributed by the pinyon-juniper and oak is now at 17%. The study is on a 20 to 25% slope with a westerly aspect and elevation of 7,000 feet. Pellet group quadrat frequency shows that deer are the most common user of the site, with elk showing light use and cattle showing little use.

According to the soil survey, the prominent soils along the upper side of the South Mayfield Face are the Fontreen series soils. This site is located on a ridge with an area of shallow Lodar very channery loam. This soil is somewhat excessively drained and 10-20 inches deep over bedrock. Rock fragments are normally present to 50% in the surface layer, so the 11% pavement and 8% rock cover are not excessive. The effective rooting depth (see methods) is about 11 inches. Soil temperature is 58°F at about 15 inches. Soil textural analysis demonstrated the soil to be a clay-loam with a pH of 7.1, giving it a neutral soil reaction. Combined rock and pavement cover is about 12%, down from 20% measured in 1989. There is adequate litter cover (51%) and satisfactory vegetative cover with almost 50% coming from herbaceous species. Runoff was considered moderate with the hazard of erosion believed to be minimal. On the study site, there is currently only slight soil movement.

Before the chaining, the dominant overstory cover was pinyon and juniper woodland, it has now become dominant again, through mostly release of young individuals after the chaining. It now contributes to an overstory cover of 15%. Under these canopy cover conditions, this amount of cover would reduce understory productivity by 50%. This would be without livestock use. It remains a somewhat open stand. Density, estimated by the point-centered quarter method, is 109 juniper and 70 pinyon trees/acre. There are enough younger trees to allow continued increase in canopy cover. Oak provides some forage on the site. Initially, 27% were classified as having been heavily hedged. Currently, no individuals show this kind of use. Palatable, but less common browse species includes true mountain mahogany with improved vigor and decreased decadence; bitterbrush with very low numbers is showing mostly heavy use, yet vigor is still good; rubber rabbitbrush also has good vigor but very low numbers.

Grass production remains high on this old chaining. Smooth brome is the most common seeded species (86% quadrat frequency). There is a good stand of crested wheatgrass with little intermediate wheatgrass. The seeded species provide 97% of the total grass cover. Natives, except for the small bluegrasses, are uncommon. Forbs are far less common contributing only 7% of the herbaceous cover. A few small native species are found but none are abundant. The principal forb is alfalfa, as it makes up 74% of the total forb cover while it only has a quadrat frequency of 6%. Even though heavily grazed, it is able to maintain itself within the chaining.

1989 APPARENT TREND ASSESSMENT

As the juniper and pinyon trees continue to increase on this old treatment, the more valuable browse species will decline leading to a downward trend for deer winter range. No detrimental effects are evident on the abundant, vigorous grass understory. As long as there is adequate grass cover, the soil trend should remain stable.

1997 TREND ASSESSMENT

The trend for soils would be considered stable as percent bare soil is slightly decreased and almost half of the

vegetative cover is furnished by herbaceous species. The trend for browse is more difficult to determine because all of the preferred species are in relatively low numbers. Only true mountain mahogany shows any indication of any reproductive potential as it is the only species with seedlings. All appear to have good vigor, but little reproduction. This would result because of the pinyon and juniper increasing their overstory cover and competition with the vigorous understory of seeded grasses, especially rhizomatous grasses (smooth brome and intermediate wheatgrass). The trend is slightly declining because of the inevitable increases in canopy cover which will eventually lead to a decline in the preferred understory browse species. The herbaceous understory, which is dominated by grasses, has a stable overall trend.

TREND ASSESSMENT

soil - stable

browse - slightly down, preferred species are in relatively low numbers; competition with an overstory cover of pinyon and juniper trees and a rhizomatous grass

herbaceous understory - stable

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 11

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	94	105	39	46	3.54
G	Agropyron intermedium	48	26	16	11	.13
G	Agropyron spicatum	-	1	-	1	.03
G	Bromus inermis	231	*271	77	86	11.03
G	Carex spp.	13	*3	5	2	.06
G	Oryzopsis hymenoides	13	*-	6	-	-
G	Poa fendleriana	50	*3	26	1	.03
G	Poa secunda	-	*17	-	6	.34
Total for Grasses		449	426	169	153	15.17
F	Astragalus convallarius	-	1	-	1	.00
F	Astragalus spp.	1	-	1	-	-
F	Convolvulus arvensis	1	-	1	-	-
F	Collinsia parviflora (a)	-	1	-	1	.00
F	Cryptantha spp.	6	3	3	1	.03
F	Descurainia pinnata (a)	-	5	-	2	.01
F	Medicago sativa	11	13	3	6	.87
F	Microsteris gracilis (a)	-	30	-	11	.05
F	Penstemon humilis	9	*-	4	-	-
F	Phlox longifolia	24	9	9	4	.02
F	Senecio multilobatus	3	-	2	-	-

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Tragopogon dubius	1	9	1	5	.17
F	Unknown forb-annual	-	3	-	1	.00
Total for Forbs		56	74	24	32	1.17

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

BROWSE TRENDS --

Herd unit 16C , Study no: 11

T y p e	Species	Strip Frequency '97	Average Cover % '97
B	Cercocarpus montanus	4	1.48
B	Chrysothamnus nauseosus consimilis	2	.00
B	Juniperus osteosperma	13	9.55
B	Pinus edulis	5	3.54
B	Purshia tridentata	2	.30
B	Quercus gambelii	4	2.09
Total for Browse		30	16.98

BASIC COVER --

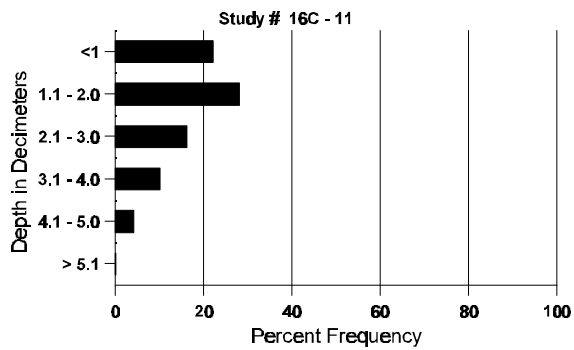
Herd unit 16C , Study no: 11

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	322	9.00	31.20
Rock	192	8.00	3.42
Pavement	254	11.50	8.08
Litter	394	60.75	50.84
Cryptogams	11	0	.05
Bare Ground	190	10.75	9.65

SOIL ANALYSIS DATA --
 Herd Unit 16C, Study no: 11

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
11.0	58.0 (15.4)	7.1	36.4	31.1	32.6	6.6	18.0	268.8	.9

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16C , Study no: 11

Type	Quadrat Frequency '97
Rabbit	14
Elk	9
Deer	31
Cattle	1

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 11

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Cercocarpus montanus</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	-	1	1	1	1	-	-	-	-	4	-	-	-	80	52	50	
D	89	-	-	1	-	-	-	-	-	-	-	-	-	1	33		1	
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			100%			+67%							
'97		40%			20%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	100%			
												'97	100		20%			
<i>Chrysothamnus nauseosus consimilis</i>																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	40	40	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		50%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	40		-			
<i>Cowania mexicana stansburiana</i>																		
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	30	33	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	33	Dec:	-			
												'97	0		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Ephedra spp.																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	39	29	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	0		-			
Juniperus osteosperma																		
Y	89	2	-	-	-	-	-	-	-	-	-	-	-	66			2	
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1	
M	89	2	-	-	2	-	-	1	-	-	-	-	-	166	61	67	5	
	97	2	-	-	4	-	-	7	-	-	-	-	-	260	-	-	13	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	80			4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+17%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	232	Dec:	-			
												'97	280		-			
Pinus edulis																		
Y	89	2	-	-	-	-	-	-	-	-	-	-	-	66			2	
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0	
	97	1	-	-	-	-	-	3	-	-	-	-	-	80	-	-	4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+34%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	-			
												'97	100		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Pseudotsuga menziesii																	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Died out						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-			
											'97	0		-			
Purshia tridentata																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	-	-	3	-	-	-	-	-	-	3	-	-	-	60	27	58
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		00%			100%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	60		-			
Quercus gambelii																	
S	89	2	-	-	1	-	-	-	-	-	3	-	-	-	100		3
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	16	1	-	24	-	-	9	-	-	50	-	-	-	1666		50
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	4	-	22	-	-	-	-	-	-	26	-	-	-	866	71	33
	97	-	2	-	12	-	-	-	-	-	14	-	-	-	280	47	49
D	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		01%			28%			00%			-89%						
'97		14%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	2598	Dec:	3%			
											'97	280		0%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Sambucus cerulea																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	22	31	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			None						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-		
												'97	0		-		

Trend Study 16C-12-97

Study site name: Manti Dump .

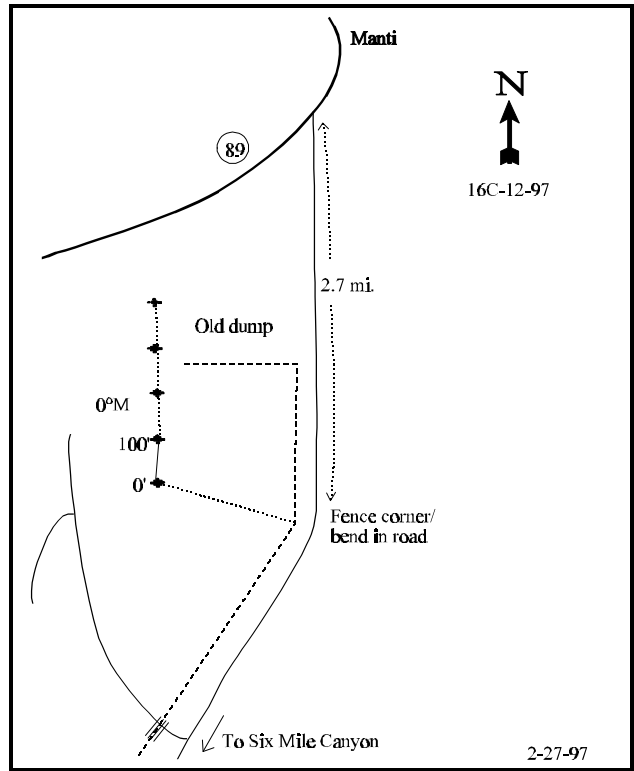
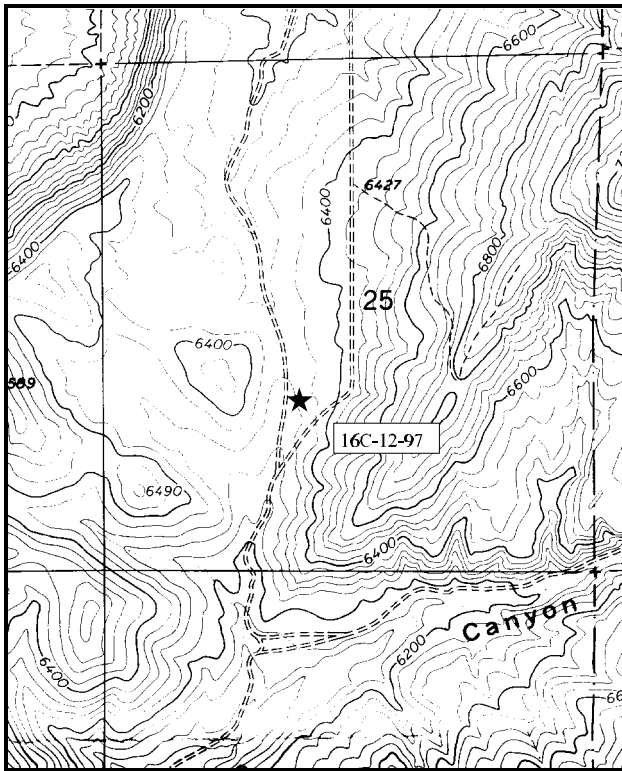
Range type: Old Chained Site

Compass bearing: frequency baseline 0 M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From highway 89 south out of Manti, just outside of town, the highway makes a gradual turn to the southwest. At this point, there is a graded gravel road that goes straight southward past the old city dump and over to Sixmile Canyon. Take this road for approximately 2.7 miles to where the road turns rather sharply to the southwest. The fence on the west side of the road also makes a slight corner here and begins to head southwest. From where the fence makes a corner, walk 36 paces at 296°M to the 0 foot baseline stake.



Map Name: Sterling .

Diagrammatic Sketch

Township 18S, Range 2E, Section 25

UTM 4340833.706 N, 444241.962 E

DISCUSSION

Trend Study No. 16C-12 (29-12)

The Manti Dump study is on Division land south of the old Manti dump. It samples a Wyoming big sagebrush range type that was part of the 1961 East Manti Dump chain/seed project. The treatment is not apparent except on the slopes above the study site in the valley. This site usually receives 1-2 feet of snow, yet still receives moderately heavy use by deer in the winter and light use by elk. Pellet groups are extremely common for deer with also several antler drops being found. The grasses, predominately seeded species, have been utilized by sheep which were in the area in the spring.

The site has a 10-12% slope with a west-southwest aspect and an elevation of 6,400 feet. Like several other studies in this unit, it is on Fontreen cobbly loam soil. Average precipitation is about 12-14 inches annually. Soil textural analysis indicates that it is a clay-loam, with a pH of 7.3, indicating a soil reaction that is neutral to slightly alkaline. Effective rooting depth is a little over 12 inches with a relatively cool soil temperature of 63°F. One possible limiting factor for this site is the phosphorus, which is less than 10 ppm. On the steeper slopes above, the soil has a severe hazard of erosion, with active sheet and rill erosion. On the study site, there was evidence of soil movement and plant pedestalling in 1989. Currently this does not appear to be the case. The erosion hazard is moderate on the deep, somewhat excessively drained, strongly calcareous soil. At the present time, pavement cover is near 30% with litter cover at 32%. There is a good ratio of herbaceous cover to total vegetative cover, producing good protection for the soils from high intensity summer storms.

In 1989, the Wyoming big sagebrush stand was thought to have a normal density (4,066 plants/acre), age class structure (57% mature), and vigor. Mature and decadent plants made up 94% of the population at that time. Now the population is estimated at only 2,360 plants/acre. About 50% of this decline can be explained by the dead plants within the population. The other differences could be explained by the much larger and improved sampling design which gives considerably improved population estimates for shrubs with discontinuous and/or clumped distributions. With the extended drought in association with continued heavy use on 60-70% of the plants, 23% classified with poor vigor, and most importantly, almost 60% of the decadent plants classified as dying, it appears that the population will continue to decline with no seedlings being inventoried and only 3% classified as young plants. Most have a moderate to heavily hedged growth form. Sagebrush cover averages 11%. The presence of black sagebrush indicates areas of shallow soil. Initially, it was estimated to be about 1,132 plants/acre. It would appear that the small sampling grid was placed on a relatively small group of individuals, for now with the much larger sample, its density is at 400 plants/acre. This large difference cannot be explained by dead plants because there are none, therefore, this is more reflective of the sampling design giving greatly improved estimates for populations that have clumped or discontinuous populations. It was thought that in 1989 the broom snakeweed was in relatively low numbers. With the better sampling design, its population is about 3,100 plants/acre. Even with this much higher population estimate it still only contributes to 3% of the total browse cover. Currently, pinyon and juniper combined density (as determined by the point-quarter method) is only 39 trees/acre. Overhead canopy cover for both of them is only about 3%.

The understory displays the low species diversity, typical of a Wyoming big sagebrush community. The seeded wheat grasses form an almost herbaceous monoculture with crested wheatgrass and intermediate wheatgrass contributing 93% of the total herbaceous cover. They are found mostly in the protection of the sagebrush crowns. Perennial forbs are almost nonexistent. The noxious annual, bur buttercup, makes up 99% of the forb cover.

1989 APPARENT TREND ASSESSMENT

The key preferred browse species is the Wyoming big sagebrush, which appears to have a stable population. They can sustain the rather heavy use. The understory is depleted, although potential is naturally low on this site. The vegetative trend is stable, to slightly downward. The soil trend is down.

1997 TREND ASSESSMENT

The trend for soil is slightly improved, with percent bare soil declining slightly. Most importantly, the herbaceous species make up over 50% of the vegetative cover. Herbaceous cover is critical for protecting the soils from high intensity summer storm events. Trend for preferred browse (Wyoming big sagebrush) is down with losses in numbers, continued heavy use on 62% of the population, 23% were classified as having poor vigor, and another crucial measurement is that 58% of the decadent plants were evaluated as dying. The trend for the herbaceous understory is slightly improved, with sum of nested frequency for perennial grass species showing notable improvement. Most all of the grass cover is contributed by two seeded species which make up 93% of the total herbaceous cover. There are almost no forbs on the site with them only making up 9% of the herbaceous cover, with bur buttercup (a noxious weed) making up 99% of what little forb cover there is.

TREND ASSESSMENT

soil - slightly up

browse - down for preferred browse, Wyoming big sagebrush

herbaceous understory - slightly up; there are almost no forbs on site and they are composed almost entirely of only one weedy species (bur buttercup)

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 12

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	174	225	64	73	8.59
G	Agropyron intermedium	168	183	59	64	5.50
G	Bromus tectorum (a)	-	67	-	24	.43
G	Oryzopsis hymenoides	-	2	-	1	.03
G	Poa secunda	3	*27	1	11	.21
G	Sitanion hystrix	13	24	10	11	.31
Total for Grasses		358	528	134	184	15.08
F	Alyssum alyssoides (a)	-	3	-	1	.00
F	Penstemon spp.	1	-	1	-	-
F	Ranunculus testiculatus (a)	-	251	-	90	1.44
F	Sphaeralcea coccinea	-	2	-	1	.00
Total for Forbs		1	256	1	92	1.45

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

BROWSE TRENDS --

Herd unit 16C , Study no: 12

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia nova	16	1.55
B	Artemisia tridentata wyomingensis	66	10.78
B	Atriplex canescens	2	-
B	Chrysothamnus viscidiflorus stenophyllus	2	-
B	Gutierrezia sarothrae	23	.41
B	Juniperus osteosperma	3	1.97
B	Pinus edulis	0	.38
Total for Browse		112	15.10

BASIC COVER --

Herd unit 16C , Study no: 12

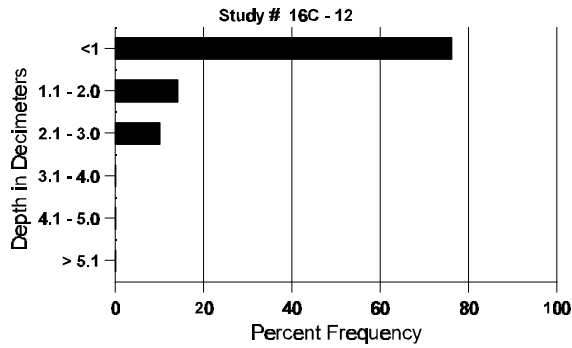
Cover Type	Nested Frequency '97	Average Cover % '89 '97	
Vegetation	363	9.00	29.62
Rock	147	1.00	1.15
Pavement	325	29.00	31.22
Litter	379	55.00	31.75
Cryptogams	198	.75	3.03
Bare Ground	154	5.25	4.92

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 12

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.2	63.0 (14.2)	7.3	38.4	35.1	26.6	3.1	8.1	137.6	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16C , Study no: 12

Type	Quadrat Frequency '97
Sheep	11
Rabbit	7
Elk	3
Deer	53

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 12

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total										
		1	2	3	4													
Artemisia nova																		
Y	89	3	-	-	-	-	-	-	3	200	-	-	-	-	3			
	97	4	-	-	-	-	-	-	4							80	4	
M	89	4	8	-	1	-	-	-	-	13	-	-	-	-	866	16	25	13
	97	4	11	-	-	-	-	-	-	15	-	-	-	-	300	17	27	15
D	89	-	1	-	-	-	-	-	-	1	-	-	-	-	66	-	-	1
	97	1	-	-	-	-	-	-	-	-	-	-	1	20	-	-	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		53%			00%			00%			-65%							
'97		55%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1132	Dec:	6%				
											'97	400		5%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total						
		1	2	3	4		1	2							
<i>Artemisia tridentata wyomingensis</i>															
S	89	2	-	-	2	-	-	-	-	4	-	-	266		4
	97	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	3	-	-	-	-	-	-	-	3	-	-	200		3
	97	2	1	1	-	-	-	-	-	4	-	-	80		4
M	89	-	13	22	-	-	-	-	-	35	-	-	2333	27 29	35
	97	2	19	49	-	1	-	-	-	69	-	2	1420	42 64	71
D	89	-	2	21	-	-	-	-	-	23	-	-	1533		23
	97	1	15	23	2	1	-	-	-	17	-	25	860		43
X	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	800		40
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		25%		70%		00%		-42%							
'97		31%		62%		23%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	4066	Dec:	38%		
										'97	2360		36%		
<i>Atriplex canescens</i>															
Y	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	1	-	-	20		1
M	89	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	-	-	1	-	-	-	-	-	1	-	-	20	33 43	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		00%		00%		00%		Appeared							
'97		00%		50%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-		
										'97	40		-		
<i>Chrysothamnus viscidiflorus stenophyllus</i>															
M	89	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	-	-	3	-	-	-	-	-	3	-	-	60	8 11	3
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		00%		00%		00%		Appeared							
'97		00%		100%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	-		
										'97	60		-		

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	36	-	-	-	-	-	-	-	-	36	-	-	-	720		36	
M	89	2	-	-	-	-	-	-	-	-	2	-	-	-	133	12	6	
	97	119	-	-	-	-	-	-	-	-	119	-	-	-	2380	8	7	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+94%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	199	Dec:	-				
											'97	3100		-				
<i>Juniperus osteosperma</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	60		-				

Trend Study 16C-38-97

Study site name: Pleasant Creek .

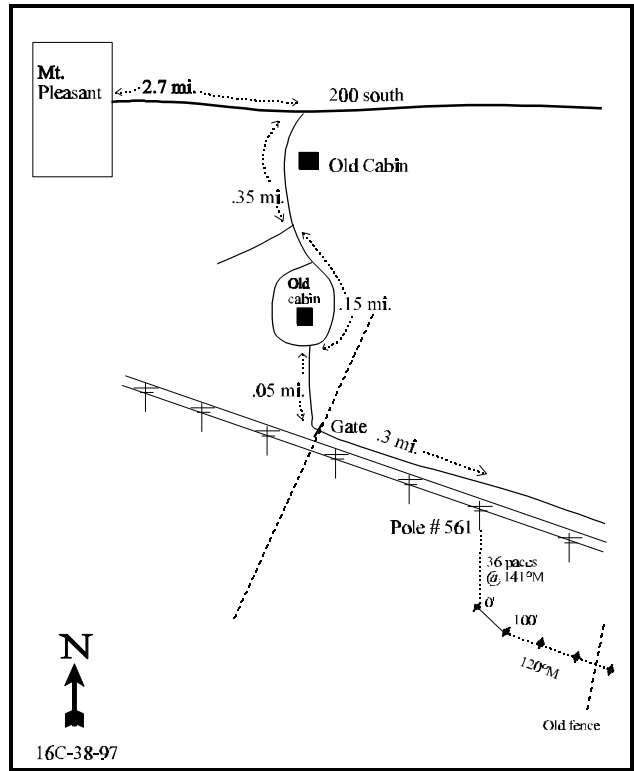
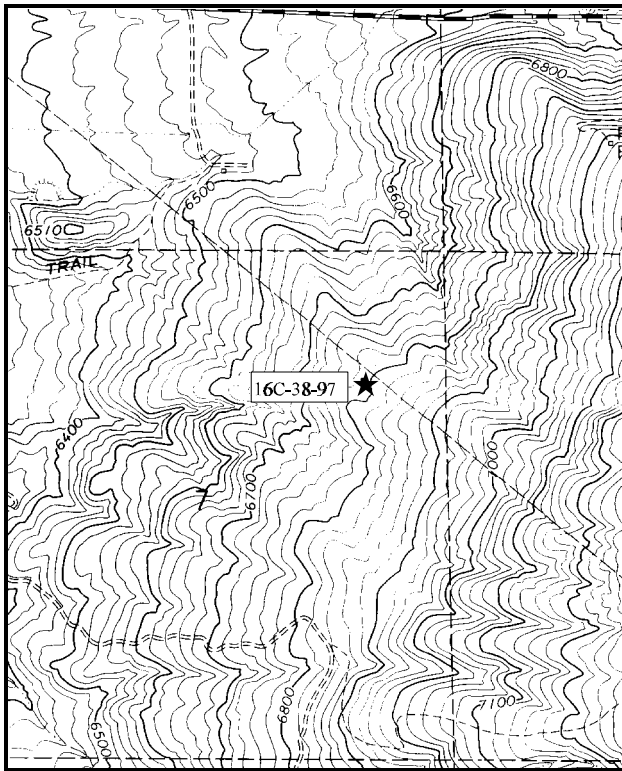
Range Type: Mixed mountain brush

Compass bearing: frequency baseline 133 M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of Highway 89 and 200 South in downtown Mt. Pleasant, take 200 Southeast for 2.7 miles. Turn right (south) and go 0.35 miles. Stay to the right and go 0.15 miles to the powerline road. Take a left (east) here and go 0.05 miles to a gate (which maybe locked). From this gate, continue eastward for another 0.3 miles and stop at the third set of power poles from the gate. The 0-foot baseline stake is 36 paces from power pole # 561 at an azimuth of 141 degrees magnetic.



Map Name: Mt. Pleasant .

Diagrammatic Sketch

Township 15S , Range 5E , Section 7

DISCUSSION

Trend Study No. 16C-38 (28-9)

The Pleasant Creek study is in mixed mountain brush located in the foothills above the town of Mt. Pleasant. It is beneath the large power transmission lines which cross the mountain. The 1997 pellet group data indicates that deer and elk use is light to moderate, with livestock use being light.

The site is on a northwest aspect with a slope of 6% and an elevation of 6,700 feet. The soils are moderate in depth, with effective rooting depth (see methods) at a little more than 12 inches. Soil textural analysis indicates it to be a clay soil with a pH of 7.2 (neutral soil reaction). Phosphorus is marginal (10.9 ppm) and could be a limiting factor on this site. The soil temperature is relatively cool at 53°F (depth of 14 inches). Rock is common throughout the upper 16 inches of soil. Vegetative cover is very good with adequate litter cover in most places. Percent bare soil is still near 25%, with the bare interspaces exhibiting slight erosion.

The area has a moderately low density for juniper estimated at 70 trees/acre using the point-quarter method. Most of the trees in 1989 were between 1 and 4 feet tall, now their average height is around 7 feet. With their relatively low density, they contribute to a canopy cover of about 6%. The mixed mountain brush canopy is the key component, along with a significant herbaceous understory. The most numerous woody species is low rabbitbrush which provides 24% of the browse cover. Surprisingly, 90% of them show light to moderate utilization. In 1989, they indicated that the population showed signs of significant browsing by domestic sheep that were in the area earlier in the season. There was evidence of summer deer use, but big game, including elk, occupy the area mainly in winter. The key browse species is mountain big sagebrush which coincidentally also makes up 24% of the browse cover. Its density has not changed very much since 1989 (1,799 vs 1,780 plants/acre in 1997). The age class structure is balanced, vigor is good on over 94% of the population. Percent decadency has improved from 22% to only 12% at this time. Use is mostly light to moderate (92%). Other preferred browse species includes: serviceberry, basin big sagebrush, bitterbrush, and snowberry. These less common species together contribute an additional 30% of the total browse cover. Serviceberry and bitterbrush show mostly heavy use, while snowberry displays chiefly light to moderate use.

Forbs are one of the key components on this site. Diversity is high, 34 species were identified in 1997. They contribute to 37% of the herbaceous cover. Several species are especially abundant, including low penstemon, longleaf phlox, showy goldeneye and the increaser species, houndstongue, and stickseed. Grass abundance is moderate, mostly because of Kentucky bluegrass and bluebunch wheatgrass. Together they provide almost 80% of the grass cover. Both show moderate use.

1989 APPARENT TREND ASSESSMENT

Soil trend is considered stable with good cover from the herbaceous species and grasses. Diversity and a high density of forbs and shrubs contribute to a stable community. There are some increaser species, but without knowing the grazing history it is difficult to predict future trends as they relate to current management. Overall, it appears to be a rather dynamic, but in the long-term, a stable and productive site.

1997 TREND ASSESSMENT

Soil trend is assessed again as stable with percent bare soil remaining about the same and almost 50% of the total vegetative cover coming from herbaceous species. The trend for preferred browse is stable as long as canopy cover from juniper stays about 6-8% and density remains relatively low (70 trees/acre). Trend for the herbaceous understory is mixed. Sum of nested frequency for perennial grasses indicates that it is slightly

improved, but for perennial forbs it has slightly gone down. Because grasses make up the majority of the herbaceous cover (63%), the trend will continue to be stable.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - stable

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 38

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	-	6	-	2	.06
G	Agropyron spicatum	166	171	66	60	8.60
G	Bromus japonicus (a)	-	93	-	33	.99
G	Bromus tectorum (a)	-	73	-	28	.63
G	Melica bulbosa	1	2	1	1	.00
G	Oryzopsis hymenoides	-	*9	-	5	.08
G	Poa fendleriana	8	-	3	-	-
G	Poa pratensis	115	101	43	31	3.78
G	Poa secunda	10	*48	7	19	.46
G	Sitanion hystrix	16	29	7	12	.34
G	Stipa columbiana	-	2	-	1	.03
G	Stipa lettermani	15	*24	6	13	.71
Total for Grasses		331	558	133	205	15.73
F	Achillea millefolium	-	4	-	1	.38
F	Agoseris glauca	-	3	-	1	.00
F	Alyssum alyssoides (a)	-	7	-	3	.01
F	Allium spp.	3	*12	1	6	.05
F	Arabis spp.	4	2	2	1	.00
F	Astragalus convallarius	40	45	18	23	.59
F	Aster spp.	79	76	31	31	1.18
F	Astragalus spp.	14	*1	7	1	.00
F	Astragalus utahensis	-	5	-	2	.01
F	Carduus nutans (a)	-	10	-	4	.21
F	Chaenactis douglasii	13	16	9	8	.06
F	Cirsium spp.	13	15	6	8	.06

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	<i>Convolvulus arvensis</i>	-	3	-	1	.01
F	<i>Collomia linearis</i> (a)	-	15	-	7	.03
F	<i>Collinsia parviflora</i> (a)	-	58	-	24	.12
F	<i>Cymopterus</i> spp.	-	2	-	2	.01
F	<i>Cynoglossum officinale</i>	94	*21	40	9	.17
F	<i>Epilobium paniculatum</i> (a)	-	3	-	3	.02
F	<i>Eriogonum umbellatum</i>	28	*-	13	-	.00
F	<i>Hackelia patens</i>	97	89	44	36	.77
F	<i>Lepidium</i> spp.	-	6	-	2	.01
F	<i>Linum kingii</i>	7	-	2	-	-
F	<i>Lithospermum ruderales</i>	3	4	3	2	.03
F	<i>Machaeranthera canescens</i>	79	*40	37	16	.26
F	<i>Microsteris gracilis</i> (a)	-	30	-	12	.08
F	<i>Penstemon humilis</i>	242	*190	94	73	3.26
F	<i>Phlox longifolia</i>	123	114	55	45	.30
F	<i>Polygonum douglasii</i> (a)	-	8	-	3	.01
F	<i>Ranunculus testiculatus</i> (a)	-	132	-	47	.45
F	<i>Sphaeralcea coccinea</i>	10	19	3	8	.14
F	<i>Taraxacum officinale</i>	1	10	1	5	.02
F	<i>Tragopogon dubius</i>	4	*20	3	9	.04
F	Unknown forb-annual	-	2	-	1	.00
F	<i>Veronica biloba</i> (a)	-	106	-	38	.46
F	<i>Vicia americana</i>	-	*33	-	15	.27
F	<i>Viguiera multiflora</i>	35	*4	19	4	.05
F	<i>Viola</i> spp.	-	3	-	1	.03
Total for Forbs		889	1108	388	452	9.22

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

BROWSE TRENDS --

Herd unit 16C , Study no: 38

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	2	.03
B	Artemisia tridentata tridentata	11	.90
B	Artemisia tridentata vaseyana	49	7.25
B	Chrysothamnus nauseosus albicaulis	2	.38
B	Chrysothamnus viscidiflorus viscidiflorus	94	7.21
B	Gutierrezia sarothrae	2	.06
B	Juniperus osteosperma	6	5.63
B	Purshia tridentata	24	5.65
B	Rosa spp.	2	.30
B	Symphoricarpos oreophilus	50	2.62
B	Tetradymia canescens	2	.15
Total for Browse		244	30.21

BASIC COVER --

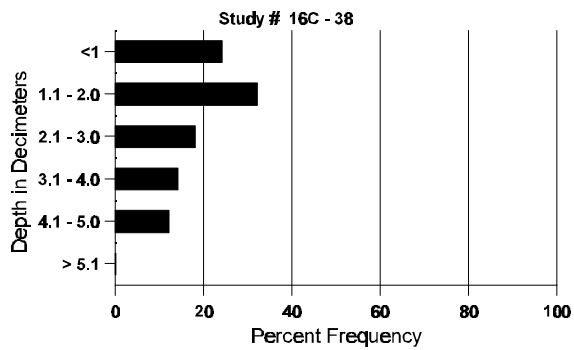
Herd unit 16C , Study no: 38

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	369	16.50	46.87
Rock	68	1.75	.58
Pavement	175	2.75	1.09
Litter	392	54.00	42.92
Cryptogams	49	0	1.62
Bare Ground	259	25.00	24.11

SOIL ANALYSIS DATA --
 Herd Unit 16C, Study no: 38

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.2	53.0 (14.1)	7.2	25.7	29.4	44.8	4.7	10.9	246.4	.5

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 16C , Study no: 38

Type	Quadrat Frequency '97
Sheep	6
Rabbit	3
Elk	11
Deer	12
Cattle	1

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 38

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Amelanchier alnifolia</i>											
Y	89	-	-	-	-	-	-	-	0	0	
	97	-	-	1	-	-	-	-	20	1	
M	89	-	1	1	-	-	-	-	133	17 15	2
	97	-	-	1	-	-	-	-	20	21 27	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'89		50%		50%		00%		-70%			
'97		00%		50%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'89	133	Dec:	-		
						'97	40		-		
<i>Artemisia tridentata tridentata</i>											
S	89	-	-	-	-	-	-	-	0	0	
	97	1	-	-	-	-	-	-	20	1	
Y	89	-	-	-	-	-	-	-	0	0	
	97	8	-	-	-	-	-	-	160	8	
M	89	-	-	-	-	-	-	-	0	0	
	97	6	-	-	1	-	-	-	140	54 53	7
D	89	-	-	-	-	-	-	-	0	0	
	97	5	-	-	-	-	-	-	100	5	
X	89	-	-	-	-	-	-	-	0	0	
	97	3	-	-	-	-	-	-	260	13	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'89		00%		00%		00%		Appeared			
'97		00%		00%		20%					
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec:	0%		
						'97	400		25%		

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	15	-	-	-	-	-	-	-	-	15	-	-	-	300		15	
Y	89	5	-	-	-	-	-	-	-	-	5	-	-	-	333		5	
	97	21	-	-	3	-	-	-	-	-	24	-	-	-	480		24	
M	89	13	3	-	-	-	-	-	-	-	15	-	1	-	1066	27 34	16	
	97	29	22	1	2	-	-	-	-	-	54	-	-	-	1080	29 32	54	
D	89	5	1	-	-	-	-	-	-	-	6	-	-	-	400		6	
	97	4	6	1	-	-	-	-	-	-	6	-	-	5	220		11	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	620		31	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		15%			00%			04%			- 1%							
'97		31%			02%			06%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	1799	Dec:	22%				
											'97	1780		12%				
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	89	2	-	-	1	-	-	-	-	-	3	-	-	-	200		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	3	1	-	-	-	-	2	-	-	6	-	-	-	400	35 22	6	
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	30 40	1	
D	89	3	1	-	-	-	-	-	-	-	4	-	-	-	266		4	
	97	-	1	-	-	-	-	-	-	-	-	-	-	1	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		15%			00%			00%			-95%							
'97		100%			00%			50%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	866	Dec:	31%				
											'97	40		50%				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																	
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	97	19	-	-	-	-	-	-	-	-	19	-	-	-	380		19
Y	89	85	3	3	-	-	-	-	-	-	91	-	-	-	6066		91
	97	109	-	-	7	-	-	-	-	-	116	-	-	-	2320		116
M	89	98	34	13	-	-	-	-	-	-	145	-	-	-	9666	11 12	145
	97	452	18	-	61	-	-	-	-	-	531	-	-	-	10620	9 12	531
D	89	10	20	5	-	-	-	-	-	-	35	-	-	-	2333		35
	97	10	-	-	-	-	-	-	-	-	8	-	-	2	200		10
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		21%			08%			00%			-27%						
'97		03%			00%			.30%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	18065	Dec:	13%			
											'97	13140		2%			
<i>Gutierrezia sarothrae</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120	8 7	6
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	180		-			
<i>Juniperus osteosperma</i>																	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66	93 89	1
	97	-	-	-	-	-	-	4	-	-	4	-	-	-	80	- -	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+45%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-			
											'97	120		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Purshia tridentata</i>																		
M	89	-	1	-	-	-	-	-	-	-	1	-	-	-	66	16	26	1
	97	-	1	9	-	5	21	-	-	-	36	-	-	-	720	44	49	36
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		100%			00%			00%			+91%							
'97		17%			83%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	66	Dec:	-				
											'97	720		-				
<i>Rosa woodsii</i>																		
Y	89	18	-	-	-	-	-	-	-	-	18	-	-	-	1200			18
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	89	17	-	-	-	-	-	-	-	-	17	-	-	-	1133	14	16	17
	97	8	-	-	-	-	-	-	-	-	8	-	-	-	160	10	17	8
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-91%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	2333	Dec:	-				
											'97	200		-				
<i>Symphoricarpos oreophilus</i>																		
S	89	-	-	-	4	-	-	-	-	-	4	-	-	-	266			4
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	89	20	-	-	-	-	-	-	-	-	20	-	-	-	1333			20
	97	22	-	-	2	-	-	-	-	-	24	-	-	-	480			24
M	89	26	6	-	-	1	-	-	-	-	31	-	2	-	2200	17	17	33
	97	45	23	1	23	-	-	-	-	-	92	-	-	-	1840	11	23	92
D	89	4	-	-	1	-	-	-	-	-	5	-	-	-	333			5
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		12%			00%			03%			-39%							
'97		20%			.85%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	3866	Dec:	9%				
											'97	2340		1%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Tetradymia canescens																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	12	-	-	-	-	-	-	-	-	-	-	-	-	240		12	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	10	-	-	-	-	-	-	-	-	-	-	-	-	200	12	25	10
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	440		-			

Trend Study 16C-39-97

Study site name: Cove Creek .

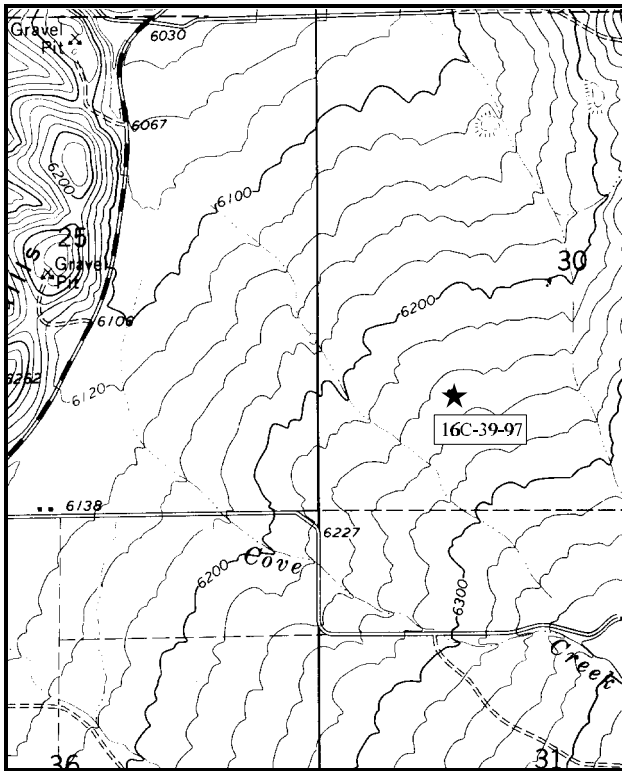
Range type: Bitterbrush

Compass bearing: frequency baseline 305M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

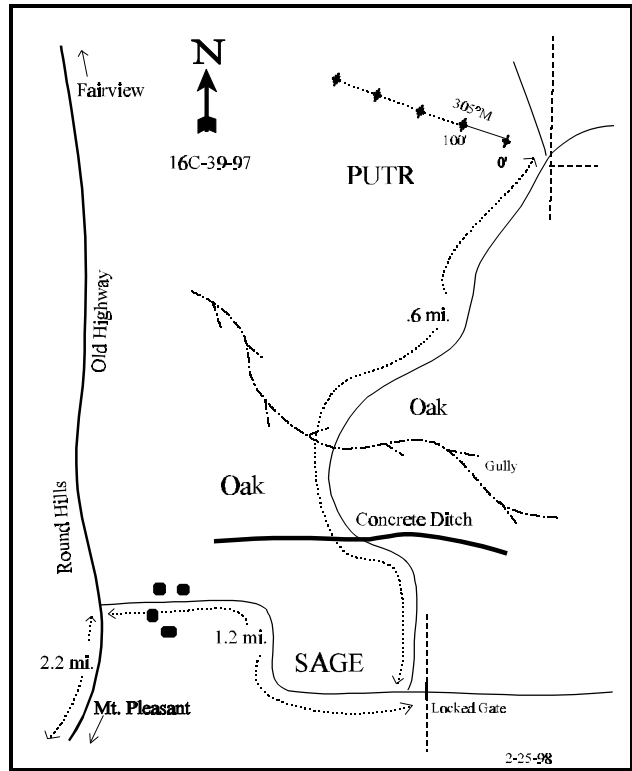
LOCATION DESCRIPTION

From State Street (89) and 200 North in Mt. Pleasant, proceed east on 200 North which curves northward and becomes the old highway to Fairview. Follow this road for 2.2 miles, then turn east on a gravel road for 1.2 miles, passing at least one house. Just before a locked gate, turn north and go 0.6 miles to a place where 3 fences intersect. The O' baseline stake, which is red, is 12 paces west of the fence corner. The 100' baseline stake is rebar.



Map Name: Mount Pleasant .

Township 14 S , Range 5E , Section 30



Diagrammatic Sketch

UTM 4379843.507 N , 464880.088 E

DISCUSSION

Trend Study No. 16C-39 (28-10)

Cove Creek is a distinctive, yet favorable location for a trend study. It was also the location of a old 1978 line-intercept transect. It is representative of the unique bitterbrush type (rather tall form) in the foothills between Fairview and Mt. Pleasant. All of the area is privately owned. Domestic sheep graze the area in winter and/or spring. There have been a few cows in the large pasture. One fawn carcass from the previous winter was found in 1989. Rabbits and small rodents are fairly common.

The site is basically level with a slope of 0-5% and aspect to the northwest. The elevation is 6,280 feet. Soil textural analysis designates it as a sandy-loam soil with a pH of 6.6 (soil reaction that is neutral to slightly acidic). Effective rooting depth (see methods) is almost 10 inches. Soil temperature was 66°F at almost 14 inches. This soil is classified in the Birdow series which is well-drained with medium runoff and a slight hazard of erosion. In the Upland Loam range site, the potential plant community consists of 80% grasses, 10% forbs and 10% shrubs (by weight). Due to the long history of grazing, annuals and increasers dominate the herbaceous understory. Shrub interspaces are bare or occupied by morning glory, storksbill, cheatgrass, and pricklypear cactus. These weedy species contribute to almost 50% of the total vegetative cover. The percentage of vegetative cover is relatively high on this site. Litter cover is also comparatively high at almost 50%.

The dominant overstory species on the site is a fairly tall bitterbrush (height through hybridizing with cliffrose). There are also prostrate forms on the site, often with distorted growth forms due to severe hedging on available branches. Vigor is good on the bitterbrush even though 90% are classified with heavy use. Mature plants have a density of 800 plants/acre. Seedlings and young are common in some years. When found they are growing in the open as well as protected in patches of cactus. There are exceptionally large patches of pricklypear throughout the site. Basin big sagebrush is fairly common and was the most numerous browse on the site at 2,400 plants/acre. Seedling and young plants are fairly common, but variable between years it was sampled. Tall oak clones occur scattered around the site.

Most of the preferred perennial grass is in association with, and protected by, shrubs or cactus. Cheatgrass and bulbous bluegrass are common in the interspaces, actually providing 91% of the grass cover. Morning glory (bindweed) and filaree (storksbill) are the only common forbs on the site, respectively a perennial and annual forb. Both are valuable spring forbs. There are also increasers such as thistle and mullein.

1989 APPARENT TREND ASSESSMENT

Trend for the key browse species, bitterbrush and big sagebrush, is stable. They have sustained themselves for many years under heavy utilization. Much new bitterbrush growth is unavailable due to height. As far as overall range condition is concerned, the prominence of annuals, increasers, and pricklypear cactus indicates a downward trend for plant composition. The soil condition is good and the trend is stable.

1997 TREND ASSESSMENT

The trend for soil is up, with percent bare soil going from 23% down to 6%. The major problem is that a majority of the plant cover is contributed to annual and/or weedy species. Seventy percent of the total vegetative cover comes from the herbaceous species which are more protective of the soils during intense summer storms. The key preferred browse is bitterbrush and basin big sagebrush. Together they contribute to 70% of the browse cover. Both have good vigor and increased densities. Trend for browse is also up. Anymore increases for prickly pear cactus should be watched closely for it has shown significant increases since 1989. This site

probably has more herbaceous cover than any other site with a total cover value of almost 52%. However, the majority of the cover is contributed by weedy species or annuals which make up 86% of the herbaceous cover. Trend for the herbaceous understory is down because of the very poor composition attributed by too many weedy species.

TREND ASSESSMENT

soil - up

browse - up

herbaceous understory - down because of the high proportion of cover contributed by annuals and weedy species

HERBACEOUS TRENDS --

Herd unit 16C , Study no: 39

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	15	17	8	6	.77
G	Bromus japonicus (a)	-	2	-	1	.03
G	Bromus tectorum (a)	-	302	-	87	15.94
G	Oryzopsis hymenoides	1	-	1	-	.00
G	Poa bulbosa	-	*214	-	65	14.45
G	Poa fendleriana	-	*9	-	4	.07
G	Poa pratensis	19	18	8	7	.25
G	Poa secunda	23	32	9	13	1.11
G	Sporobolus cryptandrus	22	15	10	7	.13
G	Stipa comata	27	*13	11	4	.71
Total for Grasses		107	622	47	194	33.49
F	Allium spp.	-	*10	-	8	.09
F	Artemisia ludoviciana	3	-	1	-	-
F	Carduus nutans (a)	-	10	-	4	.40
F	Cirsium spp.	1	7	1	4	.21
F	Convolvulus arvensis	234	202	86	71	12.14
F	Cryptantha spp.	-	4	-	2	.01
F	Cynoglossum officinale	16	*-	7	-	-
F	Epilobium paniculatum (a)	-	11	-	6	.03
F	Erodium cicutarium (a)	127	221	49	74	3.83
F	Eriogonum racemosum	9	8	3	3	.16
F	Lactuca serriola	9	-	4	-	-
F	Lepidium spp. (a)	-	55	-	22	.92

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Lithospermum ruderales	4	-	2	-	-
F	Machaeranthera canescens	23	10	9	6	.03
F	Phlox longifolia	3	3	3	2	.01
F	Polygonum douglasii (a)	-	38	-	16	.13
F	Ranunculus testiculatus (a)	-	54	-	20	.25
F	Sisymbrium altissimum (a)	6	-	4	-	.00
F	Sphaeralcea coccinea	-	2	-	1	.15
F	Taraxacum officinale	-	3	-	1	.03
F	Tragopogon dubius	-	3	-	1	.00
F	Viguiera multiflora	-	1	-	1	.03
Total for Forbs		435	642	169	242	18.44

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

BROWSE TRENDS --

Herd unit 16C , Study no: 39

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Artemisia tridentata tridentata	47	5.71
B	Gutierrezia sarothrae	4	.03
B	Opuntia spp.	67	5.97
B	Purshia tridentata	37	10.05
B	Quercus gambelii	4	.53
B	Rosa woodsii	1	-
Total for Browse		160	22.29

BASIC COVER --

Herd unit 16C , Study no: 39

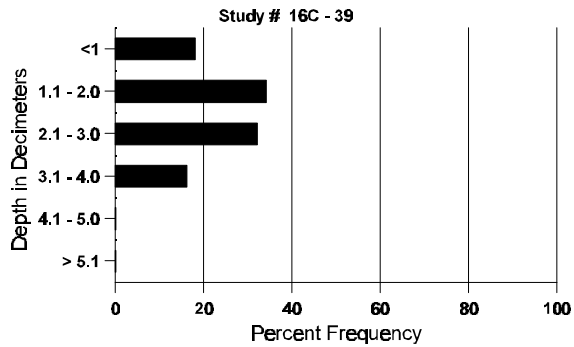
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	391	20.50	62.59
Rock	35	3.75	1.16
Pavement	50	0	.15
Litter	392	53.25	49.92
Cryptogams	24	0	.26
Bare Ground	147	22.50	5.58

SOIL ANALYSIS DATA --

Herd Unit 16C, Study no: 39

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
9.7	65.8 (13.3)	6.6	66.4	19.8	13.8	1.7	30.9	208.0	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16C , Study no: 39

Type	Quadrat Frequency '97
Sheep	20
Rabbit	18
Elk	11
Deer	34

BROWSE CHARACTERISTICS --

Herd unit 16C , Study no: 39

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total							
		1	2	3	4										
<i>Artemisia tridentata tridentata</i>															
S	89	12	-	-	6	-	-	-	18	-	-	-	600		18
	97	3	-	-	-	-	-	-	3	-	-	-	60		3
Y	89	13	11	3	8	-	-	-	33	-	-	2	1166		35
	97	25	1	-	-	-	-	-	26	-	-	-	520		26
M	89	1	1	1	-	-	-	-	3	-	-	-	100	28 30	3
	97	82	5	-	6	-	-	-	93	-	-	-	1860	34 39	93
D	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	1	-	-	-	20		1
X	89	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	80		4
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		32%		11%		05%		+47%							
'97		05%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	1266	Dec:	0%		
										'97	2400		1%		
<i>Gutierrezia sarothrae</i>															
M	89	1	-	-	-	-	-	-	1	-	-	-	33	5 4	1
	97	17	-	-	-	-	-	-	17	-	-	-	340	16 15	17
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'89		00%		00%		00%		+90%							
'97		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)										'89	33	Dec:	-		
										'97	340		-		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	89	5	-	-	-	-	-	-	-	-	5	-	-	-	166		5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	13	-	-	-	-	-	-	-	-	12	-	1	-	433	9 52	13	
	97	310	-	-	13	-	-	-	-	-	323	-	-	-	6460	7 21	323	
D	89	4	-	-	-	-	-	-	-	-	4	-	-	-	133		4	
	97	19	-	-	-	-	-	-	-	-	3	-	-	16	380		19	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	160		8	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			05%			+89%							
'97		00%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	732	Dec:	18%				
											'97	6840		6%				
Purshia tridentata																		
S	89	-	1	-	2	-	-	-	-	-	3	-	-	-	100		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	2	5	3	1	1	-	-	-	-	12	-	-	-	400		12	
	97	1	1	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	-	1	9	-	-	-	1	-	-	11	-	-	-	366	38 53	11	
	97	1	1	18	1	-	19	-	-	-	40	-	-	-	800	48 67	40	
D	89	-	-	1	-	-	1	-	-	-	2	-	-	-	66		2	
	97	-	-	5	-	-	1	-	-	-	5	-	-	1	120		6	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	100		5	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		28%			56%			00%			+13%							
'97		04%			90%			02%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	832	Dec:	8%				
											'97	960		13%				

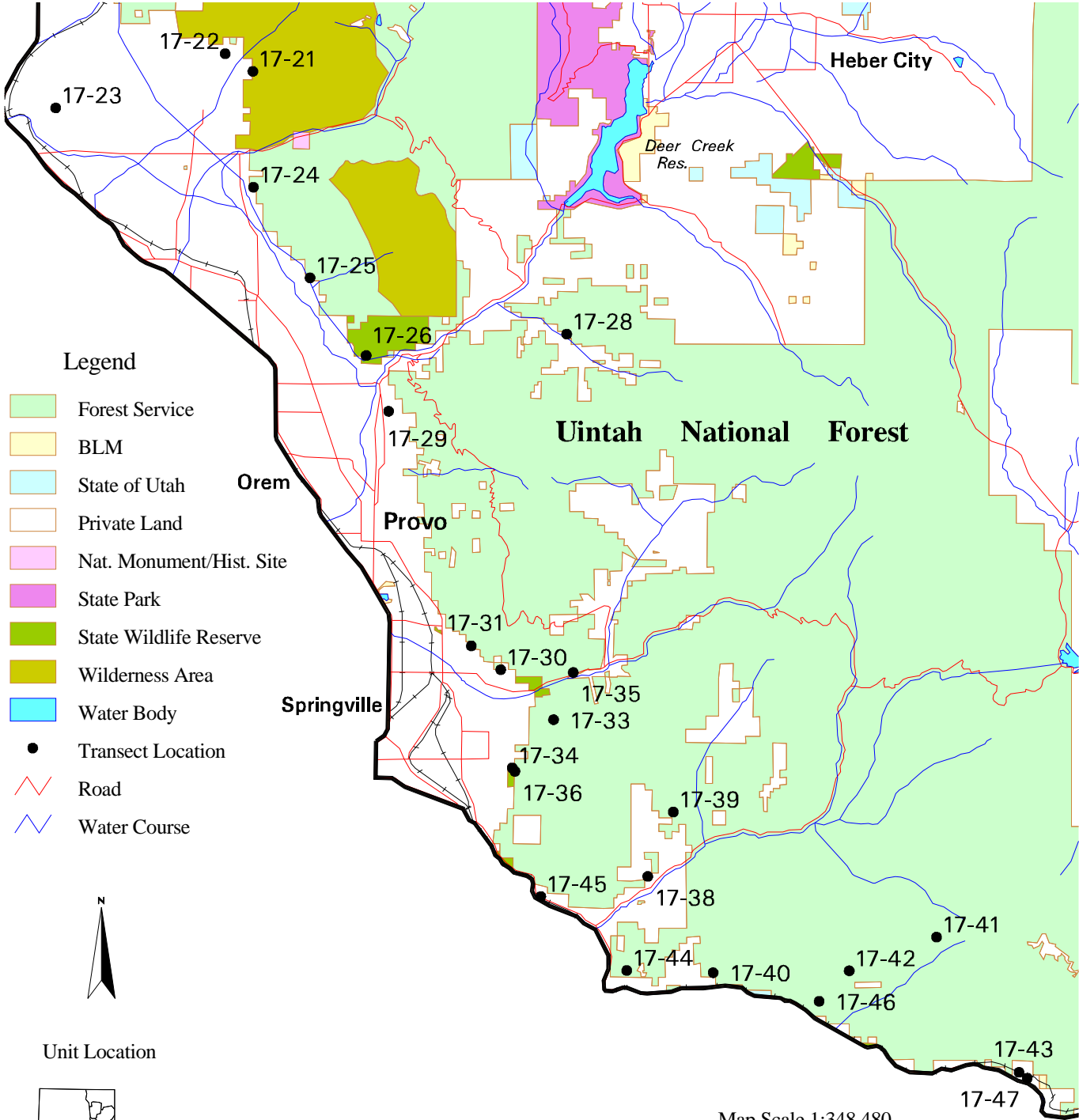
AGE	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Quercus gambelii																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	12	27	-	-	-	-	-	-	-	39	-	-	-	780	17	17	39
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		57%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	940		-				
Rosa woodsii																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	13	12	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	80		-				

TREND SUMMARY
UNIT - 16C - MANTI-NEBO, MANTI SOUTH

Site	1997		
	Soil	Browse	Grasses & Forbs
16C-1 Manti Face Chaining	0	0	0
16C-2 Willow Creek	+	+	0
16C-3 North Manti Face	0/-	-	-
16C-4 Bald Mountain	-	0	-
16C-5 Cane Valley	0	-	0
16C-6 Black Hill	+	0/+	0/+
16C-7 Mayfield Mountain Face	0/+	0	0
16C-8 Pole Canyon Chaining	+	0	-
16C-9 Pole Canyon Oak	-	0	-
16C-10 Julius Pasture	0	NONE	-
16C-11 Above South Hollow	0	-	0
16C-12 Manti Dump	+	-	+
16C-38 Pleasant Creek	0	0	0
16C-39 Cove Creek	+	+	-

+ = upward trend, - = downward trend, 0 = stable trend, 0/+ = stable to up slightly, 0/- = stable to down slightly

Management Unit 17

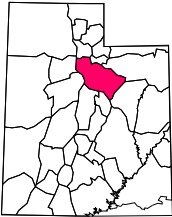


Legend

- Forest Service
- BLM
- State of Utah
- Private Land
- Nat. Monument/Hist. Site
- State Park
- State Wildlife Reserve
- Wilderness Area
- Water Body
- Transect Location
- Road
- Water Course



Unit Location



Map Scale 1:348,480
(1" = 5.5 mi)

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 in 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

The much larger management Unit 17 is now a compilation of several older herd unit numbers, these include units 13, 14, 15, 17, 18, part of 19, a small portion of 30, and 27. Currently, this much larger unit is divided into 7 smaller, more manageable subunits or populations, these are: Avintaquin, Currant Creek, Diamond Fork, Heber, Price River Drainage, Salt Lake, and Timpanogos. The 1997 vol. 1 report will be reporting only on the Diamond Fork, Hobbie Creek, and Timpanogos subunits.

Diamond Fork

As with most of the Wasatch Front, this herd unit is characterized by limited quality winter range. Olsen (1976) estimated 16,640 of severe winter range, a bulk of which is in private ownership and of low productivity. Housing developments in recent years have consumed much of this important winter range and will continue to do so in the future. Essential vegetation types monitored include antelope bitterbrush, mountain browse, mixed oakbrush/sagebrush, and Stansbury cliffrose.

Hobbie Creek

Winter habitat is limited in this herd unit by quality and quantity. Many housing developments have taken much of the winter range in the last couple of years. Most winter range has been reduced to a narrow bench above the communities of Springville, Mapleton, and Spanish Fork. Olsen (1977) estimated 21,969 acres of winter range. Vegetation types monitored include Stansbury cliffrose, Gambel oakbrush, and big sagebrush/grass.

Timpanogos

This unit is characterized by a relatively large summer range, but minimal winter range. Much of the winter range is concentrated within narrow benches and steep canyons of the Wasatch Front and is subject to a multitude of other uses (Giunta 1983). Housing developments in recent years have consumed much of what is left of this important winter range. Olsen (1977) identified 33,600 acres of normal winter range with 19,663 acres available during severe winters. Most of the winter range is in private ownership and the remaining winter range on private land will likely be developed in the future. Vegetation types monitored include Gambel oakbrush, big sagebrush/grass, antelope bitterbrush, Stansbury cliffrose, true mountain mahogany, and mixed mountain browse.

Trend Study 17-21-97

Study site name: Box Elder Canyon .

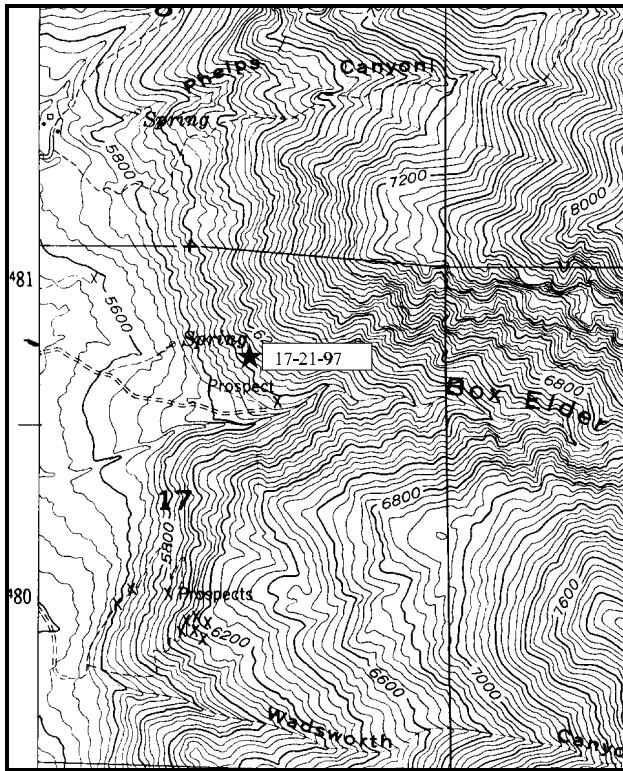
Range type: Mountain Brush

Compass bearing: frequency baseline 1 M degrees. (Line 4 82°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95), line 2 (34ft), line 3 (59ft), line 4 (71ft).

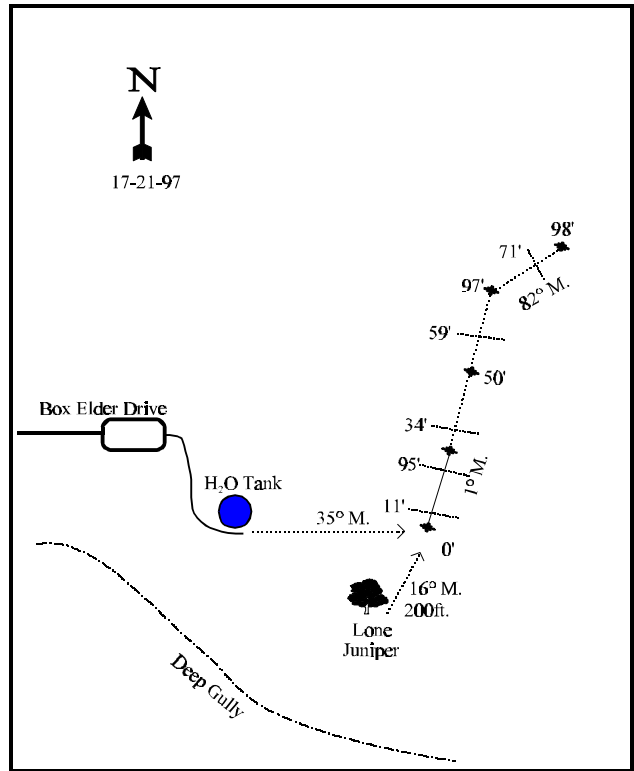
LOCATION DESCRIPTION

From Alpine, proceed northeast to the road which runs up Box Elder Canyon. Proceed up Box Elder Canyon until you come to a cement spring water collection structure, on the north side of the road. From the collection system, proceed 0.15 miles to the east, to an aqueduct breather pipe on the south side of the road. From the breather pipe, walk 74 paces at an azimuth of 35 degrees true, to a lone Utah juniper on the hillside. From the juniper, the 0-foot baseline stake is 200 feet away at an azimuth of 16°M. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. The 0-foot baseline stake has a red browse tag, number 3811, attached.



Map Name: Timpanogos Cave, Utah

Township 4 S , Range 2 E , Section 17



Diagrammatic Sketch

UTM 4480673.230 N , 437082.508 E

DISCUSSION

Trend Study No. 17-21 (19-1)

The Box Elder Canyon study is on critical deer winter range at the mouth of Box Elder Canyon. Located at 6,700 feet elevation, the study lies on a steep (60-65%) south to southwest slope. Like other similar sites along the Wasatch Front, the plant community is highly variable. Patches of Gambel oak, curlleaf mountain mahogany, and true mountain mahogany are separated by larger openings, dominated by annual and perennial grasses and broad-leafed weeds. Utilization of the browse species was reportedly high in the past, but recent data indicates a decrease in utilization. Pellet groups were moderately light for elk and deer, with some wildlife bedding areas noted in 1997.

For such a steep slope, soil conditions are remarkably good. Soil and rock movement downslope is occurring, but not at an accelerated rate. Soil is relatively shallow and extremely rocky with a limestone parent material. Textural analysis of the soil indicates it to be a loam with a neutral pH (7.2). Phosphorous may be a limiting factor to plant establishment with a value of only 6 ppm, where 10 ppm is thought to be minimal for normal plant growth. Effective rooting depth (see methods) is 16 inches, although most of the deeper soil is found where cracks occur in the rocks below the soil surface. Litter and vegetative cover are adequate to prevent serious soil loss.

Gambel oak is the dominant browse species and occurs as low-growing clumps or patches with an average height for mature plants of only 35 inches. In 1983, heavy hedging was reported on this mostly mature population. Hedging was reported as light in 1989 with only 25% of the population classified as mature. Hedging again was classified as light in 1997, but now the population is classified as mostly mature. A combination of heavy hedging and some insect and disease damage has adversely affected vigor in the past. Vigor was excellent in 1997. True mountain mahogany is also present on the site. As with Gambel oak, hedging intensity has declined since the initial classification in 1983. In 1997, all plants encountered were classified as mature with excellent vigor. Broom snakeweed density has declined since 1989, to 1,220 plants/acre. None were encountered in 1983. This is a mature population with very few young and no seedlings reported in 1997. Other browse species include small numbers of stickleaf low rabbitbrush, isolated junipers, curlleaf mountain mahogany, and remnants of basin big sagebrush.

Grasses are most abundant in the shrub interspaces. Along with forbs, they are quite rare under the oak canopy. Perennial grasses are perhaps more abundant on this site than on many comparable areas. They provide a measurable amount of forage and are also important for soil protection. Bluebunch wheatgrass comprises the bulk of grass cover, with annual grasses such as cheatgrass and rattlesnake brome present, but not overly abundant.

Forb composition is much less favorable than that of grasses. Most forbs are undesirable invaders or increaser species. These undesirable species include ragweed, storksbill, Canada thistle, and spurge. Perennials and biennials include Louisiana sagebrush, spreading fleabane, milkweed, yellow salsify, and false aster.

1983 APPARENT TREND ASSESSMENT

In spite of a very steep slope, soil trend is stable. However, the site is fragile and potentially erodible. If ground cover were to be depleted, serious erosion would follow. Vegetatively, Gambel oakbrush will continue as the dominant browse. Curlleaf and true mountain mahogany occur frequently and are heavily hedged. Their trend is difficult to predict. Basin big sagebrush has been nearly eliminated and is unlikely to recover. Grass composition and density is above average and should be maintained for watershed protection purposes. Forb composition, from a forage quality standpoint, is poor.

1989 TREND ASSESSMENT

The soil trend is slightly downward. Rock and pavement cover increased with a concurrent decline in vegetative and litter cover. This mountain brush site at the mouth of Box Elder Canyon above Alpine maintains a stable vegetative trend. The data show only slight changes since the 1983 reading. There is less hedging on the young population in 1989 than in 1983. True mountain mahogany has a low density and a stable population. Forb occurrence is lower in 1989 than in 1983, but this is probably related more to the drought conditions and a mid-September reading date than to declines in the generally weedy species.

1997 TREND ASSESSMENT

The soil trend is down with a significant increase in percent bare soil at nearly 15%, where in 1983 and 1989 it was at about 5%. Another marginal characteristic is that only about 39% of the vegetative cover is contributed by herbaceous species and on this steep of a slope, more protective cover is needed. Vegetative and litter cover are adequate to reduce serious erosion. However, soil and rocks are accumulating on the uphill side of the shrubs and trees. The browse trend is considered stable. The Gambel oak population does not appear to be expanding at this time. Hedging for all species of browse is classified as light and vigor is good. Grasses and forbs have changed very little since 1983. Bluebunch wheatgrass is the dominate grass with some annual species present. Forbs are sparse with most classified as invader or increaser species. Herbaceous understory trend is stable with a poor forb composition.

TREND ASSESSMENT

soil - down

browse - stable

herbaceous understory - stable, but poor forb composition

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 21

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron elongatum	_b 14	_a -	_a -	7	-	-	-
G	Agropyron spicatum	_a 127	_c 176	_b 132	49	69	55	3.84
G	Bromus brizaeformis (a)	-	-	118	-	-	43	.93
G	Bromus japonicus (a)	-	-	95	-	-	34	.63
G	Bromus tectorum (a)	-	-	179	-	-	68	.88
G	Poa pratensis	-	2	-	-	1	-	-
G	Poa secunda	22	12	16	9	5	6	.11
G	Stipa comata	20	36	23	7	17	10	.97
Total for Grasses		183	226	563	72	92	216	7.38
F	Alyssum alyssoides (a)	-	-	256	-	-	84	2.00
F	Allium spp.	-	-	2	-	-	1	.00
F	Ambrosia psilostachya	_a -	_b 8	_b 11	-	4	6	.15
F	Arabis drummondi	-	-	3	-	-	1	.00

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Artemisia ludoviciana</i>	_b 87	_b 63	_a 28	37	30	13	.88
F	<i>Asclepias labrifloris</i>	4	1	3	3	1	2	.03
F	<i>Cirsium arvense</i>	14	4	-	8	4	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	7	-	-	3	.02
F	<i>Epilobium paniculatum</i> (a)	-	-	1	-	-	1	.01
F	<i>Erodium cicutarium</i> (a)	-	-	3	-	-	1	.00
F	<i>Erigeron divergens</i>	_b 34	_a 3	_a 13	15	1	6	.22
F	<i>Euphorbia</i> spp.	2	-	-	1	-	-	-
F	<i>Galium aparine</i> (a)	-	-	28	-	-	12	.24
F	<i>Hackelia patens</i>	9	2	3	4	1	2	.15
F	<i>Lygodesmia grandiflora</i>	-	-	1	-	-	1	.00
F	<i>Machaeranthera canescens</i>	3	3	3	1	1	1	.03
F	<i>Microseris nutans</i>	8	3	-	3	2	-	-
F	<i>Oenothera</i> spp.	-	-	8	-	-	3	.09
F	<i>Phlox longifolia</i>	-	1	-	-	1	-	-
F	<i>Stellaria jamesiana</i>	-	-	1	-	-	1	.00
F	<i>Tragopogon dubius</i>	19	4	7	9	3	4	.04
F	Unknown forb-annual	-	-	20	-	-	10	.26
F	<i>Vicia americana</i>	-	2	-	-	1	-	-
Total for Forbs		180	94	398	81	49	152	4.20

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 21

Type	Species	Strip Frequency '97	Average Cover % '97
B	<i>Cercocarpus ledifolius</i>	0	.03
B	<i>Cercocarpus montanus</i>	15	5.80
B	<i>Gutierrezia sarothrae</i>	30	1.03
B	<i>Juniperus osteosperma</i>	0	-
B	<i>Quercus gambelii</i>	36	11.59
Total for Browse		81	18.46

BASIC COVER --

Herd unit 17 , Study no: 21

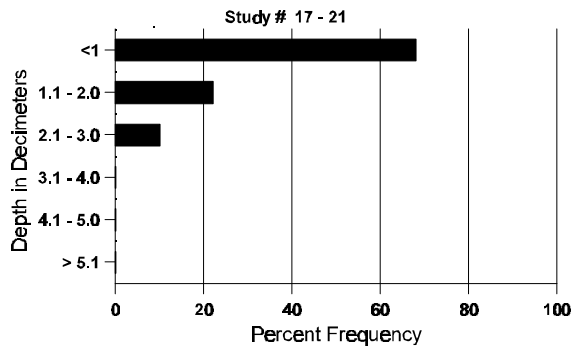
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	335	6.00	3.50	27.98
Rock	243	13.25	19.00	16.49
Pavement	226	6.00	16.00	7.09
Litter	393	68.75	56.75	42.16
Cryptogams	19	1.50	.25	.12
Bare Ground	229	4.50	4.50	14.78

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 21

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
16.1	57.36 (16.0)	7.2	46.0	29.1	24.9	2.9	6.0	76.8	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 21

Type	Quadrat Frequency '97
Rabbit	1
Elk	10
Deer	9

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 21

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Cercocarpus ledifolius																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	106	109	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	0		-			
Cercocarpus montanus																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	-	2	5	-	-	-	-	-	-	4	1	2	-	233	46	39	7
	89	1	4	-	-	2	-	-	-	-	7	-	-	-	233	43	53	7
	97	10	5	1	-	3	-	-	-	-	19	-	-	-	380	65	73	19
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		29%			71%			29%			+12%							
'89		75%			13%			00%			+30%							
'97		42%			05%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	233	Dec:	-			
												'89	266		-			
												'97	380		-			

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus lanceolatus</i>																		
M	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	13	20	1
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Died out							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	-			
												'89	0		-			
												'97	0		-			
<i>Gutierrezia sarothrae</i>																		
S	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'97	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	42	-	-	-	-	-	-	-	-	42	-	-	-	1400	10	13	42
	'97	58	-	-	-	-	-	-	-	-	58	-	-	-	1160	12	14	58
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	12	-	-	-	-	-	-	-	-	9	-	-	3	400			12
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Appeared							
'89		00%			00%			06%			-32%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	1800		22%			
												'97	1220		0%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Juniperus osteosperma																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	16	10	0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			None						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	0		-		
Quercus gambelii																	
S	83	2	-	-	-	-	-	-	-	-	-	-	-	66			2
	89	13	-	-	1	-	-	-	-	-	-	-	-	466			14
	97	6	-	-	-	-	-	-	-	-	-	-	-	120			6
Y	83	-	5	6	-	-	-	-	-	-	-	-	-	366			11
	89	86	-	-	1	-	-	-	-	-	-	-	-	2900			87
	97	36	-	-	-	-	-	-	-	-	-	-	-	720			36
M	83	-	12	51	-	-	-	-	-	-	-	-	-	2100	31	23	63
	89	34	-	-	-	-	-	-	-	-	-	-	-	1133	32	16	34
	97	99	38	-	-	1	-	-	-	-	-	-	-	2760	35	43	138
D	83	-	-	2	-	-	-	-	-	-	-	-	-	66			2
	89	10	4	-	1	-	-	-	-	-	-	-	-	500			15
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		22%			78%			43%			+44%						
'89		03%			00%			06%			-23%						
'97		22%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	2532	Dec:	3%		
												'89	4533		11%		
												'97	3480		0%		

Trend Study 17-22-97

Study site name: Schoolhouse Springs .

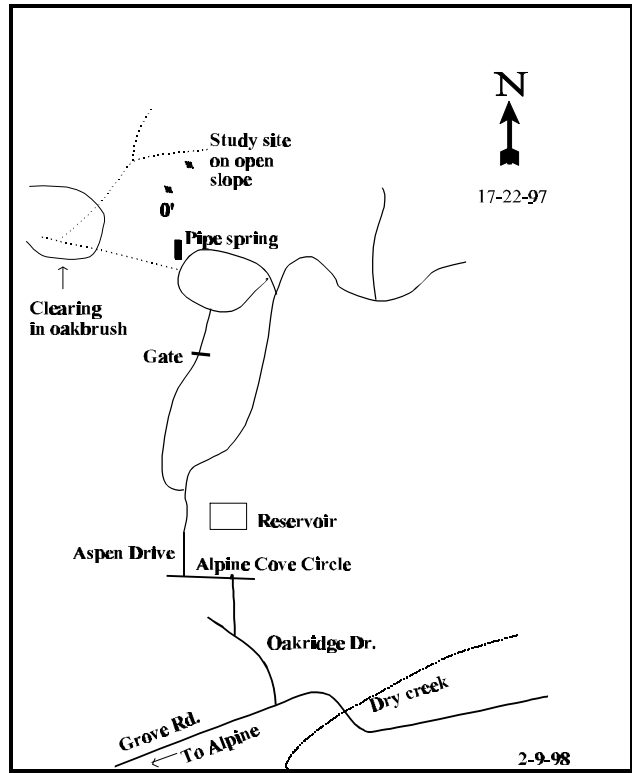
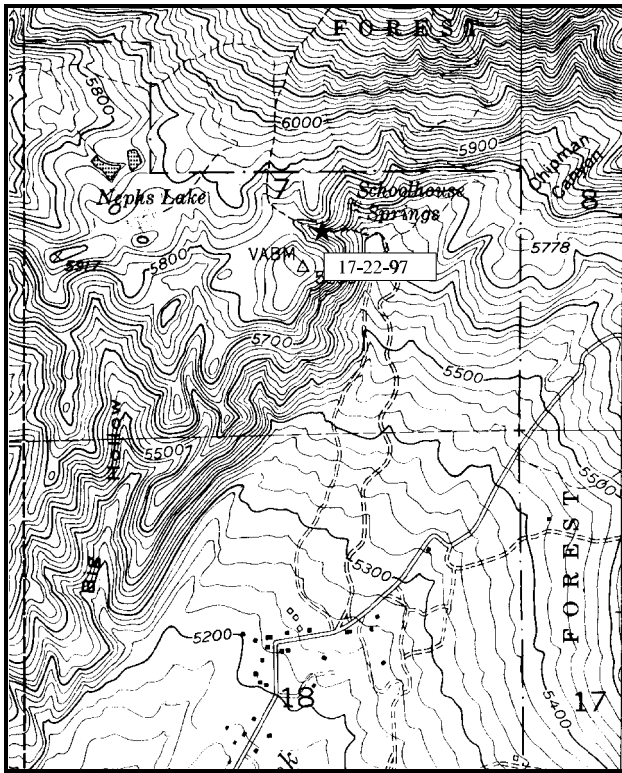
Range type: Bitterbrush

Compass bearing: frequency baseline 30 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11, 34, 59, 71 & 95ft).

LOCATION DESCRIPTION

Access to this study site may change due to continued road and housing development. In 1989, the easiest way to access Schoolhouse Springs was from the end of the pavement on Aspen Drive(13560 North 4300 West). Continue northerly on a dirt road for approximately 0.5 miles to the springs and the trail to the study site. Walk west up the trail approximately 200 paces until you enter a sagebrush-grass clearing. To the right, near the edge of the clearing, a deer trail runs to the northeast along the hillside. Walk 55 paces along the trail, then turn and walk 9 paces south down to the 0-foot baseline stake. It is marked by a red browse tag, #3908.



Map Name: Lehi

Diagrammatic Sketch

Township 45 , Range 2E , Section 7

UTM 4481701.148 N , 435464.766 E

DISCUSSION

Trend Study No. 17-22 (19-2)

The Schoolhouse Springs study is located on deer winter range near the top of a small ridge west of Schoolhouse Springs. Slope varies from 20% near the top to 70% on the main portion of the slope and a south aspect. The range type is mixed mountain brush varying from relatively open sagebrush-bitterbrush areas to rather dense and tall growing Gambel oak and Rocky Mountain maple. Although few deer and elk pellet groups were observed, browse utilization appeared moderate to heavy. Grazing of cattle during summer has occurred in the past, but there are no signs that this still occurs.

Soil is a well drained stony or cobbly loam derived from granite and quartzite. The pH is 6.6, which is neutral with a soil temperature of 54°F at a depth of 17 inches. Effective rooting depth (see methods) is 15 inches, a relatively deep measurement for this vegetative type. The soil is rapidly permeable and has poor water retention capabilities. Erosion potential is high when disturbed (USDA-SCS, 1972). Badly eroded horse and ORV trails in the immediate area are ample evidence of erosion potential. Considering the steepness of the slope, the study area is relatively intact with adequate vegetative and litter cover to keep erosion to a minimum.

Available browse forage comes primarily from Gambel oakbrush and antelope bitterbrush. Both species are important, but bitterbrush would be the most preferred species. In the more open areas it would be the most abundant and favored shrub available. The bitterbrush population is composed of mature plants with a semi-prostrate growth habit. No seedling and few young plants were encountered in any year. Vigor is good even though plants are heavily hedged and have a 'clubbed' appearance. Height of the plants has stayed relatively the same over the years at a little over a one foot. Mountain big sagebrush is also present in the openings and is irregularly distributed and much less abundant than bitterbrush. Plants are light to moderately hedged. There are nearly as many dead plants present as there are live plants in the population. Most plants encountered in 1997 were classified as young with all exhibiting good vigor. Gambel oakbrush averaged over 4 feet tall in 1997 with variable utilization of the available stems. In 1983, it was suggested that it would be desirable to knock down or burn some of the over-mature oak thickets to increase availability and understory production, which was then poor. This situation is still ongoing in 1997, but with the high proportion of annual grasses and forbs in the understory, it would be necessary to help control the weedy species with a seeding of competitive perennial grass species.

Perennial grasses occur only occasionally with an overall decrease in abundance since 1983. In the more open areas, cheatgrass, rattlesnake brome, and Japanese brome comprise the bulk of herbaceous production. These weedy species are dense enough to present severe competition to seedling establishment and also constitute a dangerous fire hazard. Relatively few grasses or forbs grow within the oak clones.

Forbs are more diverse and numerous than perennial grasses. However, most are annuals, biennials, or poor value perennials. Production and watershed protection are fair, but forage quality is poor. Arrowleaf balsamroot is the best quality forb available.

1983 APPARENT TREND ASSESSMENT

Soil trend is stable, but overly dependant on annuals for soil protection. The bulk of litter and live vegetation cover in the open areas comes from annual grasses and forbs. Within oak clones, a thick layer of oak leaves prevails. Vegetative trend is difficult to predict, but probably is at least temporarily stable. Over a long period, we would expect some expansion of Gambel oak. Antelope bitterbrush seems dependant on stem layering for stand maintenance. Whether layering will be adequate remains to be seen. The heavy use of bitterbrush depresses seed production and the dense annual grass cover offers stiff competition to developing seedlings.

1989 TREND ASSESSMENT

The data shows a reduction in litter and significantly more erosion pavement exposed. Total rock and pavement cover have increased since 1983. Still, soil movement is less than expected, especially considering the steep slope and lack of effective perennial ground cover. Percent bare soil has decreased from 16% to 9%. Except for leaf litter under the oak clones, there is little protective cover. The soil trend is stable to slightly downward. There are no seedlings and few young of either sagebrush or bitterbrush. Forage production is low on these key browse species, and the openings where they occur are limited. The bitterbrush continues to spread by layering and most of the new growth is close to the ground. Species composition of the forb component is similar between years, but lower numbers were encountered due to the late season and dry conditions. There are numerous annual species present.

1997 TREND ASSESSMENT

The soil trend is considered stable at this time. There are no signs of unreasonable erosion, but the soil stability depends greatly on the annual grasses and forbs that are present. Establishment of perennial species to protect the watershed should be encouraged. Densities for browse species have remained relatively stable over all years. Hedging intensity has decreased on bitterbrush and Gambel oak. These two species can tolerate heavy utilization for long periods of time which keeps the densities stable for oak on this site. Browse trend is stable. The herbaceous understory has changed very little over time. Many of the species encountered are annual species and provide little forage. The abundance of bluebunch wheatgrass continues to decline with the intense competition from annual grasses and forbs. This leads to a slightly downward trend for the herbaceous understory with because of the poor composition.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - slightly downward because of the poor composition

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 22

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	_b 162	_a 138	_a 123	65	55	43	3.93
G	Bromus brizaeformis (a)	-	-	189	-	-	68	1.77
G	Bromus japonicus (a)	-	-	53	-	-	19	.90
G	Bromus tectorum (a)	-	-	283	-	-	87	5.86
G	Melica bulbosa	-	1	-	-	1	-	-
G	Poa bulbosa	-	-	2	-	-	1	.15
G	Poa fendleriana	2	-	-	1	-	-	-
G	Poa pratensis	5	6	-	2	2	-	-
G	Poa secunda	23	19	15	12	9	5	.26
Total for Grasses		192	164	665	80	67	223	12.89

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Agoseris glauca</i>	2	-	6	1	-	3	.06
F	<i>Agoseris grandiflora</i>	7	-	-	3	-	-	-
F	<i>Alyssum alyssoides</i> (a)	-	-	189	-	-	63	1.27
F	<i>Allium</i> spp.	77	71	64	30	26	28	.53
F	<i>Ambrosia psilostachya</i>	-	-	3	-	-	2	.01
F	<i>Artemisia ludoviciana</i>	_b 41	_a 14	_a 15	15	9	6	.27
F	<i>Balsamorhiza sagittata</i>	-	3	-	-	1	-	.15
F	<i>Camelina microcarpa</i> (a)	-	-	6	-	-	3	.01
F	<i>Calochortus nuttallii</i>	4	-	2	2	-	1	.00
F	<i>Collomia linearis</i> (a)	-	13	4	-	7	2	.03
F	<i>Collinsia parviflora</i> (a)	-	-	3	-	-	1	.00
F	<i>Crepis acuminata</i>	3	-	-	2	-	-	-
F	<i>Cynoglossum officinale</i>	-	-	3	-	-	1	.03
F	<i>Epilobium paniculatum</i> (a)	-	-	96	-	-	39	.66
F	<i>Erodium cicutarium</i> (a)	-	-	192	-	-	68	2.66
F	<i>Erigeron pumilus</i>	_b 59	_a 9	_c 94	23	6	39	2.25
F	<i>Galium aparine</i> (a)	-	-	121	-	-	46	1.55
F	<i>Hackelia patens</i>	4	1	-	2	1	-	-
F	<i>Haplopappus</i> spp.	_a 6	_b -	_b -	5	-	-	-
F	<i>Holosteum umbellatum</i> (a)	-	-	74	-	-	32	.16
F	<i>Hydrophyllum capitatum</i>	3	-	4	3	-	2	.21
F	<i>Lactuca serriola</i>	_a -	_b 41	_b 63	-	19	30	.30
F	<i>Lithophragma parviflora</i>	_b 7	_{ab} 1	_a -	4	1	-	-
F	<i>Lithospermum ruderale</i>	3	-	1	1	-	1	.18
F	<i>Medicago sativa</i>	-	-	3	-	-	2	.01
F	<i>Microsteris gracilis</i> (a)	-	-	17	-	-	9	.07
F	<i>Montia perfoliata</i> (a)	28	-	-	13	-	-	-
F	<i>Petradoria pumila</i>	13	13	4	4	6	2	.18
F	<i>Polygonum douglasii</i> (a)	-	-	18	-	-	6	.43
F	<i>Sisymbrium altissimum</i> (a)	-	-	22	-	-	11	.18
F	<i>Solidago</i> spp.	1	-	-	1	-	-	-
F	<i>Taraxacum officinale</i>	-	1	3	-	1	1	.00
F	<i>Tragopogon dubius</i>	_{ab} 53	_a 34	_b 53	21	15	27	.78

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Unknown forb-annual	-	-	5	-	-	3	.01
F	Unknown forb-perennial	_b 116	_a 4	_a -	46	2	-	-
F	Vicia americana	-	1	2	-	1	1	.00
F	Zigadenus paniculatus	_a -	_b 5	_{ab} 4	-	4	2	.06
Total for Forbs		427	211	1071	176	99	431	12.14

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 22

Type	Species	Strip Frequency '97	Average Cover % '97
B	Acer grandidentatum	2	1.36
B	Artemisia tridentata vaseyana	13	.21
B	Gutierrezia sarothrae	25	2.50
B	Purshia tridentata	49	8.45
B	Quercus gambelii	14	6.51
Total for Browse		103	19.05

BASIC COVER --

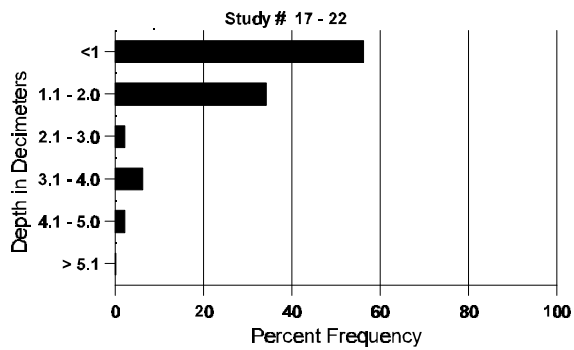
Herd unit 17 , Study no: 22

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	370	4.00	4.00	49.07
Rock	165	4.00	6.25	4.73
Pavement	237	.50	22.75	5.50
Litter	395	75.50	58.00	50.18
Cryptogams	4	.50	0	.04
Bare Ground	182	15.50	9.00	6.58

SOIL ANALYSIS DATA --
 Herd Unit 17, Study no: 22

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.0	54.0 (42.7)	6.6	48.0	29.4	22.6	3.3	20.6	131.2	.6

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 17 , Study no: 22

Type	Quadrat Frequency '97
Rabbit	1
Elk	3
Deer	5

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 22

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
<i>Acer grandidentatum</i>													
Y	83	2	-	-	-	-	-	-	-	2	133		2
	89	2	-	-	-	-	-	-	-	2	133		2
	97	-	-	1	-	-	-	-	-	1	20		1
M	83	1	-	-	-	-	-	-	-	1	66	67 59	1
	89	-	-	-	-	-	-	1	-	1	66	256 185	1
	97	1	-	-	-	-	-	-	-	1	20	- -	1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
		'83		00%		00%		+ 0%					
		'89		00%		00%		-80%					
		'97		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	199	Dec:	-
										'89	199		-
										'97	40		-
<i>Artemisia tridentata vaseyana</i>													
Y	83	1	-	-	-	-	-	-	-	1	66		1
	89	1	-	-	-	-	-	-	-	1	66		1
	97	10	-	1	-	-	-	-	-	11	220		11
M	83	1	1	-	-	-	-	-	-	2	133	26 28	2
	89	1	-	-	-	-	-	-	-	1	66	15 6	1
	97	1	2	-	-	-	-	-	-	3	60	13 15	3
D	83	-	-	-	-	-	-	-	-	-	0		0
	89	1	-	-	-	-	-	-	-	1	66		1
	97	-	-	-	-	-	-	-	-	-	0		0
X	83	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	260		13
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
		'83		33%		00%		- 1%					
		'89		00%		00%		+29%					
		'97		14%		07%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	199	Dec:	0%
										'89	198		33%
										'97	280		0%

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
M	'83	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	-	-	0	9	8	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		None				
'89		00%		00%		00%		None				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-			
						'89	0		-			
						'97	0		-			
<i>Gutierrezia sarothrae</i>												
Y	'83	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	0		0	
	'97	2	-	-	-	-	-	-	40		2	
M	'83	-	-	-	-	-	-	-	0	-	-	0
	'89	29	-	-	-	-	-	-	1933	12	11	29
	'97	82	-	-	-	-	-	-	1640	13	15	82
D	'83	-	-	-	-	-	-	-	0			0
	'89	2	-	-	-	-	-	-	133			2
	'97	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		Appeared				
'89		00%		00%		00%		-19%				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	0%			
						'89	2066		6%			
						'97	1680		0%			

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Purshia tridentata																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	4	-	-	-	-	-	-	-	-	-	-	266		4	
	97	3	4	-	-	-	-	-	-	-	-	-	-	-	140		7	
M	83	-	-	23	-	-	-	-	-	-	-	-	-	1533	17	25	23	
	89	-	8	22	-	-	1	-	-	-	-	-	-	2066	13	21	31	
	97	-	21	58	-	8	6	-	-	-	-	-	-	1860	13	32	93	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	1	5	-	-	-	-	-	-	-	-	-	400			6	
	97	-	-	8	-	2	4	-	-	-	-	-	6	280			14	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	140			7	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			100%			00%			+44%							
'89		22%			78%			07%			-17%							
'97		31%			67%			05%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1533	Dec:	0%			
												'89	2732		15%			
												'97	2280		12%			

AGE	Y	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	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	21	-	-	-	-	-	-	-	-	21	-	-	-	1400		21	
	89	31	-	12	14	-	-	-	-	-	57	-	-	-	3800		57	
	97	8	-	-	4	-	-	-	-	-	12	-	-	-	240		12	
M	83	-	-	11	-	-	-	20	-	-	31	-	-	-	2066	47 31	31	
	89	5	-	-	1	-	-	-	10	-	16	-	-	-	1066	236 118	16	
	97	43	9	-	3	-	-	-	-	-	55	-	-	-	1100	55 70	55	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	1	-	-	-	-	-	2	-	5	-	-	-	333		5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	60		3		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			21%			00%			+33%							
'89		01%			15%			00%			-74%							
'97		13%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	3466	Dec:	0%				
											'89	5199		6%				
											'97	1340		0%				

Trend Study 17-23-97

Study site name: Lower Oak Hollow .

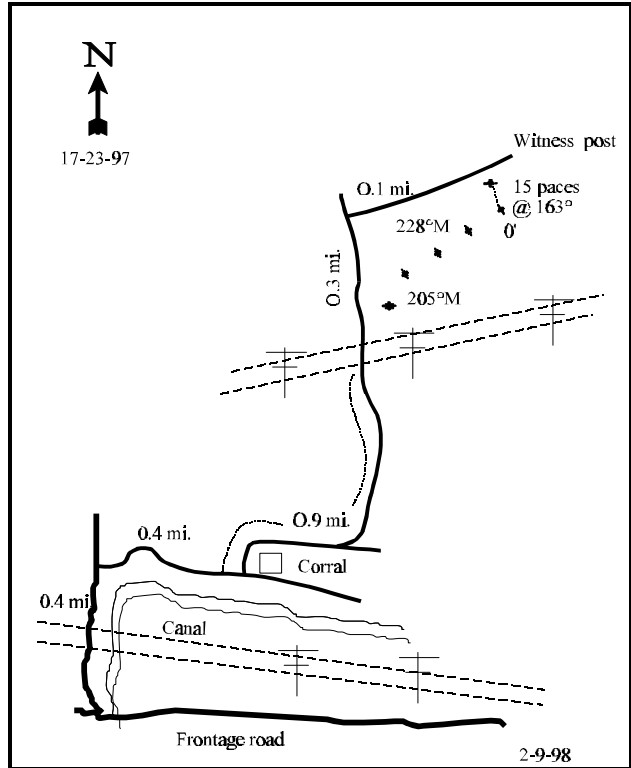
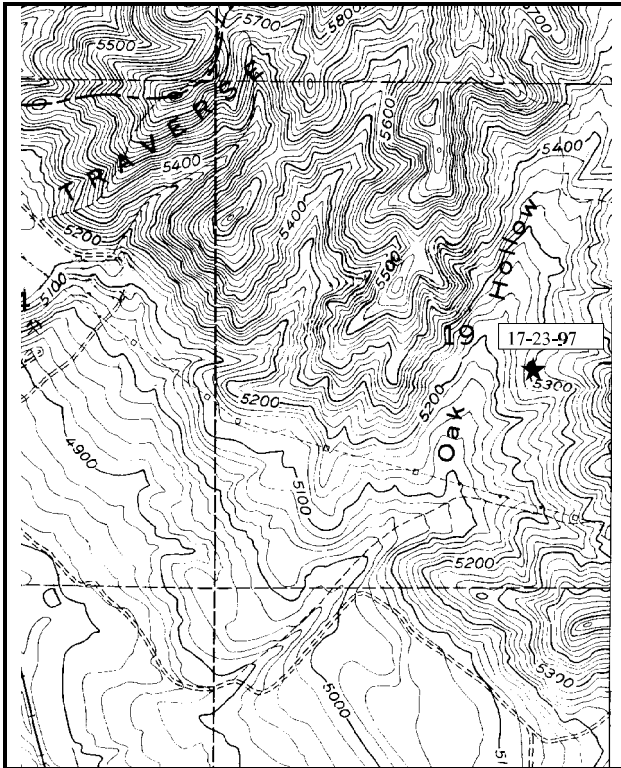
Range type: Mixed Oak-Sage

Compass bearing: frequency baseline 228 M degrees. (Line 5 205°M)

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Beginning on the south side of the “Point of the Mountain”, follow the frontage road to the road that leads to Oak Hollow. This road is right next to the gravel pit. Follow this road for 0.4 miles to a right turn. Take this turn (south) and go another 0.4 miles to a fork and a corral on the left. Take the left fork and go 0.9 miles to the powerlines. Go another 0.3 miles to a road on the right. Take this road for 0.1 miles to a witness post on the right. From the witness post walk 15 paces at an azimuth of 163 degrees magnetic to the 0-foot stake. The study is marked by green, steel fenceposts approximately 12-18 inches in height.



Map name: Jordan Narrows .

Diagrammatic Sketch

Township 4 S , Range 1 E , Section 19

UTM 4478540.452 N , 425591.000 E

DISCUSSION

Trend Study No. 17-23 (19-3)

In 1997, it was determined the original study site for Oak Hollow did not accurately represent the critical winter range that is present in this area. Therefore, the site was moved west of the original site to a small ridge to sample mountain big sagebrush and bitterbrush. Slope varies from 5% at the beginning of the ridge to 25% near the lower end. Aspect is southwest and elevation is approximately 5,400 feet. There is much more wildlife use apparent on this site than on the original study.

Soil textural analysis indicates a sandy clay loam with a surprisingly moderate acidic pH of 5.6, one of the lowest recorded for a mixed mountain browse site. The effective rooting depth (see methods) is nearly 17 inches with an average temperature of 54°F at this depth. At the 0-foot baseline stake, there was a layer of clay about 12 inches below the soil surface, however this does not occur at any other baseline stake down the line. Golf ball sized rock is common in the soil profile. Vegetative and litter cover are relatively high at 44% and 67% respectively. There is very little bare soil present with no signs of recent erosion.

Mountain big sagebrush is the dominate browse species with an estimated 4,280 plants/acre. This is a healthy population with nearly the same proportion of young and mature plants. Utilization of mature plants is light to moderate with only light hedging on the young plants. Average height and crown of the mature plants are 22 inches and 28 inches respectively. The dead to live ratio for mountain big sagebrush is about 1:3. The amount of dead plants is not unusual with the initial high density and the extended period of drought. The population does appear to be stable at their current population. Some basin big sagebrush plants are scattered throughout the site where there is deeper soil. In some places it is difficult to distinguish between the two species which are freely hybridizing. More of the basin big sagebrush plants encountered were classified as dead than alive, illustrating the difficulty they had during the long drought in marginally deep enough soils to survive. Broom snakeweed has an estimated density of 2,000 plants/acre with nearly 80% of the population classified as mature. Average height and crown are nearly one foot. Bitterbrush plants are large and scattered across the site. Estimated density is 260 plants/acre with 77% classified as mature. These plants are heavily hedged with some partly unavailable due to their height. Surrounding slopes have discontinuous cover of Gambel oak which could provide some thermal and escape cover until leaf-fall.

The dominate understory species is cheatgrass, which comprises 43% of the herbaceous understory cover. Cheatgrass cover is very dense and constitutes a fire hazard which would destroy the critical winter range, where 89% of the preferred browse cover are species that do not resprout after fire. Other annual grasses include Japanese brome and rattail fescue. Perennial species, such as Sandberg bluegrass, bluebunch wheatgrass, and intermediate wheatgrass, are scattered at relatively low quadrat frequencies throughout the site. These species provide little cover or forage. Forb composition is diverse, but many of the species are invader or increaser species.

1997 APPARENT TREND ASSESSMENT

Erosion is not apparent at this time on the site. Most of the protective ground cover comes from vegetation and litter from annual species. Erosion could become severe in the event of a high intensity storm, especially after a fire. The abundant cheatgrass litter provides abundant fine fuel for a fire. The browse populations appear to be healthy and receive moderate utilization, mostly by deer. The sagebrush populations will likely suppress the broom snakeweed at this time. The herbaceous understory is dominated by cheatgrass. Perennial grasses are scattered and will likely have a difficult time establishing within the abundant winter annuals.

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 23

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron dasystachyum	a1	b10	a-	1	4	-	-
G	Agropyron intermedium	-	-	7	-	-	2	.76
G	Agropyron spicatum	20	29	25	9	11	9	.82
G	Aristida purpurea	-	-	4	-	-	1	.03
G	Bromus japonicus (a)	-	-	85	-	-	26	1.12
G	Bromus spp.	-	-	59	-	-	19	.75
G	Bromus tectorum (a)	-	-	300	-	-	91	14.18
G	Festuca myuros (a)	-	-	30	-	-	12	.16
G	Poa bulbosa	a3	b51	a-	1	23	-	-
G	Poa fendleriana	a22	b44	a14	10	20	5	.36
G	Poa secunda	b127	a75	a82	49	34	33	1.29
G	Vulpia octoflora (a)	-	-	15	-	-	9	.31
Total for Grasses		173	209	621	70	92	207	19.82
F	Achillea millefolium	b24	b20	a-	9	9	-	-
F	Agoseris glauca	a21	a11	b60	11	6	25	.32
F	Allium acuminatum	b119	b118	a-	53	49	-	-
F	Alyssum alyssoides (a)	-	-	19	-	-	9	.04
F	Ambrosia psilostachya	-	-	1	-	-	1	.03
F	Artemisia ludoviciana	b15	b17	a3	8	7	1	.15
F	Castilleja chromosa	-	-	1	-	-	1	.00
F	Cardaria draba	a-	a-	b17	-	-	6	.05
F	Calochortus nuttallii	a-	ab2	b6	-	1	4	.04
F	Cirsium spp.	-	-	4	-	-	2	.15
F	Collinsia parviflora (a)	-	-	41	-	-	16	.13
F	Crepis acuminata	-	-	3	-	-	1	.03
F	Cruciferae	-	-	5	-	-	4	.02
F	Cryptantha spp.	-	-	2	-	-	1	.00
F	Descurainia pinnata (a)	-	-	1	-	-	1	.00
F	Draba spp. (a)	-	-	64	-	-	25	.12
F	Epilobium paniculatum (a)	-	-	170	-	-	72	2.91
F	Eriogonum cernuum (a)	-	-	27	-	-	10	.29

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Erodium cicutarium</i> (a)	-	-	135	-	-	56	1.87
F	<i>Eriogonum racemosum</i>	3	-	6	1	-	2	.06
F	<i>Eriogonum umbellatum</i>	-	-	1	-	-	1	.00
F	<i>Galium aparine</i> (a)	-	-	28	-	-	14	.31
F	<i>Grindelia squarrosa</i>	-	1	1	-	1	1	.00
F	<i>Helianthus annuus</i> (a)	-	-	22	-	-	11	.10
F	<i>Holosteum umbellatum</i> (a)	-	-	101	-	-	42	.84
F	<i>Hydrophyllum capitatum</i>	6	-	-	3	-	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	8	-	-	4	.04
F	<i>Lactuca serriola</i>	a-	a ¹	b ¹⁰²	-	1	48	1.87
F	<i>Lomatium dissectum</i>	1	1	-	1	1	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	18	-	-	10	.05
F	<i>Montia perfoliata</i> (a)	20	-	-	11	-	-	-
F	<i>Petrorhiza pumila</i>	-	-	4	-	-	2	.38
F	<i>Phlox longifolia</i>	a-	b ¹⁸	b ³¹	-	9	14	.12
F	<i>Polygonum douglasii</i> (a)	-	-	104	-	-	48	.36
F	<i>Ranunculus testiculatus</i> (a)	-	-	14	-	-	6	.05
F	<i>Sphaeralcea coccinea</i>	-	-	3	-	-	1	.15
F	<i>Taraxacum officinale</i>	-	-	3	-	-	1	.03
F	<i>Tragopogon dubius</i>	a-	a ⁵	b ¹²³	-	3	55	1.13
F	Unknown forb-annual	-	-	5	-	-	2	.06
F	Unknown forb-perennial	a-	a-	b ⁶⁵	-	-	25	.81
F	<i>Verbascum blattaria</i>	a-	a-	b ⁸	-	-	4	.24
F	<i>Vicia americana</i>	a-	b ⁸⁶	a-	-	34	-	-
F	<i>Viola</i> spp.	6	-	-	3	-	-	-
F	<i>Zigadenus paniculatus</i>	-	-	2	-	-	1	.00
Total for Forbs		215	280	1208	100	121	527	12.86

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 23

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata tridentata	14	1.46
B	Artemisia tridentata vaseyana	75	9.55
B	Chrysothamnus nauseosus albicaulis	0	.00
B	Gutierrezia sarothrae	29	1.65
B	Purshia tridentata	11	2.95
Total for Browse		129	15.62

BASIC COVER --

Herd unit 17 , Study no: 23

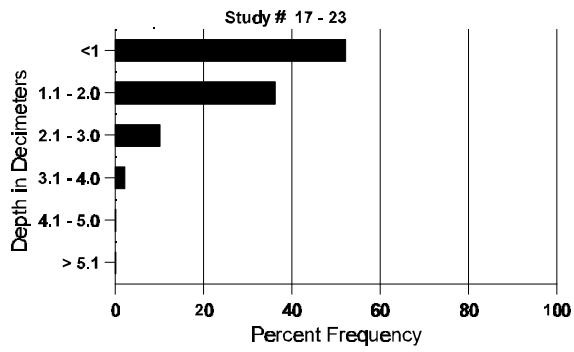
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	376	.50	9.00	44.26
Rock	66	17.00	17.50	1.49
Pavement	75	1.75	4.00	.70
Litter	395	79.25	66.50	66.80
Cryptogams	68	1.00	0	1.00
Bare Ground	82	.50	3.00	1.58

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 23

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
16.7	50.0 (17.2)	5.6	46.0	27.4	26.6	3.6	11.2	214.4	.4

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 23

Type	Quadrat Frequency '97
Rabbit	3
Elk	5
Deer	49

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 23

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
Artemisia tridentata tridentata																
S	83	-	1	-	-	-	-	-	-	1	-	-	-	66		1
	89	2	-	-	-	-	-	-	-	2	-	-	-	133		2
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	-	1	-	-	-	-	-	-	1	-	-	-	66		1
	89	4	-	-	2	-	-	-	-	6	-	-	-	400		6
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	83	1	15	7	-	-	-	-	-	23	-	-	-	1533	41 43	23
	89	4	4	-	-	-	-	-	-	8	-	-	-	533	33 26	8
	97	12	7	-	-	-	-	-	-	19	-	-	-	380	33 42	19
D	83	-	3	4	-	-	-	-	-	7	-	-	-	466		7
	89	5	5	-	-	-	-	-	-	9	1	-	-	666		10
	97	-	1	1	-	-	-	-	-	2	-	-	-	40		2
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	580		29
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>					
'83		61%			35%			00%			-23%					
'89		38%			00%			00%			-74%					
'97		38%			05%			00%								
Total Plants/Acre (excluding Dead & Seedlings)										'83	2065	Dec:	23%			
										'89	1599		42%			
										'97	420		10%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	13	-	-	-	-	-	-	-	-	12	-	1	-	260		13
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	87	-	-	3	-	-	-	-	-	90	-	-	-	1800		90
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	65	30	9	1	-	-	-	-	-	105	-	-	-	2100	22 28	105
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	5	9	5	-	-	-	-	-	-	14	-	-	5	380		19
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	1540			77
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>				<u>%Change</u>							
'83		00%		00%		00%				None							
'89		00%		00%		00%				Appeared							
'97		18%		07%		02%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	0%				
										'89	0		0%				
										'97	4280		9%				
<i>Chrysothamnus nauseosus albicaulis</i>																	
M	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133	43 13	2
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	15 11		0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	66			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>				<u>%Change</u>							
'83		00%		00%		00%				-50%							
'89		00%		00%		00%				Died out							
'97		00%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	133	Dec:	0%				
										'89	66		100%				
										'97	0		0%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total			
		1	2	3	4		1	2				
<i>Gutierrezia sarothrae</i>												
S	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	7	-	-	-	-	-	-	140	-	7	
Y	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	21	-	-	-	-	-	-	420	-	21	
M	83	-	-	-	-	-	-	-	0	-	0	
	89	7	-	-	-	-	-	-	466	11	9	7
	97	79	-	-	-	-	-	-	1580	11	12	79
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		Appeared				
'89		00%		00%		00%		+77%				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-			
						'89	466		-			
						'97	2000		-			
<i>Purshia tridentata</i>												
Y	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	-	1	-	-	-	-	-	20	-	1	
M	83	-	-	-	-	-	-	-	0	-	0	
	89	-	2	-	-	-	-	-	133	20	51	2
	97	-	1	9	-	-	-	-	200	40	62	10
D	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	-	-	1	-	-	1	-	40	-	2	
X	83	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	0	-	0	
	97	-	-	-	-	-	-	-	40	-	2	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'83		00%		00%		00%		Appeared				
'89		100%		00%		00%		+49%				
'97		15%		85%		00%						
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	0%			
						'89	133		0%			
						'97	260		15%			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	31	-	-	-	-	-	-	-	-	27	-	4	-	2066		31	
	89	12	-	-	-	-	-	-	-	-	11	1	-	-	800		12	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	49	-	-	-	-	-	-	-	-	49	-	-	-	3266		49	
	89	59	20	-	3	-	-	-	-	-	82	-	-	-	5466		82	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	24	25	-	5	-	-	-	-	46	8	-	-	3600	35 26	54	
	89	5	4	-	1	-	-	-	-	-	10	-	-	-	666	83 36	10	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	56 59	0	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	3	-	-	-	-	-	-	-	3	1	-	1	333		5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		28%			24%			00%			- 6%							
'89		28%			00%			01%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	6866	Dec:	0%			
												'89	6465		5%			
												'97	0		0%			

Trend Study 17-24-97

Study site name: Heisetts Hollow

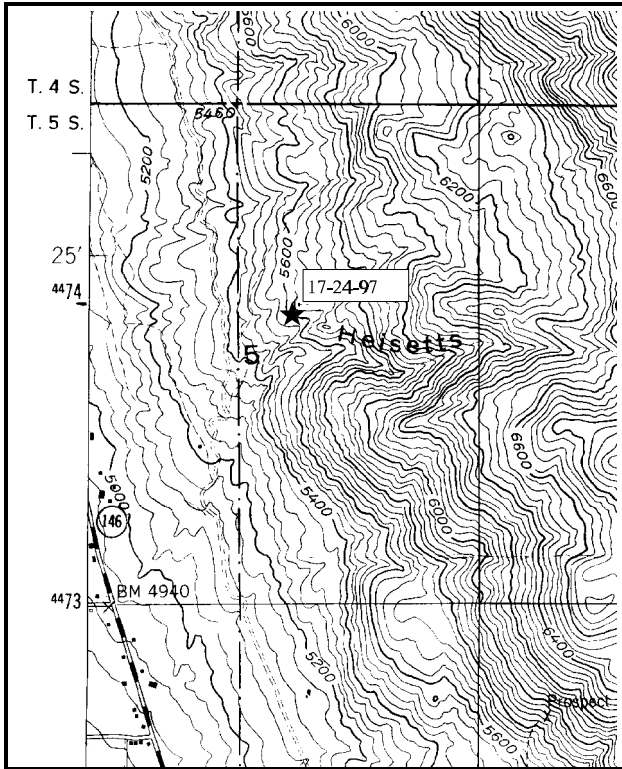
Range Type: Big sagebrush-grass

Compass bearing: frequency baseline 136 degrees. (Lines 2-4 28°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft).

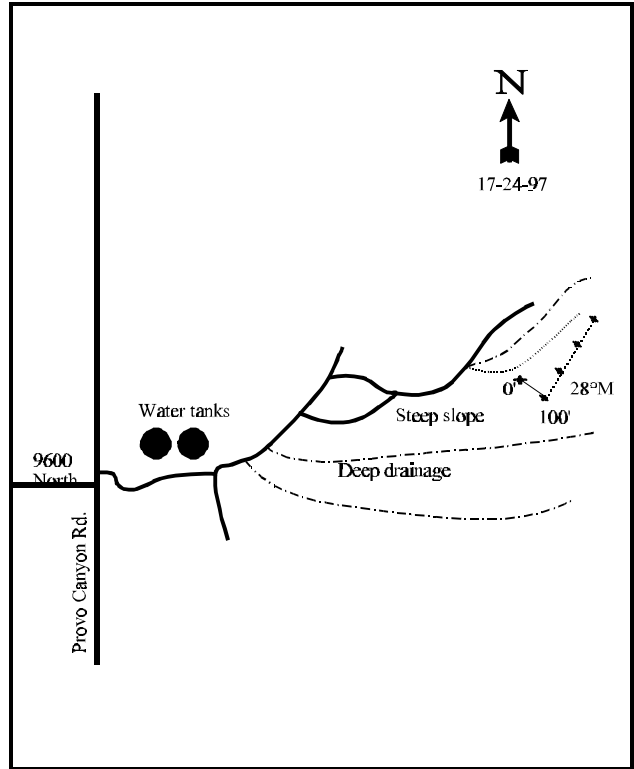
LOCATION DESCRIPTION

North of Pleasant Grove, turn east off Canyon Road (Rt 146) opposite 9600 North, and go 0.4 miles towards the water tank on the hill. From the southeast side of the concrete tank, go northerly 0.15 miles to a fork. Bear right up the steep, eastern most road and continue 0.15 miles to the Forest Service boundary. Go 0.1 miles to a fork, continue east 0.1 miles up a steep slope to a small level area. A deer trail goes southeast. Follow the trail 65 paces to the 0-foot baseline stake.



Map Name: Timpanogos Cave

Township 5S, Range 2E, Section 5



Diagrammatic Sketch

UTM 4473919.896 N, 437113.549 E

DISCUSSION

Trend Study No. 17-24 (19-4)

The Heisette Hollow study is located on the upper Lake Bonneville terrace near the mouth of Heisette Hollow and uphill from the Salt Lake Aqueduct. This entire area is considered critical deer winter range. An old browse transect which samples the few Stansbury cliffrose plants present is located in the immediate area. Judging from browse utilization and the number of pellet groups present, deer use is heavy. Slope varies from about 5% at the 0-foot baseline stake to nearly 49% at the end of the baseline. Aspect is south-southeast to south-southwest, depending on one's position along the baseline. Elevation is 5,560 feet. The range type is a relatively low density mountain big sagebrush community interspersed with isolated oak clones and few large cliffrose plants. A moderately dense and vigorous perennial grass cover occupies the shrub interspaces.

Soil is a clay loam containing a moderate amount of rock in the profile. Texture is gravelly to sandy and typical of sedimentary lake deposits. Effective rooting depth (see methods) is 24 inches, some of which is unconsolidated "C" horizon. Phosphorous may be limiting to plant development (5.7 ppm) where it is thought that 10 ppm is the minimum necessary. The steeper slopes show signs of erosion problems in the past, leaving behind some steep terraces, as well as some pedestalling of the plants. Currently, there does not appear to be any active erosion. A foot trail is located directly north of the site with soil movement evident on the trail.

The key browse species is a sparsely distributed population of mountain big sagebrush. The increased sample size used in 1997 indicates an estimated density of 1,120 plants/acre, a slight increase from the 866 plants/acre estimated in 1983 and 1989. Utilization is moderate to heavy. The percent of heavily hedged plants has declined since 1989 as have those classified with poor vigor. Percent decadency has declined since 1989, making it similar to that of 1983. One alarming change is how the density of the broom snakeweed has increased from an estimated 1,433 plants/acre in 1989 to 10,300 plants/acre in 1997. The number of seedlings encountered is also a concern, but many of these plants may not become established. Average height is only 6 inches, although these plants will compete for water resources and possibly prohibit mountain big sagebrush seedlings from establishing in the future. Other browse species have relatively stable populations, yet comprise only a minor portion of browse composition.

Perennial grasses are the dominant herbaceous understory component. With the exclusion of livestock grazing, bluebunch wheatgrass is becoming vigorous and abundant. It comprises a uniform but somewhat open cover that helps stabilize soil. Bulbous bluegrass and Sandberg bluegrass are present. Cheatgrass is present but not very abundant.

The forb component is subject to grass competition. As a result, forbs occur infrequently. The more common species include northern sweetvetch, longleaf phlox, ragweed, and scarlet globemallow. Little vegetative cover or forage is provided by forbs.

1983 APPARENT TREND ASSESSMENT

Soil trend is stable on a highly erodible and sensitive site. Past erosion has been severe but is slowly being stabilized by an aggressive and increasing perennial grass cover. Vegetation trend for big game habitat purposes is definitely down. All the available evidence points to a rapidly decreasing population of mountain big sagebrush, the key browse species. Other desirable browse species are barely maintaining current population levels. Broom snakeweed appears to be increasing at a rapid rate.

1989 TREND ASSESSMENT

This section of the hill is subject to subsidence, and recent cracking and slumping have occurred. It appears the site will eventually slide down into the large gully below. Adjacent slopes are subject to severe gullying. The study site has adequate grass cover, however total combined cover from vegetative and litter show a slight decrease. Pavement cover increased from 7 to 20%. The percent bare soil is similar between years. The soil trend is slightly downward. The 1989 data demonstrates that the increaser subshrub broom snakeweed is not a good indicator of trend. Although it was apparently rapidly expanding in 1983, the snakeweed now has a largely decadent population. The short statured oakbrush on the site is heavily hedged and has expanded slightly. No changes are apparent in the heavily browsed cliffrose population and the more infrequent shrubs were not adequately sampled. Perennial grasses still predominate in the understory. The small bluegrasses and bluebunch wheatgrass maintained comparable quadrat frequencies. Not counting the abundant annual weeds, forb frequency and composition is unchanged and insignificant.

1997 TREND ASSESSMENT

The soil trend is stable. Some past erosion has occurred as well as plant pedestaling. Current erosion does not appear to be significant and not more than would be expected. The adjacent foot trail shows signs of erosion which could eventually adversely affect the site. The mountain big sagebrush population is moderate to heavily hedged, but the percentage of heavily hedged plants has declined since 1989. Seedlings and young plants are sparse with 70% of the plants encountered classified as mature. The broom snakeweed population has expanded quickly to over 10,000 plants/acre being sampled in 1997. The browse trend is slightly downward at this time due to this great increase. This species can have highly fluctuating populations and this community should be monitored closely. Nested frequency for bluebunch wheatgrass continues to increase with only a sparse cover value for cheatgrass. Bulbous bluegrass also has a relatively high cover value with a very short growth form. Forbs are insignificant on the site at this time. Herbaceous trend is slightly upward.

TREND ASSESSMENT

soil - stable

browse - slightly downward with the great increase in broom snakeweed density

herbaceous understory - slightly upward

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 24

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	b ⁹	b ⁷	a ⁻	5	5	-	-
G	Agropyron dasystachyum	c ⁸⁶	b ⁸	a ⁻	33	4	-	-
G	Agropyron spicatum	a ¹⁹⁶	b ²³⁷	c ²⁸⁹	76	82	85	20.39
G	Bromus tectorum (a)	-	-	133	-	-	49	1.51
G	Poa bulbosa	b ²⁸⁴	a ¹²⁰	c ³⁰⁷	89	59	89	16.68
G	Poa secunda	a ⁻	c ²⁹⁹	b ²⁸	-	95	14	.17
Total for Grasses		575	671	757	203	245	237	38.76

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Alyssum alyssoides</i> (a)	-	-	128	-	-	49	.49
F	<i>Allium</i> spp.	-	-	3	-	-	1	.00
F	<i>Ambrosia psilostachya</i>	_a -	_c 52	_b 35	-	27	15	.18
F	<i>Artemisia ludoviciana</i>	3	2	-	1	1	-	-
F	<i>Arabis perennans</i>	-	-	2	-	-	1	.03
F	<i>Astragalus</i> spp.	-	2	-	-	1	-	-
F	<i>Astragalus utahensis</i>	-	-	3	-	-	1	.15
F	<i>Castilleja chromosa</i>	7	1	2	3	1	1	.00
F	<i>Calochortus nuttallii</i>	_b 7	_{ab} 1	_a -	4	1	-	-
F	<i>Cirsium</i> spp.	_a -	_a 2	_b 11	-	1	8	.19
F	<i>Comandra pallida</i>	4	8	3	2	3	3	.01
F	<i>Crepis acuminata</i>	-	-	5	-	-	2	.01
F	<i>Erodium cicutarium</i> (a)	-	-	44	-	-	19	.26
F	<i>Helianthus annuus</i> (a)	-	17	-	-	7	-	-
F	<i>Hedysarum boreale</i>	12	11	26	6	5	11	.71
F	<i>Lactuca serriola</i>	-	-	1	-	-	1	.00
F	<i>Lithospermum ruderales</i>	-	3	3	-	2	2	.01
F	<i>Oenothera albicaulis</i> (a)	2	-	5	1	-	3	.33
F	<i>Orobanche</i> spp.	5	-	-	2	-	-	-
F	<i>Phlox longifolia</i>	_a 3	_a 6	_b 28	1	4	12	.08
F	<i>Sphaeralcea coccinea</i>	8	7	6	4	2	2	.03
F	<i>Tragopogon dubius</i>	_a 2	_a -	_b 31	2	-	14	.24
F	Unknown forb-perennial	-	3	-	-	1	-	-
Total for Forbs		53	115	336	26	56	145	2.76

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd Unit: 17, Study no: 24

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	35	8.28
B	Atriplex confertifolia	1	.03
B	Cercocarpus montanus	1	.15
B	Chrysothamnus nauseosus albicaulis	4	.15
B	Gutierrezia sarothrae	72	3.59
Total for Browse		113	12.21

BASIC COVER --

Herd unit 17 , Study no: 24

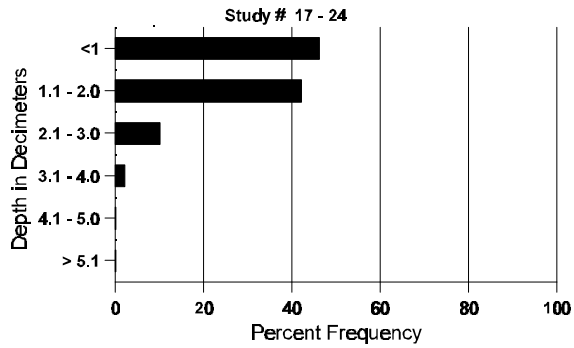
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	381	7.00	22.25	53.82
Rock	172	3.00	4.50	4.96
Pavement	245	6.75	19.75	6.84
Litter	388	72.50	41.00	39.14
Cryptogams	43	.25	0	.59
Bare Ground	190	10.50	12.50	7.46

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 24

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
24.3	49.6 (17.7)	7.1	32.0	35.4	32.6	3.8	5.7	105.6	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 24

Type	Quadrat Frequency '97
Rabbit	1
Elk	1
Deer	43

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 24

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total						
		1	2	3	4										
Amelanchier alnifolia															
M	83	-	-	1	-	-	-	-	-	-	-	33	30	35	1
	89	-	-	1	-	-	-	-	-	-	-	33	28	31	1
	97	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>							
'83		00%		100%		100%		+ 0%							
'89		00%		100%		100%		Died out							
'97		00%		00%		00%									
Total Plants/Acre (excluding Dead & Seedlings)						'83	33	Dec:							
						'89	33								
						'97	0								

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
Y	83	-	-	1	-	-	-	-	-	-	1	-	-	-	33		1
	89	-	1	-	-	-	-	-	-	-	1	-	-	-	33		1
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4
M	83	-	8	12	-	-	-	-	-	-	15	-	-	5	666	22 28	20
	89	-	1	12	-	-	-	-	-	-	12	1	-	-	433	24 29	13
	97	-	23	15	1	-	-	-	-	-	39	-	-	-	780	25 47	39
D	83	-	1	1	3	-	-	-	-	-	1	-	1	3	166		5
	89	-	2	10	-	-	-	-	-	-	10	1	-	1	400		12
	97	4	7	2	-	-	-	-	-	-	5	1	-	7	260		13
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	240			12
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		35%			54%			35%			+ 0%						
'89		15%			85%			04%			+23%						
'97		54%			30%			13%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	865	Dec:	19%			
											'89	866		46%			
											'97	1120		23%			
<i>Atriplex confertifolia</i>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	15 27	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			Appeared						
'97		100%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-			
											'89	0		-			
											'97	20		-			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Cercocarpus montanus</i>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	1	-	-	-	-	-	-	1	-	-	-	20	70 127	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			Appeared						
'89		00%			100%			00%			-39%						
'97		00%			100%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	33		-		
												'97	20		-		
<i>Chrysothamnus nauseosus albicaulis</i>																	
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	20 24	1
	89	2	-	-	-	-	-	-	-	-	-	2	-	-	66	26 26	2
	97	4	-	-	-	-	-	-	-	-	3	1	-	-	80	28 48	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+50%						
'89		00%			00%			00%			+18%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	-		
												'89	66		-		
												'97	80		-		
<i>Cowania mexicana stansburiana</i>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	38 48		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			None						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	0		-		

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																	
S	83	123	-	-	-	-	-	-	-	-	123	-	-	-	4100		123
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	445	-	-	-	-	-	-	-	-	445	-	-	-	8900		445
Y	83	22	-	-	-	-	-	-	-	-	22	-	-	-	733		22
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	214	-	-	-	-	-	-	-	-	214	-	-	-	4280		214
M	83	15	-	-	-	-	-	-	-	-	15	-	-	-	500	11 8	15
	89	22	-	-	-	-	-	-	-	-	16	-	6	-	733	9 8	22
	97	299	-	-	-	-	-	-	-	-	299	-	-	-	5980	6 7	299
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	21	-	-	-	-	-	-	-	-	8	-	10	3	700		21
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+14%						
'89		00%			00%			44%			+86%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	1233	Dec:	0%			
											'89	1433		49%			
											'97	10300		0%			
Quercus gambelii																	
Y	83	-	-	1	-	-	-	-	-	-	-	-	1	-	33		1
	89	-	-	5	1	-	-	-	-	-	2	4	-	-	200		6
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	83	-	1	2	-	-	-	-	-	-	2	-	1	-	100	33 35	3
	89	-	-	4	-	-	1	-	-	-	5	-	-	-	166	59 33	5
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	52 43	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		25%			75%			50%			+64%						
'89		00%			91%			00%			Died out						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	133	Dec:	-			
											'89	366		-			
											'97	0		-			

Trend Study 17-25-97

Study site name: North Battle Creek .

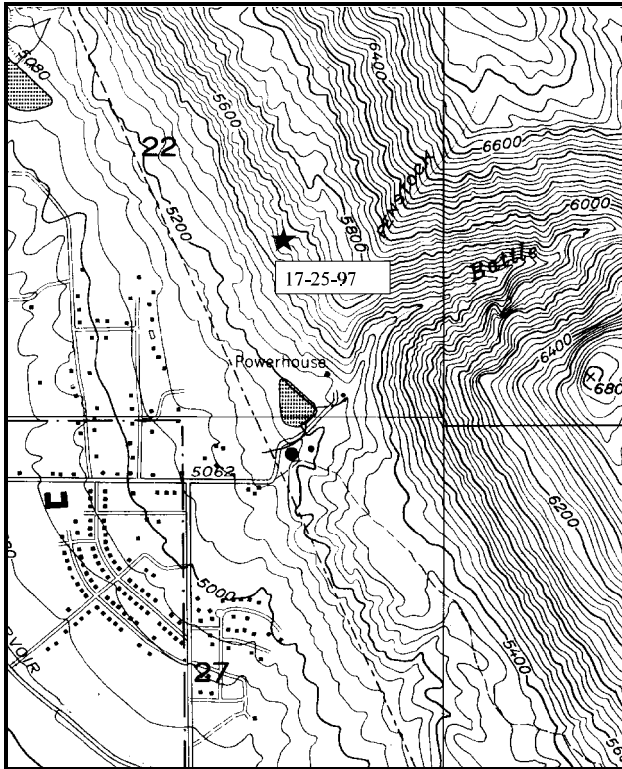
Range Type: Stansbury cliffrose

Compass bearing: frequency baseline 192 degrees. (Lines 2 & 3 274°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (34 & 71ft).

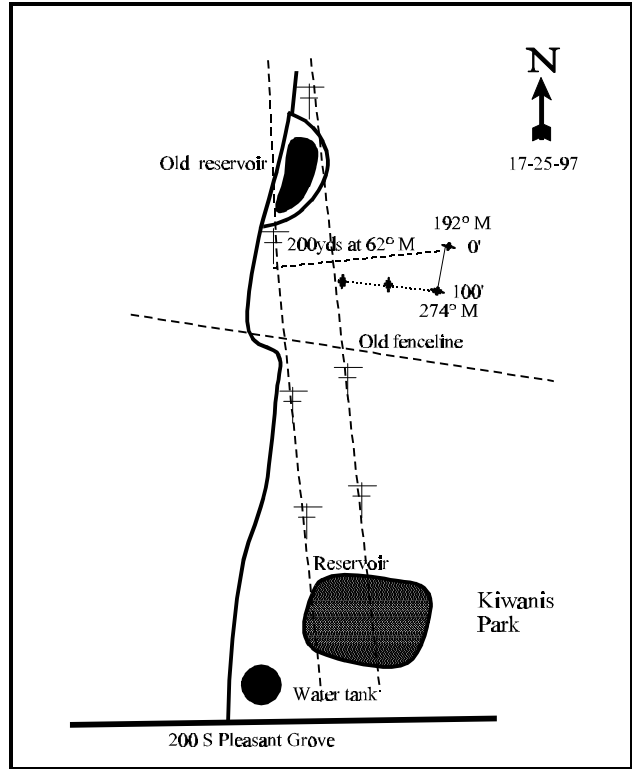
LOCATION DESCRIPTION

From Pleasant Grove, go up 200 South towards Battle Creek Canyon. The paved road ends at a water tank. Follow one of the many dirt roads north along the base of the foothill under the powerlines. From the water tank, go about 1/4 mile to a very old reservoir. Stop on the south end. From the powerline pole on the south end of the old reservoir, the 0 foot stake is about 200 yards at 62 degrees. The study samples the first face or slope below the second terrace, in a fairly dense cliffrose type, just north of a small drainage. A red browse tag, #3988, is attached to the 0-foot stake.



Map Name: Orem

Township 5S, Range 2E, Section 22



Diagrammatic Sketch

UTM 4438640.109 N, 440412.957 E

DISCUSSION

Trend Study No. 17-25 (19-5)

The North Battle Creek study is on a steep (65-70%) southwest facing hillside located just north of Battle Creek. The study sight is typical of the severe winter range in this area. Elevation is 5,320 feet which is between the upper and lower lake terraces. Reservoirs are located north, south, and below the site just above the houses. New subdivisions are being constructed just below the site as well. There is moderate to heavy use by deer in the area. The range type through the years has become a fairly sparse mountain big sagebrush-grass community interspersed with a few scattered white rubber rabbitbrush. The Stansbury cliffrose now has higher density than the sagebrush and provides 77% of the browse cover. Above the study sight, Gambel oak becomes increasingly dominant.

Soil is a well drained clay loam derived from limestone and quartzite. Soils in this area often have a lime-cemented hardpan at 12 to 20 inches depth, which can be a barrier to root and water penetration. Effective rooting depth (see methods) is nearly 13 inches with a neutral pH (7.1). Both phosphorous and potassium may be limiting for plant development on the site for both are significantly below the minimums thought required for normal plant development. On the steep slopes like the study site, the erosion hazard is considered severe (USDA-SCS, 1972).

The key browse species are mountain big sagebrush and Stansbury cliffrose. Mountain big sagebrush, initially the most abundant, now only has an estimated density of 220 plants/acre. It is moderate to heavily hedged with generally good vigor. Age structure has changed little since 1983 with most plants classified as mature. Those classified as having poor vigor have increased to 18%. Another indication of failing vigor is that there are very few seedstalks from the past fall. For cliffrose, even though a greater percentage of the plants are classified as heavily browsed, they still have improved vigor and lower percent decadency rates. Cliffrose currently has an estimated density of 800 plants/acre. Other species that occur occasionally include white stem rabbitbrush and broom snakeweed.

Perennial herbaceous plants are severely depleted, which could be the result of fairly low amounts of phosphorous and potassium in the soil. Occasional clumps of bluebunch wheatgrass and Sandberg bluegrass are the principal grasses. Annual grasses, especially cheatgrass, comprise the bulk of herbaceous growth. Also, numerous are the annual forbs storksbill, bur buttercup, and pale alyssum. These species pose a serious fire hazard when dry. All annual species together contribute 53% of the total herbaceous cover. The most desirable forb on the site was Utah sweetvetch. Another forb of interest is desert princes plume, a species normally regarded as a selenium indicator.

1983 APPARENT TREND ASSESSMENT

This site is located on a highly erodible and very steep slope. Litter and vegetation cover is primarily the result from annual plants. Because of this, the rate of erosion is moderately high. Soil trend is down. Vegetative trend is more difficult to assess. The area has the appearance of a declining sagebrush population that is being replaced by annual grasses and weeds. However, the data is contradictory to this and is more indicative of a stable browse stand. The density plot sample is a small one and there is some question as to validity. It is more likely that big sagebrush is declining in abundance much as it is elsewhere on the "Wasatch Face."

1989 TREND ASSESSMENT

The lower amount of vegetative and litter cover calculated in 1989 is reflective of the dry conditions. More rock and pavement is exposed, 29% in 1983 compared to 46.5% in 1989. The soil trend is down. Data from the study site north of Battle Creek indicate that no significant changes have occurred on the sagebrush and cliffrose site. The 1983 report predicted downward trends for the soil and vegetation, and these appear to be continuing. Trend is downward especially for the few sagebrush on the site. They now appear moderately, as opposed to heavily, hedged, but no young shrubs were encountered and the population is 20% decadent. Herbaceous vegetation is limited, especially on the density plots. No perennial grasses were found in the dense cheatgrass in 1989. Grass and forb frequency is unchanged. The lower amount of vegetative and litter cover determined in 1989 may be a reflection of the dry conditions.

1997 TREND ASSESSMENT

Soil trend is stable. Past erosion is apparent with some terracing and plant pedestaling. Erosion does not appear to be very active now. Vegetation and litter provide some soil protection, but a bulk of the basic ground cover is provided by rock and pavement (40% cover). The browse trend is considered stable for cliffrose which makes up 77% of the browse cover. Sagebrush only contributes 9% of the browse cover. Populations appear to be relatively stable and not expanding. An increased sample size was used in 1997 which accounts for some of the shifts in densities. The much larger sample size gives better population estimates for browse that have distributions that are clumped or discontinuous. This is especially true for sagebrush, where the low number of dead plants encountered on the site cannot explain the decrease in density. Utilization has increased on cliffrose and mountain big sagebrush. The herbaceous understory is depleted with a bulk of the cover coming from annual species. Bluebunch wheatgrass nested frequency has significantly declined since 1989. Herbaceous understory trend is slightly downward.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - slightly downward

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 25

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	-	-	1	-	-	1	.00
G	Agropyron spicatum	_b 128	_{ab} 117	_a 65	46	44	26	3.48
G	Bromus tectorum (a)	-	-	159	-	-	59	2.51
G	Hilaria jamesii	-	-	3	-	-	1	.03
G	Poa secunda	15	13	6	5	5	2	.18
G	Secale cereale (a)	-	-	2	-	-	1	.00
G	Unknown grass - perennial	-	3	-	-	2	-	-
Total for Grasses		143	133	236	51	51	90	6.22

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Alyssum alyssoides</i> (a)	-	-	81	-	-	35	.30
F	<i>Allium campanulatum</i>	20	6	16	9	4	10	.08
F	<i>Ambrosia psilostachya</i>	a ⁻	a ⁻	b ¹³	-	-	7	.21
F	<i>Artemisia ludoviciana</i>	-	-	5	-	-	3	.30
F	<i>Cirsium</i> spp.	-	-	1	-	-	1	.00
F	<i>Convolvulus arvensis</i>	a ⁻	a ⁻	b ¹¹	-	-	4	.36
F	<i>Epilobium paniculatum</i> (a)	-	-	4	-	-	2	.01
F	<i>Erodium cicutarium</i> (a)	-	-	213	-	-	71	6.43
F	<i>Galium aparine</i> (a)	-	-	59	-	-	27	.84
F	<i>Hackelia patens</i>	a ⁻	a ⁻	b ¹⁴	-	-	5	.05
F	<i>Hedysarum boreale</i>	a ⁵⁷	a ⁵²	b ¹¹¹	25	21	42	4.23
F	<i>Lactuca serriola</i>	a ⁻	a ⁻	b ¹⁷	-	-	11	.16
F	<i>Machaeranthera canescens</i>	2	1	-	1	1	-	-
F	<i>Medicago sativa</i>	-	-	3	-	-	1	.03
F	<i>Oenothera latifolia</i>	2	-	-	1	-	-	-
F	<i>Phlox longifolia</i>	6	13	11	3	9	5	.05
F	<i>Ranunculus testiculatus</i> (a)	-	-	166	-	-	60	1.64
F	<i>Sisymbrium altissimum</i> (a)	-	-	3	-	-	1	.00
F	<i>Stanleya pinnata</i>	b ²⁴	b ¹²	a ⁻	10	9	-	-
F	<i>Taraxacum officinale</i>	a ⁻	a ⁻	b ⁶	-	-	4	.07
F	<i>Tragopogon dubius</i>	a ⁻	a ⁻	b ¹⁸	-	-	8	.11
F	Unknown forb-annual	-	-	1	-	-	1	.15
Total for Forbs		111	84	753	49	44	298	15.05

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 25

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	8	.83
B	Chrysothamnus nauseosus albicaulis	2	.78
B	Cowania mexicana stansburiana	32	7.41
B	Gutierrezia sarothrae	12	.56
Total for Browse		54	9.59

BASIC COVER --

Herd unit 17 , Study no: 25

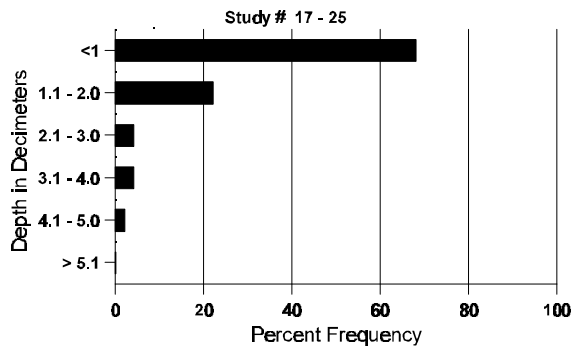
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	342	3.50	7.00	30.84
Rock	318	8.75	20.50	28.40
Pavement	286	20.25	26.00	11.94
Litter	371	48.75	30.50	19.88
Cryptogams	5	.75	.25	.01
Bare Ground	248	18.00	15.75	16.89

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 25

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.7	52.3 (15.4)	7.1	28.0	33.4	38.6	2.9	6.4	38.4	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 25

Type	Quadrat Frequency '97
Deer	47

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 25

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Artemisia tridentata vaseyana																		
Y	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	13	-	-	-	-	-	-	-	-	13	-	-	-	866	20	35	13
	89	-	12	-	-	-	-	-	-	-	11	-	1	-	800	22	26	12
	97	-	3	5	-	1	-	-	-	-	9	-	-	-	180	26	40	9
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	3	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	1	-	1	-	-	-	-	-	-	-	-	2	40		2		
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	80		4		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			- 6%							
'89		100%			00%			07%			-78%							
'97		36%			55%			18%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1066	Dec:	0%			
												'89	1000		20%			
												'97	220		18%			

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	66	23	30	1
	'89	-	1	-	-	-	-	-	-	-	1	-	-	-	66	20	37	1
	'97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	22	30	1
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'97	2	-	-	-	-	-	-	-	-	-	-	2	40			2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		100%			00%			00%			- 9%							
'97		00%			00%			67%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	66	Dec:	0%				
											'89	66		0%				
											'97	60		67%				
<i>Cowania mexicana stansburiana</i>																		
M	'83	-	3	-	-	-	1	-	-	-	3	-	1	-	266	50	60	4
	'89	-	4	-	-	-	-	-	-	-	4	-	-	-	266	58	59	4
	'97	-	4	14	-	-	18	-	-	-	36	-	-	-	720	50	57	36
D	'83	-	-	1	-	-	-	-	-	-	-	-	1	-	66			1
	'89	-	1	1	-	-	-	-	-	-	2	-	-	-	133			2
	'97	-	-	3	-	-	1	-	-	-	3	-	-	1	80			4
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		60%			40%			40%			+17%							
'89		83%			17%			00%			+50%							
'97		10%			90%			03%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	332	Dec:	20%				
											'89	399		33%				
											'97	800		10%				

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
<i>Gutierrezia sarothrae</i>																	
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'97	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	'97	37	-	-	-	-	-	-	-	-	37	-	-	-	740	9 11	37
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-			
											'89	0		-			
											'97	860		-			

Trend Study 17-26-97

Study site name: Orem Water Tank .

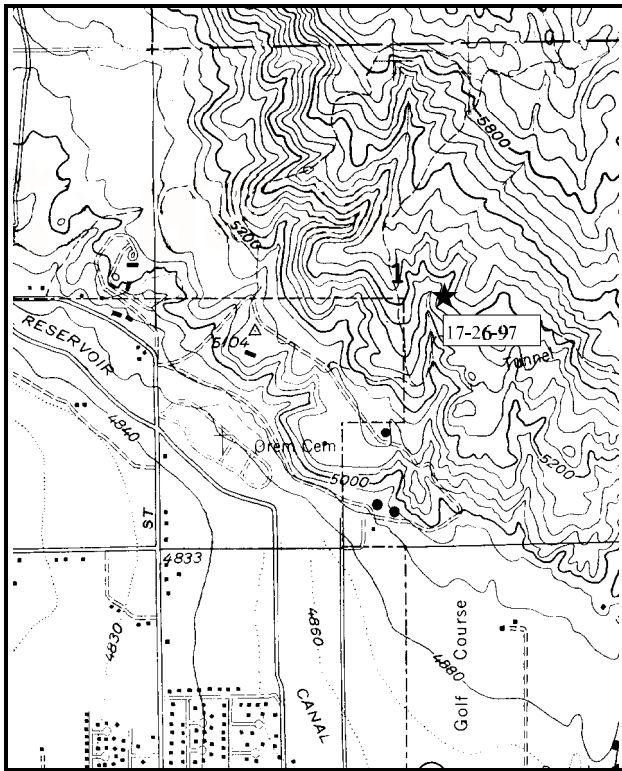
Range Type: Mixed oak-sage

Compass bearing: frequency baseline 38 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

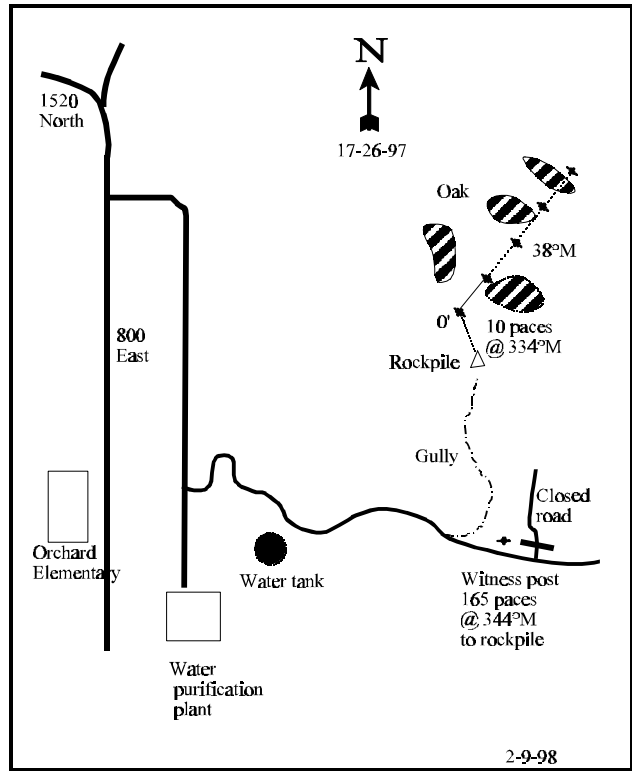
LOCATION DESCRIPTION

On the north side of Orem, go east up 1600 North (which turns into 1520 North) to 800 East. Just south of this intersection on 800 East, turn up the road towards the water purification plant. Go 0.45 miles, turn left and go 0.25 miles to a water tank. Continue on this road 0.25 miles and park. The old road towards the study site is closed, but a witness post should mark the junction. From there walk about 165 paces (275 yards) to a rock pile at the head of a small drainage or gully. From the rockpile, walk north (334 degrees) 10 paces to the 0-foot baseline stake at the edge of the oakbrush. It is marked by a red browse tag, #3913.



Map Name: Orem

Township 6S, Range 2E, Section 1



Diagrammatic Sketch

UTM 4464113.885 N, 443685.912 E

DISCUSSION

Trend Study No. 17-26 (19-6)

The Orem Water Tank study is located on burned and seeded oakbrush range immediately north of the Orem Water Treatment Plant. Slope is moderate, ranging from about 12% at the base of the slope to 30% near the top of the slope. Aspect is south to southwest at an elevation of 5,260 feet. Deer use has been heavy in the past, but only light hedging was noted in 1997. Deer pellet groups were fairly frequent with some scattered elk pellet groups as well. Livestock are excluded to protect the watershed. In 1983, grasshopper damage was apparent on the oak, but not enough to impact vigor. In the summer of 1996, a fire burned through the area, eliminating what browse there was with the exception of Gambel oak, which can re-sprout.

Textural analysis indicates a clay loam soil with an effective rooting depth (see methods) of 13 inches. The pH is neutral at 6.7 with an average soil temperature of 58.2°F measured at 14 inches. A dense cover of seeded grasses and litter provides adequate soil protection where 83% of the vegetative cover is from herbaceous species. The 1996 fire has increased percent bare ground, but there is still adequate vegetation and litter cover to protect the soil.

In 1989, it was reported that the Gambel oak stand had changed very little since 1983. Mature oak averaged nearly 4 feet in height and the frequency and density had changed only slightly. Estimated density at that time was 14,333 stems/acre. The fire that swept through the area in 1996 burned all of the oak within the area. No mature plants remained in 1997, with re-sprouting plants classified as seedling or young. These plants average 13 inches in height with an estimated density of 10,560 plants/acre. Unlike other browse species, it is likely that many of the plants classified as seedling on this site will survive to maturity. This population will continue to increase in height and crown but it is unlikely that it will expand at this time. All mountain big sagebrush plants were consumed by the fire and none were encountered in 1997. Previous, its density was estimated at 333 plants/acre. Fourwing saltbush was seeded but not encountered in the density strips. White stem rabbitbrush was encountered with an estimated density of 20 plants/acre.

As reported in the past, seeded perennial grasses (especially smooth brome which is shade tolerant and rhizomatous) continue to be highly successful. Smooth brome is the dominant grass in the Gambel oak understory while intermediate wheatgrass and crested wheatgrass are dominant in the interspaces. Low amounts of annual grass species, cheatgrass, Japanese brome, and six weeks fescue are present but the density of perennial grasses will suppress these annuals from spreading. Alfalfa is the dominant forb at this time. It is healthy and robust, although showing signs of utilization. Other forbs were seldom encountered.

1983 APPARENT TREND ASSESSMENT

Soil trend is improving but is doing so at the expense of plant diversity. Gambel oak and seeded perennial grasses currently are overwhelmingly dominant and threaten to become even more so. From a management point of view, the area provides an abundant, but low diversity diet for deer. Any management action that could increase browse diversity would be welcome.

1989 TREND ASSESSMENT

The perennial grasses contribute significant litter cover, and along with leaf litter from the oaks, provide 92% ground cover. The soil trend is stable. The vegetative trend is down in terms of sagebrush and browse diversity on the winter range.

1997 TREND ASSESSMENT

The soil trend is stable. Although percent bare ground has increased because the recent fire event, there is still adequate vegetative and litter cover to protect the soil from erosion. Gambel oak will continue to grow and provide additional protection as well. It is difficult to assess the browse trend at this time. All mountain big sagebrush plants were destroyed by the fire, but the reading in 1989 estimated only 333 plants/acre. Gambel oak is the key forage species at this time and it will continue to grow in height. Browse trend is stable, although the establishment of other forage species should be encouraged. Herbaceous understory trend is stable with many of the same species present now that were present prior to the fire. Smooth brome will continue to dominate the understory and protect the watershed. Forb diversity is relatively high, although many of the species are in comparatively low numbers.

TREND ASSESSMENT

soil - stable

browse - stable, only oakbrush is available since the fire

herbaceous understory - stable, but dominated by seeded exotic species

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 26

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	a8	a1	b41	5	1	14	1.68
G	Agropyron intermedium	ab112	b148	a103	41	52	35	4.96
G	Agropyron trichoporum	c61	b18	a-	27	8	-	-
G	Bromus inermis	a235	b268	ab232	76	83	74	13.45
G	Bromus japonicus (a)	-	-	37	-	-	12	.86
G	Bromus tectorum (a)	-	-	105	-	-	38	2.49
G	Poa pratensis	-	3	-	-	1	-	-
G	Poa secunda	3	7	10	1	3	3	.06
G	Vulpia octoflora (a)	-	-	2	-	-	1	.00
Total for Grasses		419	445	530	150	148	177	23.54
F	Alyssum alyssoides (a)	-	-	101	-	-	43	.73
F	Astragalus spp.	-	2	-	-	2	-	-
F	Calochortus nuttallii	b20	a1	b14	11	1	8	.04
F	Descurainia pinnata (a)	-	-	10	-	-	5	.02
F	Epipactis gigantea	-	-	2	-	-	1	.00
F	Erodium cicutarium (a)	-	-	28	-	-	12	.21
F	Eriogonum racemosum	5	3	5	4	1	2	.03
F	Galium aparine (a)	-	-	6	-	-	2	.04
F	Hedysarum boreale germinale	b22	a-	a-	9	-	-	-

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Holosteum umbellatum (a)	-	-	2	-	-	1	.00
F	Lappula occidentalis (a)	-	-	7	-	-	4	.02
F	Lactuca serriola	-	-	2	-	-	2	.18
F	Linaria dalmatica	-	-	3	-	-	1	.03
F	Medicago sativa	_a 14	_a 22	_b 99	7	10	37	12.19
F	Polygonum douglasii (a)	-	-	2	-	-	1	.00
F	Sphaeralcea coccinea	6	8	6	4	3	3	.04
F	Tragopogon dubius	1	-	5	1	-	2	.06
F	Zigadenus paniculatus	1	-	-	1	-	-	-
Total for Forbs		69	36	292	37	17	124	13.64

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 26

T y p e	Species	Strip Frequency '97	Average Cover % '97
B	Chrysothamnus nauseosus albicaulis	1	-
B	Quercus gambelii	57	7.65
Total for Browse		58	7.65

BASIC COVER --

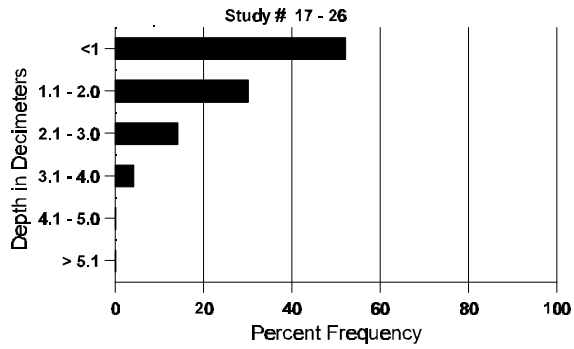
Herd unit 17 , Study no: 26

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	349	1.50	3.00	42.85
Rock	206	.50	1.00	3.87
Pavement	239	.75	1.00	1.99
Litter	385	95.50	91.50	34.48
Cryptogams	1	.25	0	.00
Bare Ground	307	1.50	3.50	23.51

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 26

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.0	58.2 (14.3)	6.7	33.8	38.4	27.8	2.9	15.9	198.4	.7

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 26

Type	Quadrat Frequency '97
Elk	7
Deer	36

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 26

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	2	-	-	-	-	-	-	2	-	-	-	133	31	26	2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	83	-	-	4	-	-	-	-	-	-	4	-	-	-	266		4	
	89	-	1	3	-	1	-	-	-	-	2	-	3	-	333		5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			100%			00%			-17%							
'89		40%			60%			60%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	399	Dec:	67%				
											'89	333		100%				
											'97	0		0%				
<i>Atriplex canescens</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	16	13	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			None							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	0		-				

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
<i>Chrysothamnus nauseosus albicaulis</i>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	1	-	-	-	-	-	-	-	-	-	1	-		1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>					
	'83	00%			00%			00%				None					
	'89	00%			00%			00%				Appeared					
	'97	00%			100%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	20		-		
<i>Gutierrezia sarothrae</i>																	
D	83	2	-	-	-	-	-	-	-	-	-	-	-	2	-		2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>					
	'83	00%			00%			00%				Died out					
	'89	00%			00%			00%				None					
	'97	00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	133	Dec:	100%		
												'89	0		0%		
												'97	0		0%		

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Quercus gambelii																	
S	83	21	-	-	-	-	-	-	-	-	21	-	-	-	1400		21
	89	26	2	-	12	-	-	-	-	-	32	2	2	4	2666		40
	97	229	-	-	-	-	-	-	-	-	229	-	-	-	4580		229
Y	83	15	48	-	-	-	-	-	-	-	63	-	-	-	4200		63
	89	117	9	-	9	-	-	-	-	-	132	-	3	-	9000		135
	97	363	-	-	45	-	-	-	-	-	326	74	-	8	8160		408
M	83	-	124	-	-	40	-	-	-	-	164	-	-	-	10933	40 15	164
	89	43	7	-	2	1	-	-	-	-	53	-	-	-	3533	46 19	53
	97	120	-	-	-	-	-	-	-	-	104	16	-	-	2400	13 10	120
D	83	-	-	3	-	-	-	-	-	-	-	3	-	-	200		3
	89	14	11	-	1	-	-	1	-	-	13	1	11	2	1800		27
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	8280		414
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>			
'83		92%			01%			00%						- 7%			
'89		13%			00%			07%						-26%			
'97		00%			00%			02%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	15333	Dec:	1%			
											'89	14333		13%			
											'97	10560		0%			

Trend Study 17-28-97

Study site name: Spring Hollow .

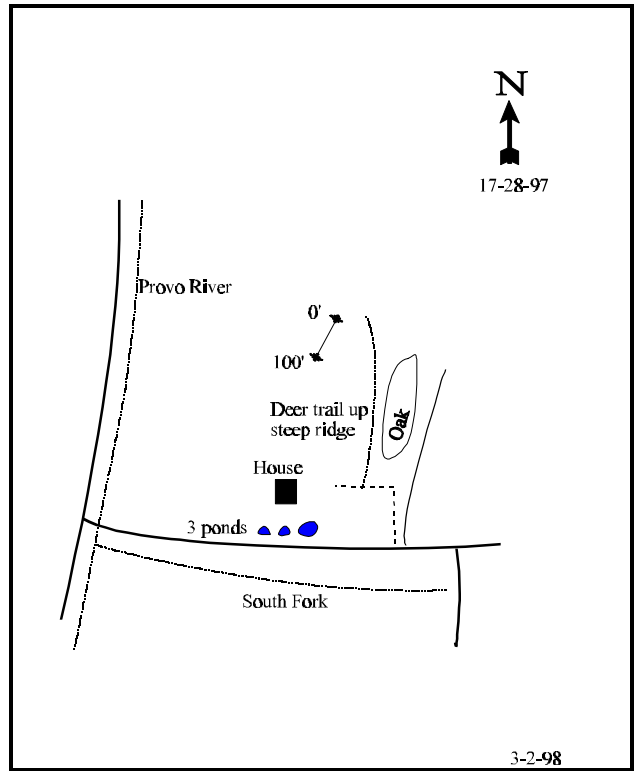
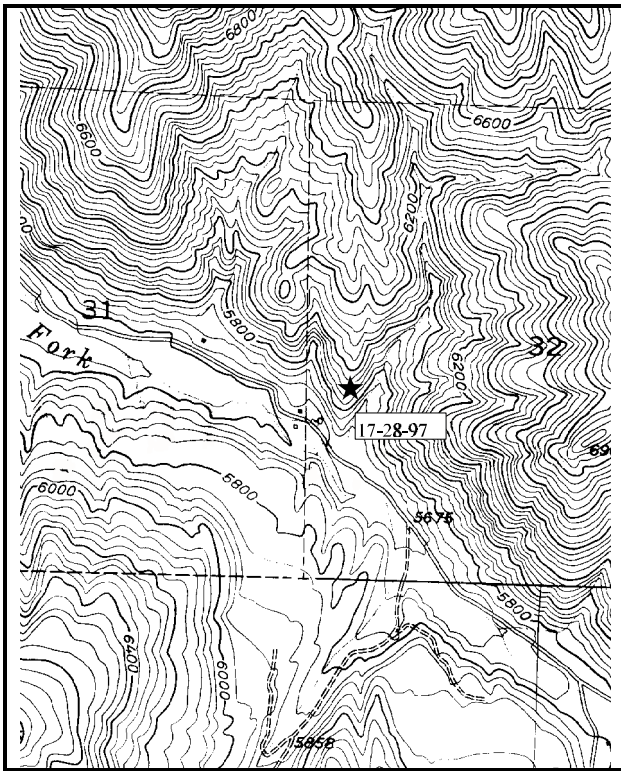
Range type: Mixed mountain brush

Compass bearing: frequency baseline 205 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11,34,59,71 & 95ft).

LOCATION DESCRIPTION

Beginning in Provo Canyon, proceed 3.1 miles up the south fork of the Provo River to an old road just past a house with 3 ponds in front of it. From the paved road, walk 40 paces up the old (closed) road to a fence corner. Walk west along the fence line to a deer trail. Hike northerly up the trail about 250 yards to an oak saddle. The study runs south down the ridge from the oak saddle. The 0-foot baseline stake is 20 paces from the saddle. Browse tag #3986 is attached to the 0-foot baseline stake. Hint: the oak saddle is at an azimuth of 350 degrees from the fence corner.



Map Name: Bridal Veil Falls .

Diagrammatic Sketch

Township 5S , Range 4E , Section 32

UTM 4465360.497 N , 455372.786 E

DISCUSSION

Trend Study No. 17-28 (27-2)

The Spring Hollow study is located on the South Fork of the Provo River. The study is at approximately 5,800 feet elevation and near the top of a small north-south oriented ridge. The slope is steep at 75% with an aspect to the west and southwest. The sampled range type is a small area of mixed mountain brush that may be limited by the extremely shallow, rocky soil and very steep slope. In 1983, it was reported that the frequency of pellet groups and the intensity of browse utilization was high. This does not appear to be the situation at this time. While some browse species exhibit moderate hedging, pellet group frequency is very low. It is recommended that this site no longer be sampled in the future.

Soil is exceptionally shallow and rocky with exposed bedrock in many places. Soil textural analysis indicates a clay loam soil with a neutral pH of 6.3. The effective rooting depth (see methods) is quite shallow measuring almost 8 inches. The soil surface is mostly covered with rock and pavement. Gullies are found on either side (east and west) of the site. Presently, erosion does not appear to be higher than expected on this steep and rocky slope.

Browse composition is mixed and seemingly dependent on slope position. Near the ridge top, true mountain mahogany and mountain big sagebrush prevail. Further downslope, Gambel oak becomes increasingly common. All of these species are important forage sources. The initial reading (1983) of this site indicated 1,232 mountain big sagebrush plants/acre. The current estimate is 320 plants/acre. This is a mature population with no seedlings and only one young plant classified. All of the decadent plants encountered were classified as dying at this time. Height and crown measurements have increased to 26 inches and 39 inches respectively. The true mountain mahogany population is mostly mature with an average height of just over 4 feet. Utilization is moderate with most showing good vigor. The 1997 density estimation was 240 plants/acre. Broom snakeweed density has been highly variable with an estimated density of 840 plants/acre in 1997. In 1983, utilization of Gambel oak was moderate to heavy, but this is no longer the case. Gambel oak now exhibits light hedging with an estimated density of 1,740 stems/acre. White rubber rabbitbrush, stickyleaf low rabbitbrush, and antelope bitterbrush were other browse species encountered, but consist of only scattered individuals.

As reported in 1983, herbaceous plants are poorly represented in this community. Bluebunch wheatgrass is an important perennial grass that has significantly increased in nested frequency since 1989. Cheatgrass and Japanese brome are present but not very abundant at this time. Soil characteristics and severe erosion preclude development of any significant herbaceous understory. Apparently the only herbaceous plants that can flourish under these conditions are annuals or perennials that complete their growth cycle early, before the upper soil horizons dry completely.

1983 APPARENT TREND ASSESSMENT

Soil trend is declining because of the steep slope, lack of perennial cover, and excessive erosion. Vegetative trend is also down. The big sagebrush population, although reproductively dynamic, is slowly being browsed out of existence. True mountain mahogany also is heavily browsed but is in slightly better condition. Oak will persist and perhaps even thicken, especially on the lower slopes. Herbaceous composition and density is poor and unlikely to improve.

1989 TREND ASSESSMENT

The soil trend is down due to the continual movement of rocks and the lack of developed soils. There is little sign of recent big game use. The important shrubs have increased in size since 1983 and show improved vigor. Overall, the vegetative trend is stable. Species composition is unchanged.

1997 TREND ASSESSMENT

The soil trend is stable. There are no signs of accelerated erosion at this time. Vegetation cover is scattered and the surface is armored by rock and pavement. Browse trend is stable for true mountain mahogany and oak which make up 95% of the browse cover. The mountain big sagebrush population is slowly being lost, but currently only contributes to 1% of the browse cover. The percent decadency has remained nearly the same over all years. Now the number of dead plants outnumbers the living ones. Other browse have remained relatively stable with the exception of the highly fluctuating broom snakeweed population. The herbaceous trend is slightly downward. Mutton and Sandberg bluegrasses have decreased slightly in sum of nested frequency with bluebunch wheatgrass significantly increasing. Very few forbs are found on the site while *Lathyrus brachycalyx*, the predominant forb in past years, was not sampled in 1997.

TREND ASSESSMENT

soil - stable

browse - stable for oak and true mountain mahogany, down for sagebrush which only makes up 1% of the browse cover

herbaceous understory - slightly downward

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 28

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	a72	a93	b126	31	42	50	7.83
G	Bromus japonicus (a)	-	-	47	-	-	18	1.07
G	Bromus tectorum (a)	-	-	97	-	-	33	1.31
G	Poa fendleriana	18	16	8	10	8	3	.30
G	Poa secunda	b22	ab12	a3	8	6	1	.03
Total for Grasses		112	121	281	49	56	105	10.56
F	Alyssum alyssoides (a)	-	-	22	-	-	8	.04
F	Allium spp.	b62	a-	a-	29	-	-	-
F	Castilleja chromosa	2	-	-	1	-	-	-
F	Cryptantha spp.	3	-	-	1	-	-	-
F	Cynoglossum officinale	-	2	3	-	1	1	.03
F	Eriogonum brevicaule	b30	b28	a9	13	14	5	.33
F	Lathyrus brachycalyx	c80	b44	a-	33	15	-	-
F	Machaeranthera canescens	-	1	-	-	1	-	.00

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Penstemon humilis	-	-	1	-	-	1	.00
F	Penstemon spp.	-	2	2	-	1	1	.03
F	Tragopogon dubius	2	-	-	1	-	-	-
Total for Forbs		179	77	37	78	32	16	0.43

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 28

T y p e	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	12	.19
B	Cercocarpus montanus	10	2.84
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	2	.00
B	Gutierrezia sarothrae	21	.53
B	Quercus gambelii	27	13.81
Total for Browse		73	17.42

BASIC COVER --

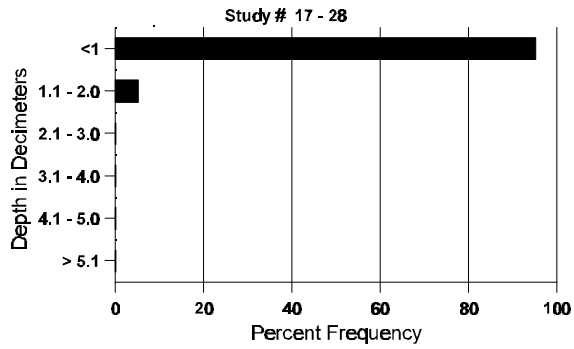
Herd unit 17 , Study no: 28

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	244	1.25	3.00	30.21
Rock	343	40.75	54.50	49.10
Pavement	159	8.75	13.00	5.99
Litter	330	37.50	24.00	23.80
Cryptogams	3	4.00	.25	.03
Bare Ground	91	7.75	5.25	3.95

SOIL ANALYSIS DATA --
 Herd Unit 17, Study no: 28

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
7.36	60.5 (10.0)	7.3	38.0	39.1	22.9	4.9	16.4	92.8	.7

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 17 , Study no: 28

Type	Quadrat Frequency '97
Deer	2

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 28

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Artemisia tridentata vaseyana																	
S	83	4	-	-	-	-	-	-	-	-	4	-	-	-	133		4
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	11	-	-	-	-	-	-	-	-	11	-	-	-	366		11
	89	5	-	-	-	-	-	-	-	-	5	-	-	-	166		5
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
M	83	-	-	11	-	-	-	-	-	-	-	-	4	7	366	5 8	11
	89	9	7	-	-	-	-	-	-	-	16	-	-	-	533	13 10	16
	97	5	2	1	2	-	-	-	-	-	10	-	-	-	200	26 43	10
D	83	-	-	15	-	-	-	-	-	-	-	-	-	15	500		15
	89	6	1	-	1	-	-	-	-	-	8	-	-	-	266		8
	97	3	2	-	-	-	-	-	-	-	-	-	-	5	100		5
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	400		20
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			70%			70%			-22%						
'89		28%			00%			00%			-67%						
'97		25%			06%			31%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	1232	Dec:	41%			
											'89	965		28%			
											'97	320		31%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total																					
	1	2	3	4	5	6	7	8	9	1	2	3	4																									
Cercocarpus montanus																																						
S	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2																					
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																					
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																					
Y	83	6	-	-	-	-	-	-	-	-	6	-	-	-	200		6																					
	89	3	2	2	-	-	-	-	-	-	6	-	1	-	233		7																					
	97	1	1	-	-	-	-	-	-	-	-	1	1	-	40		2																					
M	83	-	-	7	-	1	-	-	-	-	3	-	5	-	266	44 32	8																					
	89	5	5	1	-	-	-	-	-	-	10	-	1	-	366	51 45	11																					
	97	3	4	2	-	-	-	-	-	-	8	1	-	-	180	52 66	9																					
D	83	-	-	1	-	-	-	-	-	-	-	-	-	1	33		1																					
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																					
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20		1																					
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																					
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																					
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1																					
<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> </tr> <tr> <td>'83</td> <td>07%</td> <td>53%</td> <td>40%</td> <td>+17%</td> </tr> <tr> <td>'89</td> <td>39%</td> <td>17%</td> <td>11%</td> <td>-60%</td> </tr> <tr> <td>'97</td> <td>50%</td> <td>17%</td> <td>08%</td> <td></td> </tr> </table>																		% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>	'83	07%	53%	40%	+17%	'89	39%	17%	11%	-60%	'97	50%	17%	08%		
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																		
'83	07%	53%	40%	+17%																																		
'89	39%	17%	11%	-60%																																		
'97	50%	17%	08%																																			
<table border="0" style="width:100%"> <tr> <td>Total Plants/Acre (excluding Dead & Seedlings)</td> <td></td> <td></td> <td>'83</td> <td>499</td> <td>Dec:</td> <td>7%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'89</td> <td>599</td> <td></td> <td>0%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'97</td> <td>240</td> <td></td> <td>8%</td> </tr> </table>																		Total Plants/Acre (excluding Dead & Seedlings)			'83	499	Dec:	7%				'89	599		0%				'97	240		8%
Total Plants/Acre (excluding Dead & Seedlings)			'83	499	Dec:	7%																																
			'89	599		0%																																
			'97	240		8%																																
Chrysothamnus nauseosus albicaulis																																						
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	28 47	1																					
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	25 24	1																					
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	32 33	0																					
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0																					
	89	1	-	-	-	-	-	-	-	-	-	-	-	1	33		1																					
	97	1	-	-	-	-	-	-	-	-	-	-	-	1	20		1																					
<table border="0" style="width:100%"> <tr> <td>% Plants Showing</td> <td><u>Moderate Use</u></td> <td><u>Heavy Use</u></td> <td><u>Poor Vigor</u></td> <td><u>%Change</u></td> </tr> <tr> <td>'83</td> <td>00%</td> <td>00%</td> <td>00%</td> <td>+50%</td> </tr> <tr> <td>'89</td> <td>00%</td> <td>00%</td> <td>50%</td> <td>-70%</td> </tr> <tr> <td>'97</td> <td>00%</td> <td>00%</td> <td>100%</td> <td></td> </tr> </table>																		% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>	'83	00%	00%	00%	+50%	'89	00%	00%	50%	-70%	'97	00%	00%	100%		
% Plants Showing	<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>																																		
'83	00%	00%	00%	+50%																																		
'89	00%	00%	50%	-70%																																		
'97	00%	00%	100%																																			
<table border="0" style="width:100%"> <tr> <td>Total Plants/Acre (excluding Dead & Seedlings)</td> <td></td> <td></td> <td>'83</td> <td>33</td> <td>Dec:</td> <td>0%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'89</td> <td>66</td> <td></td> <td>50%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>'97</td> <td>20</td> <td></td> <td>100%</td> </tr> </table>																		Total Plants/Acre (excluding Dead & Seedlings)			'83	33	Dec:	0%				'89	66		50%				'97	20		100%
Total Plants/Acre (excluding Dead & Seedlings)			'83	33	Dec:	0%																																
			'89	66		50%																																
			'97	20		100%																																

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	2	-	-	-	-	-	-	-	-	2	-	-	40	10	11	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-			
											'89	0		-			
											'97	40		-			
<i>Gutierrezia sarothrae</i>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	33			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	33			1
	97	10	-	-	-	-	-	-	-	-	10	-	-	200			10
M	83	7	-	-	-	-	-	-	-	-	7	-	-	233	13	10	7
	89	46	-	-	-	-	-	-	-	-	36	-	10	1533	9	9	46
	97	32	-	-	-	-	-	-	-	-	32	-	-	640	12	13	32
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			+85%						
'89		00%			00%			21%			-46%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	233	Dec:	-			
											'89	1566		-			
											'97	840		-			
<i>Purshia tridentata</i>																	
M	83	-	-	-	-	-	1	-	-	-	1	-	-	33	28	75	1
	89	-	-	1	-	-	-	-	-	-	1	-	-	33	39	69	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			100%			00%			+ 0%						
'89		00%			100%			00%			Died out						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	33	Dec:	-			
											'89	33		-			
											'97	0		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total			
		1	2	3	4	5	6	7	8	9	1	2	3	4						
Quercus gambelii																				
S	'83	5	-	-	-	-	-	-	-	-	5	-	-	-	166		5			
	'89	4	-	-	4	-	-	7	-	-	14	-	1	-	500		15			
	'97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1			
Y	'83	-	20	20	-	-	-	-	-	-	40	-	-	-	1333		40			
	'89	76	-	-	-	-	-	-	-	-	74	-	2	-	2533		76			
	'97	35	-	-	5	-	-	-	-	-	40	-	-	-	800		40			
M	'83	-	51	-	-	-	-	-	-	1	42	10	-	-	1733	22 13	52			
	'89	24	-	-	-	-	-	-	-	-	21	-	3	-	800	37 30	24			
	'97	28	-	-	8	-	-	3	3	-	42	-	-	-	840	55 45	42			
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	'89	5	1	-	-	-	-	-	-	-	2	-	4	-	200		6			
	'97	3	-	-	2	-	-	-	-	-	2	1	-	2	100		5			
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0			
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1			
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>						
'83		77%			23%			00%						+13%						
'89		.94%			00%			08%						-51%						
'97		00%			00%			02%												
Total Plants/Acre (excluding Dead & Seedlings)													'83		3066		Dec:		0%	
													'89		3533				6%	
													'97		1740				6%	

Trend Study 17-29-97

Study site name: Above Edgemont .

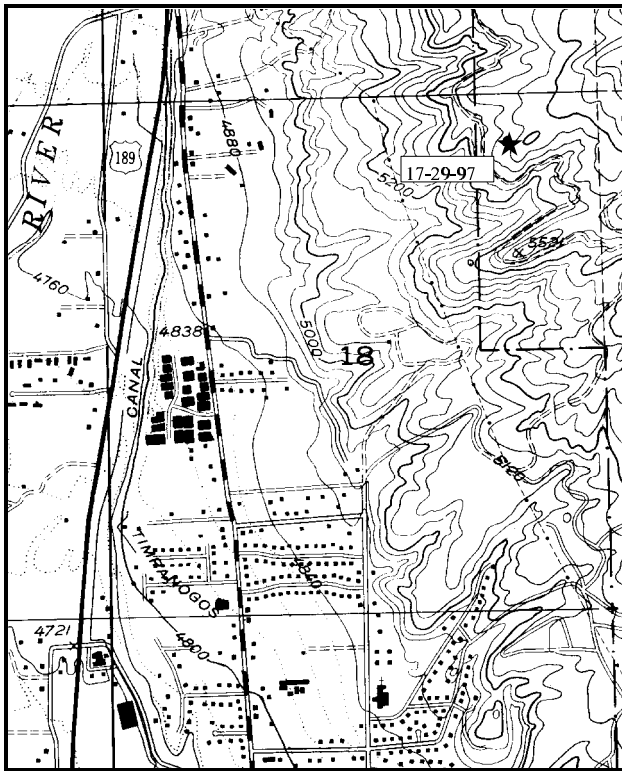
Range Type: Big sagebrush-grass

Compass bearing: frequency baseline 252 degrees.

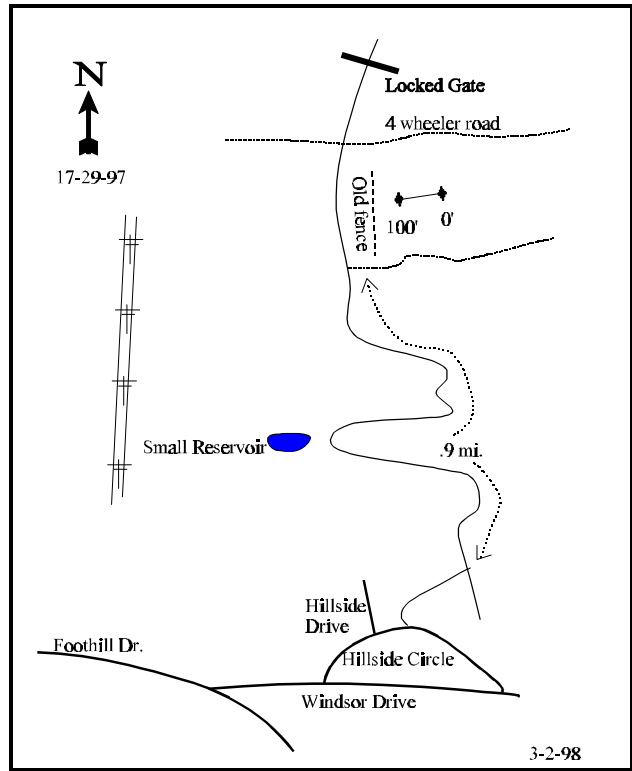
First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11,34,59,71 & 95ft).

LOCATION DESCRIPTION

From Route 189 south of the Orem Power Plant at the mouth of Provo Canyon, turn onto Canyon Road. Go east and south on Canyon road for 1 mile to Foothill Drive. Turn left and go up Foothill Drive to Windsor Drive. Go up Windsor to hillside Circle. Turn north onto a dirt road across from 1084 Hillside Circle. You will need to contact Dave Halton (owner, 1177E Aspen Ridge Lane, 224-0776) in order to open the gate. Drive 0.1 miles to a fork below a hillside crisscrossed with 4-wheeler roads. Go left around riding area, then follow the main foothill road traversing the face. Go 0.9 miles from the fork to a 4-wheeler road which goes up the slope to the right. Park here, then walk up the 4-wheeler road 75 paces. Turn left and walk 13 paces north-northwest to a sage opening. The 0-foot baseline stake is located at the top of the opening. The 100-foot baseline stake is painted red.



Map Name: Orem .



Diagrammatic Sketch

Township 6S , Range 3E , Section 18

DISCUSSION

Trend Study No. 17-29 (27-3)

In 1989, the original Edgemont study #15-9-83, later changed to #27-3-83, could not be located. The study transect stakes had apparently been removed from the private land. A new study was established in 1989 further up the slope on Forest Service administered land. The new study was named "Above Edgemont" and was identified with the same study number. The site is on an open, dry, west-facing slope of 35%. The elevation is 5,500 feet on the open sagebrush/grass slope, approximately 300 feet higher than the oak-dominated 1983 site. Deer use is light to moderate in winter. Human activity was heavy in this area in 1989, but access is now through private property and a locked gate. There still appears to be OHV use, horseback riders, mountain bikers, and joggers. Winter recreational use is more restricted, but this winter range is impacted by its proximity to a large population base. A number of fruit orchards lying immediately below the study may attract or hold deer during periods other than winter. In 1983 one small buck was observed in the immediate area in late June.

Soil is similar to that described for study number 17-24 (Heisette's Hollow). Soil textural analysis indicates a clay loam with a neutral pH (7.1). Phosphorous may be limiting (9.3 ppm) to plant development for it is below the minimum (10 ppm) thought needed for normal plant growth. Vegetative and litter cover appear adequate to prevent serious erosion. However, the area is susceptible to rill and gully erosion and some evidence of this is present. A number of roads and OHV trails in the area are significant starting points for erosion.

This study samples a more open area that at one time had a fair population of the preferred mountain big sagebrush. In 1989, it was reported that there were many sagebrush skeletons occurring on the slope. The skeletons have now fallen apart and are laying on the ground as litter. Estimated sagebrush density in 1997 is 600 plants/acre, a decline of over 900 plants/acre since 1989. From the browse table one can see that the number of dead plants found on the site was 980 plants/acre. The decrease in the population can be accounted for. There was a significant improvement in percent decadency in 1997 (20%), where it was not as high as that reported in 1989 (87%). This is most likely because many of the plants encountered at that time have now died. Vigor of the surviving plants is improved with less utilization. Oakbrush is dense in the surrounding clones with all plants encountered on the edges of the clumps. The Gambel oak does not appear to be expanding at this time. No seedling and few young plants were encountered. Cliffrose plants are scattered around the site but none were encountered in 1997.

Bluebunch wheatgrass provides the most vegetative cover on this site. Nested frequency and quadrat frequency have increased since 1989 with plants appearing healthy at this time. Conversely, Sandberg bluegrass nested frequency has declined significantly since 1989. Other perennial grasses include intermediate wheatgrass and smooth brome. Cheatgrass, rattlesnake brome, and Japanese brome are also present and provide some herbaceous cover and litter.

Sixteen different forbs were sampled in 1997. Forbs include a mixture of annual weeds, poor value perennials or biennials, and a few desirable perennials. The most common forbs include yellow salsify, pale alyssum, and arrowleaf balsam root.

1989 APPARENT TREND ASSESSMENT

Soil trend is stable on the site due to the fairly good vegetative and litter cover and most importantly the lack of erodible trails across the site. As has long been observed across the Wasatch Front, the trend is downward for big sagebrush on the winter range. On these sites with limited browse forage, the remaining available shrubs tend to be heavily used. Competition between native grasses and the introduced weeds is significant.

1997 TREND ASSESSMENT

The soil trend continues to be stable. Vegetative and litter cover are adequate to reduce the amount of soil moving downslope. Browse trend is down. More mountain big sagebrush plants were lost since 1989 and the few remaining plants will have difficulty replacing themselves with the intense competition from winter annuals. The herbaceous understory composition has changed very little since 1989. The trend is stable with a poor composition of forbs. Bluebunch wheatgrass is the most important grass and should help suppress the winter annuals.

TREND ASSESSMENT

soil - stable

browse - down

herbaceous understory - stable

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 29

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	<i>Aegilops cylindrica</i> (a)	-	3	-	-	1	-	-
G	<i>Agropyron intermedium</i>	a-	a-	b19	-	-	8	.06
G	<i>Agropyron spicatum</i>	a150	b223	c269	65	80	88	8.68
G	<i>Bromus brizaeformis</i> (a)	-	-	177	-	-	66	1.52
G	<i>Bromus inermis</i>	-	-	3	-	-	1	.03
G	<i>Bromus japonicus</i> (a)	-	-	40	-	-	16	.35
G	<i>Bromus tectorum</i> (a)	-	-	291	-	-	87	4.97
G	<i>Poa secunda</i>	a8	b104	a26	4	50	12	.08
G	<i>Sitanion hystrix</i>	-	2	-	-	1	-	-
Total for Grasses		158	332	825	69	132	278	15.70
F	<i>Agoseris glauca</i>	1	-	-	1	-	-	-
F	<i>Alyssum alyssoides</i> (a)	-	-	236	-	-	75	3.54
F	<i>Artemisia ludoviciana</i>	a17	a-	a-	8	-	-	-
F	<i>Astragalus</i> spp.	-	-	4	-	-	2	.01
F	<i>Balsamorhiza sagittata</i>	a-	b14	c28	-	7	12	3.05
F	<i>Calochortus nuttallii</i>	a1	b41	a2	1	21	2	.01
F	<i>Castilleja</i> spp.	-	-	2	-	-	1	.00
F	<i>Cirsium</i> spp.	a-	a-	b11	-	-	5	.10
F	<i>Collomia grandiflora</i> (a)	6	-	-	4	-	-	-
F	<i>Comandra pallida</i>	a-	ab7	b13	-	3	6	.10
F	<i>Crepis acuminata</i>	b52	a-	a-	21	-	-	-

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Erodium cicutarium</i> (a)	-	-	31	-	-	18	.38
F	<i>Eriogonum racemosum</i>	-	1	1	-	1	1	.03
F	<i>Hedysarum boreale</i>	5	-	-	2	-	-	-
F	<i>Lactuca serriola</i>	-	8	6	-	3	2	.03
F	<i>Linum lewisii</i>	-	-	1	-	-	1	.00
F	<i>Lithophragma</i>	-	-	-	-	-	-	.03
F	<i>Lomatium</i> spp.	-	5	-	-	3	-	-
F	<i>Lupinus</i> spp.	-	1	-	-	1	-	-
F	<i>Penstemon</i> spp.	a-	b14	a-	-	7	-	-
F	<i>Phlox longifolia</i>	b38	c113	a9	19	49	6	.03
F	<i>Polygonum douglasii</i> (a)	-	-	1	-	-	1	.00
F	<i>Senecio integerrimus</i>	1	-	-	1	-	-	-
F	<i>Tragopogon dubius</i>	a23	a14	b218	12	10	85	4.29
F	<i>Vicia americana</i>	a-	b74	a3	-	32	1	.00
F	<i>Zigadenus paniculatus</i>	a-	b30	b26	-	17	18	.22
Total for Forbs		144	322	604	69	154	240	12.01

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 29

T y p e	Species	Strip Frequency '97	Average Cover % '97
B	<i>Artemisia tridentata</i> <i>vaseyana</i>	23	.96
B	<i>Gutierrezia sarothrae</i>	12	.06
B	<i>Quercus gambelii</i>	4	1.06
Total for Browse		39	2.08

BASIC COVER --

Herd unit 17 , Study no: 29

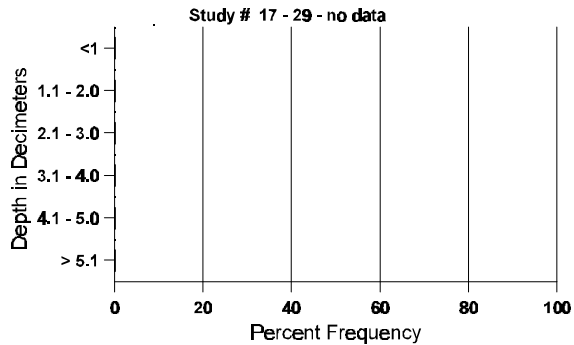
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	381	.25	6.00	39.70
Rock	217	18.50	13.50	6.95
Pavement	265	3.75	21.75	15.26
Litter	391	65.75	56.50	40.40
Cryptogams	9	0	0	.02
Bare Ground	110	11.75	2.25	2.84

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 29

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
15.0	52.0 (17.0)	7.1	42.4	29.1	28.6	2.7	9.3	220.8	1.2

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 29

Type	Quadrat Frequency '97
Rabbit	3
Deer	9

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 29

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total							
		1	2	3	4		1	2								
<i>Artemisia tridentata vaseyana</i>																
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1
Y	83	4	-	-	-	-	-	-	-	4	-	-	-	266		4
	89	-	2	-	-	-	-	-	-	2	-	-	-	133		2
	97	8	-	-	-	-	-	-	-	8	-	-	-	160		8
M	83	2	7	-	-	-	-	-	-	9	-	-	-	600	30 34	9
	89	-	1	-	-	-	-	-	-	1	-	-	-	66	12 9	1
	97	8	8	-	-	-	-	-	-	16	-	-	-	320	19 35	16
D	83	-	-	1	-	-	-	-	-	1	-	-	-	66		1
	89	-	4	16	-	-	-	-	-	7	-	4	9	1333		20
	97	1	1	-	-	-	-	-	-	-	-	-	2	120		6
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	2	-	-	-	-	-	-	-	2	-	-	-	980		49
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'83		50%		07%		00%		+39%								
'89		30%		70%		57%		-61%								
'97		30%		00%		07%										
Total Plants/Acre (excluding Dead & Seedlings)										'83	932	Dec:	7%			
										'89	1532		87%			
										'97	600		20%			
<i>Cowania mexicana stansburiana</i>																
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	1	-	-	-	-	-	-	1	-	-	-	66		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	89	-	-	-	-	1	-	-	-	1	-	-	-	66	106 75	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>								
'83		00%		00%		00%		Appeared								
'89		100%		00%		00%		Died out								
'97		00%		00%		00%										
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-			
										'89	132		-			
										'97	0		-			

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Gutierrezia sarothrae</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	97	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	24	-	-	-	-	-	-	-	-	24	-	-	-	1600	14	11	24
	97	32	-	-	-	-	-	-	-	-	32	-	-	-	640	11	14	32
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	-	-	-	1	66			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Appeared							
'89		00%			00%			04%			-61%							
'97		00%			00%			06%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	1732		4%			
												'97	680		0%			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	59	-	-	-	-	-	-	-	-	59	-	-	-	3933		59	
	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	181	80	-	-	-	-	-	-	-	261	-	-	-	17400		261	
	89	2	2	1	4	-	-	-	-	-	4	5	-	-	600		9	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	83	-	11	-	-	-	-	-	-	-	11	-	-	-	733	56 26	11	
	89	-	-	-	-	-	-	2	-	-	2	-	-	-	133	110 63	2	
	97	8	-	-	-	-	-	-	-	-	8	-	-	-	160	109 113	8	
D	83	-	7	-	-	-	-	-	-	-	7	-	-	-	466		7	
	89	-	2	2	-	-	-	-	-	-	1	3	-	-	266		4	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>				
'83		35%			00%			00%						-95%				
'89		27%			20%			00%						-80%				
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	18599	Dec:	3%				
											'89	999		27%				
											'97	200		0%				

Trend Study 17-30-97

Study site name: Spring Canyon .

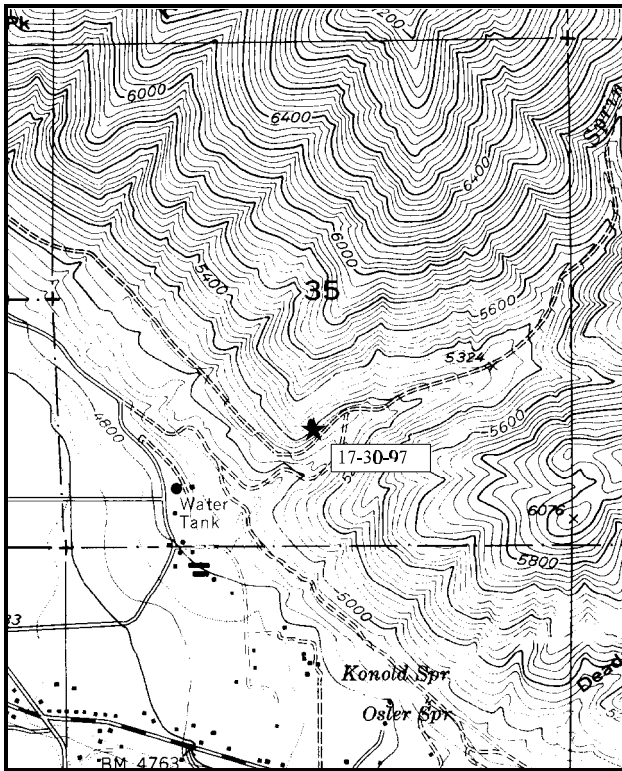
Range type: Stansbury cliffrose

Compass bearing: frequency baseline 348 M degrees. (Line 2-3 311°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft).

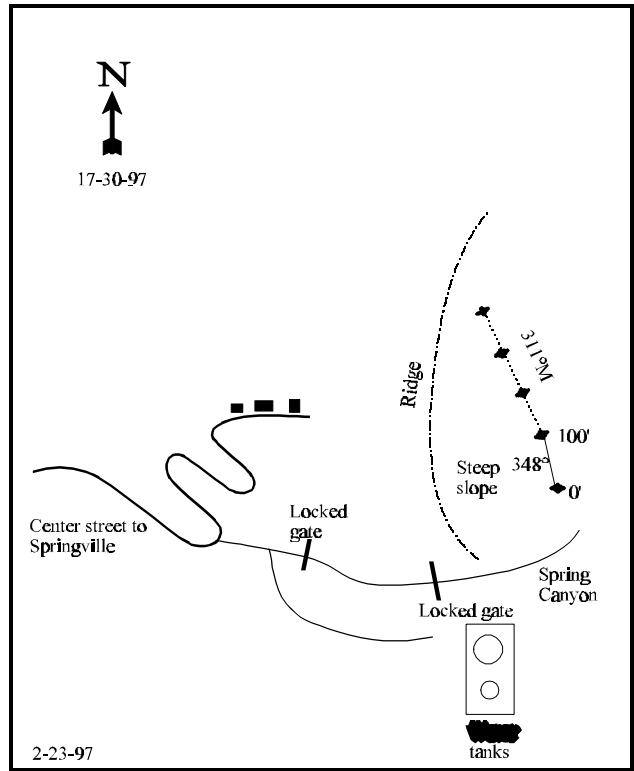
LOCATION DESCRIPTION

Follow Center Street in Springville easterly toward the mountain. From the first switchback where the main road goes up to houses on the bench north of Spring Canyon, continue towards the canyon mouth to the first gate. Continued development may alter the approach to the canyon. In 1989, you could walk 1/2 mile from the first locked gate to another gate up in the canyon. From this gate, continue 119 paces east up Spring Canyon. Uphill to the northwest (azimuth 271 degrees) there is a conspicuous group of rock outcroppings. Walk up the side hill to the uppermost rock near the top of the ridge. The 0-foot baseline stake, marked with a red browse tag, is north of the rock.



Map Name: Springville .

Township 7S , Range 3E , Section 35



Diagrammatic Sketch

UTM 445798.978 N,451530.768 E

DISCUSSION

Trend Study No. 17-30 (27-4)

The Spring Canyon study typifies severe winter range on much of herd unit 17, especially that portion located north of Hobble Creek Canyon. This is an area of critical importance but also one which is seriously depleted. Located at an elevation of 5,300 feet on a steep (60%-65%) south-southeast facing slope near the mouth of Spring Canyon, the study samples a sparse Stansbury cliffrose community. During the winter, the area is intensively used by deer and increasingly so by elk.

Soil condition is poor. The soil is exceptionally loose and easily moved down the steep slope and very rocky. Moisture holding capacity would be very low. Soil textural analysis indicates a sandy loam with a neutral pH (7.0). Both phosphorous and potassium may be limiting to plant development with readings respectively of 5.9 ppm (minimum is 10 ppm) and 57.6 ppm (minimum is 70 ppm). Effective rooting depth (see methods) is almost 11 inches with an average temperature of 55.8°F about 12 inches. Surface rock is variable in size and appear metamorphic in origin. No soil profile or horizon development is detectable. Erosion is unavoidable but little is occurring due to the nearly complete cover of rock and vegetation. Most perennial plants are pedestaled.

What little browse cover there is on the site, Stansbury cliffrose is the key by providing the bulk of the browse cover (47%). A short distance up the canyon, there are a few patches of Gambel oak, netleaf hackberry, and Rocky Mountain smooth sumac. Cliffrose comprises a scattered population of mostly mature plants. Currently, the density is estimated to be 180 plants/acre. This is slightly lower than the 1989 estimate of 365 plants/acre. However, a greatly enlarged sample size was used in 1997 to more accurately reflect the true density. Some reproduction is apparent with 80 seedlings/acre encountered in 1997. The cliffrose average about 6 feet in height with a few individuals in excess of 10 feet. Utilization or hedging of the available portions is heavy, but vigor and leader growth remain adequate. Broom snakeweed density is estimated to be 2,760 plants/acre. This population appears to be expanding at this time with many seedling and young plants encountered.

As reported in 1983, the perennial grass composition is depleted. Bulbous bluegrass nested frequency has increased every year since 1983. Seventy percent of the herbaceous understory cover is contributed by bulbous bluegrass. This plant has a growth form similar to annual grasses. Growth is completed and curing takes place very early in the growing season. Only minimal forage or soil protection is afforded by bulbous bluegrass. Bluebunch wheatgrass is the most desirable grass on the site. Nested frequency has increased since 1989 to numbers similar to 1983. Cheatgrass was encountered in nearly every quadrat although cover values are not excessive for this plant for this site.

Forb composition is only slightly more diverse than that of grasses. The most abundant species is shortstem wild buckwheat. This plant still exhibits pedestaling with no apparent utilization. Other forbs include Louisiana sagebrush, wavyleaf thistle, and yellow salsify. As in 1983, the most abundant forb is pale allysum, an annual that dries early in the growing season.

1983 APPARENT TREND ASSESSMENT

Range condition is poor and continues to decline. The soil, already seriously depleted, suffers from a lack of effective ground cover and is unlikely to stabilize without some form of direct intervention (i.e., terracing, reseeded etc.). Vegetative trend is also declining. Although the key browse species, Stansbury cliffrose, is long-lived, the lack of reproduction coupled with heavy utilization will eventually result in its demise. When this species is gone, not much with any real value will remain. The site is currently dominated by annual forbs and grasses, a few low value perennials, and a remnant population of cliffrose. Drastic remedial action is needed, but not very practical.

1989 TREND ASSESSMENT

In the five years since the study was established, there have been no changes in condition on this critical winter range. The data between years is virtually identical. Forage for big game is still limited, and the rehabilitation potential is very low due to the shallow, rocky and dry soil on the very steep 65% slope. The ground cover measurements indicate an increase in rock and pavement cover to 69%. Soil and rock movement is continuous. The trend is stable on a poor condition range.

1997 TREND ASSESSMENT

The soil trend is stable, although poor. Erosion will always occur on this slope due to the steepness. Vegetative cover will slow erosion and there is currently little bare soil. Rock and pavement cover is high, although they may increase erosion potential. Browse trend is stable with Stansbury cliffrose being the key species. Plants are heavily hedged but still exhibit good vigor. Percent decadency has increased, but more seedlings were encountered in 1997. Broom snakeweed could be increasing on the site. Although this species can fluctuate highly between years, it should still be monitored for further increase. The herbaceous trend is stable as well. Species composition is nearly identical to past estimates.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - stable

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 30

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	_b 157	_a 97	_b 162	64	45	68	3.85
G	Bromus tectorum (a)	-	-	288	-	-	97	3.47
G	Poa bulbosa	_a 294	_a 320	_b 348	96	98	98	24.68
G	Poa secunda	-	-	6	-	-	3	.18
Total for Grasses		451	417	804	160	143	266	32.20
F	Alyssum alyssoides (a)	-	-	53	-	-	24	.14
F	Artemisia ludoviciana	-	5	-	-	2	-	-
F	Artemisia ludoviciana	39	23	27	17	9	13	.28
F	Astragalus utahensis	-	-	6	-	-	3	.06
F	Cirsium undulatum	8	15	16	3	9	8	.59
F	Eriogonum brevicaule	_b 89	_{ab} 64	_a 52	36	32	24	1.88
F	Erodium cicutarium (a)	-	-	4	-	-	2	.01
F	Heterotheca villosa	-	-	2	-	-	1	.03
F	Lomatium spp.	-	-	2	-	-	1	.00

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Machaeranthera canescens</i>	-	1	3	-	1	2	.04
F	<i>Penstemon</i> spp.	-	-	3	-	-	2	.03
F	<i>Tragopogon dubius</i>	1	-	1	1	-	1	.03
Total for Forbs		137	108	169	57	53	81	3.12

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 30

Type	Species	Strip Frequency '97	Average Cover % '97
B	<i>Celtis reticulata</i>	0	.03
B	<i>Chrysothamnus nauseosus albicaulis</i>	1	.00
B	<i>Cowania mexicana stansburiana</i>	9	2.66
B	<i>Gutierrezia sarothrae</i>	48	1.89
B	<i>Quercus gambelii</i>	1	1.03
Total for Browse		59	5.63

BASIC COVER --

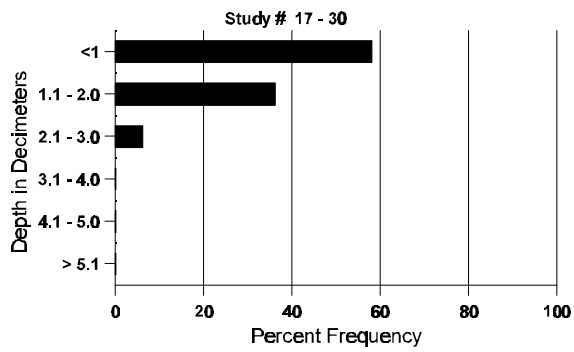
Herd unit 17 , Study no: 30

Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	369	4.50	8.25	39.04
Rock	311	14.00	12.50	13.13
Pavement	362	45.00	56.25	28.82
Litter	386	31.00	14.25	17.02
Cryptogams	83	.75	0	.43
Bare Ground	238	4.75	8.75	10.95

SOIL ANALYSIS DATA --
 Herd Unit 17, Study no: 30

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
10.6	55.8 (12.6)	7.0	61.8	22.4	15.8	2.0	5.87	57.6	.6

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 17 , Study no: 30

Type	Quadrat Frequency '97
Elk	22
Deer	38

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 30

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Celtis reticulata</i>																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	1	-	-	-	-	-	-	-	-	1	-	-	33	46	67	1
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	104	0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Appeared							
'89		100%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	33		-			
												'97	0		-			
<i>Chrysothamnus nauseosus albicaulis</i>																		
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	-	-	-	-	1	-	-	-	1	-	-	-	20	17	41	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	20		-			

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Cowania mexicana stansburiana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	83	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	89	-	-	2	-	-	-	-	-	-	2	-	-	-	66			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	83	-	2	3	-	-	2	-	-	-	2	-	5	-	233	52	81	7
	89	-	2	6	-	-	-	-	-	-	8	-	-	-	266	55	64	8
	97	-	-	3	-	-	4	-	-	-	7	-	-	-	140	76	83	7
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	97	-	-	1	-	-	1	-	-	-	2	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		38%			63%			63%			+27%							
'89		18%			82%			00%			-51%							
'97		00%			100%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	266	Dec:	0%			
												'89	365		9%			
												'97	180		22%			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
Gutierrezia sarothrae											
S	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	15	-	-	-	-	-	-	15	-	15
Y	83	16	-	-	-	-	-	-	533		16
	89	3	-	-	-	-	-	-	100		3
	97	40	-	-	-	-	-	-	800		40
M	83	11	-	-	-	-	-	-	366	11 14	11
	89	19	-	-	-	-	-	-	633	6 5	19
	97	98	-	-	-	-	-	-	1960	8 11	98
D	83	-	-	-	-	-	-	-	0		0
	89	4	-	-	-	-	-	-	133		4
	97	-	-	-	-	-	-	-	0		0
X	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>			<u>%Change</u>				
'83		00%	00%	00%			- 4%				
'89		00%	00%	15%			+69%				
'97		00%	00%	00%							
Total Plants/Acre (excluding Dead & Seedlings)				'83	899	Dec:	0%				
				'89	866		15%				
				'97	2760		0%				
Quercus gambelii											
M	83	-	-	-	-	-	-	-	0	- -	0
	89	-	-	-	-	-	-	-	0	- -	0
	97	-	-	-	1	-	-	-	1	94 114	1
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>			<u>%Change</u>				
'83		00%	00%	00%			None				
'89		00%	00%	00%			Appeared				
'97		00%	00%	00%							
Total Plants/Acre (excluding Dead & Seedlings)				'83	0	Dec:	-				
				'89	0		-				
				'97	20		-				

Trend Study 17-31-97

Study site name: Round Mountain .

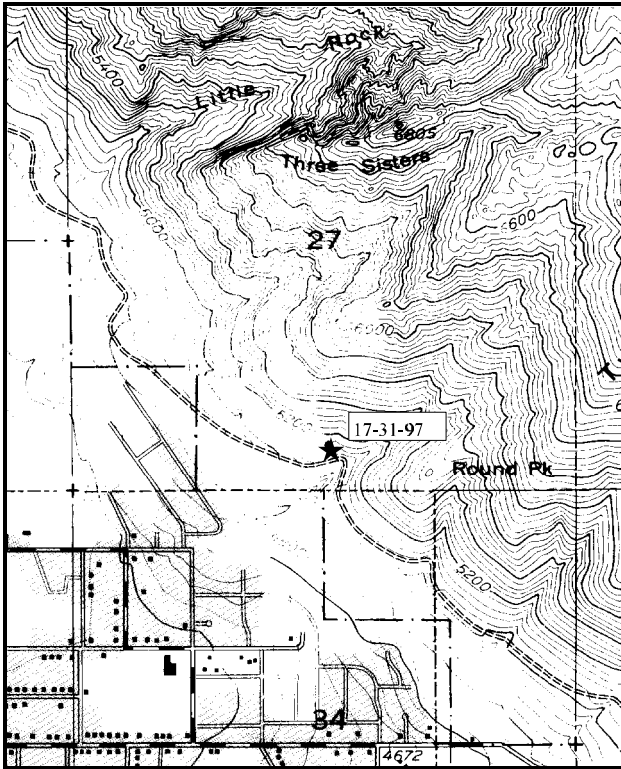
Range Type: Gambel oakbrush

Compass bearing: frequency baseline 342 degrees. (Line 2-3 40°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59 & 71ft).

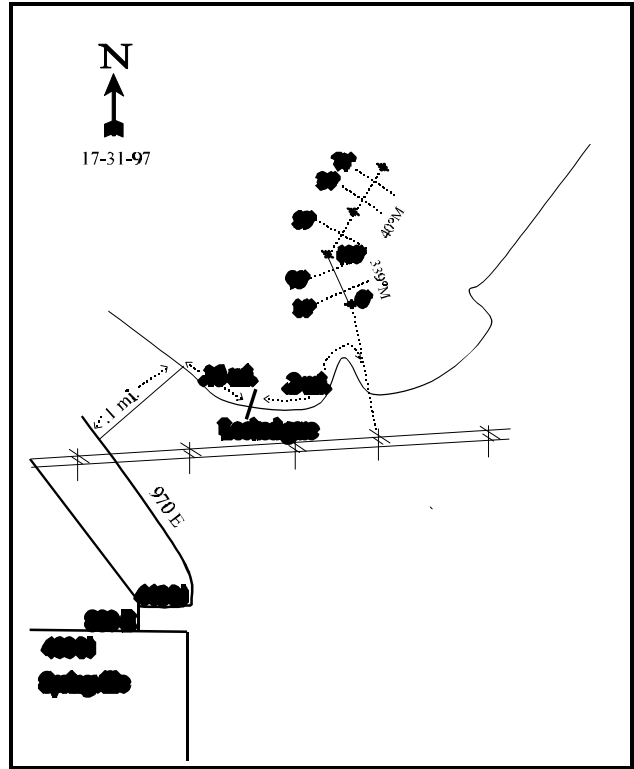
LOCATION DESCRIPTION

From the town of Springville, take 440 North and 970 East to an intersection at the end of the paved road. Turn right and proceed 0.1 miles to an intersection. Turn right and go southeast along the foothills for 0.15 miles to a locked gate. Walk 0.2 miles along the road and stop even with 2 power poles which are 50 yards south of the road. From the power poles, the 0-foot baseline stake is 95 paces north (339 degrees).



Map Name: Springville .

Township 75 , Range 3E , Section 27



Diagrammatic Sketch

UTM 4447189.120 N , 449810.913 E

DISCUSSION

Trend Study No. 17-31 (27-5)

The Round Mountain study samples a severe winter range site located on national forest land just east of the state fish hatchery in Springville. Like study number 17-30 (Spring Canyon), this site is typical of the depleted foothills north of Hobble Creek. The study is on a moderately steep (40%-45%), south-southwest facing slope at an elevation of 5,200 feet. Vegetative composition consists of grasses, annual forbs and isolated patches of Gambel oak, Rocky Mountain smooth sumac, and netleaf hackberry. In the summer of 1989, several fawn carcasses were found, most likely winter-killed in the deep snows of 1988-89. Pellet group quadrat frequency in 1997 showed that elk and deer both have fairly high frequencies, 22% and 19% respectively.

Soils are rocky and highly eroded. Parent material appears to be limestone and there are large rock outcrops in the surrounding area. Protective cover is abundant and well dispersed due to bulbous bluegrass and bluebunch wheatgrass. Rock and erosion pavement account for 35% of the ground cover. Erosion and soil compaction are especially evident on the many deer trails interconnecting the area.

The dominant browse is Rocky Mountain smooth sumac as it provides 39% of the browse cover. Smooth sumac is an invader and/or increaser on disturbed or depleted sites, such as this one. Deer use of this species is moderate to heavy. The estimated population density in 1997 is 1,100 stems/acre. The most numerous browse plant is broom snakeweed, an undesirable subshrub that is a known invader and increaser. This plant numbers 3,280 plants/acre with numerous seedlings and young plants encountered. Utilization is almost nonexistent and age structure indicates a rapidly expanding population. Other shrubs include netleaf hackberry, skunkbush sumac, and Gambel oak.

Grass cover and density are higher on this site than on study number 17-30 (Spring Canyon). Bluebunch wheatgrass is quite abundant with a slight upward change in nested frequency over all years. Other perennial grasses are limited to bulbous bluegrass, which more closely resembles an annual growth habit. Annual grasses are present and are represented by several species including, cheatgrass, rattlesnake brome, and Japanese brome. The wild oat and Sandberg bluegrass encountered in 1989 were not encountered in 1997.

Forb composition consists of three relatively common perennials and a number of annual weeds. Among the perennial forbs are: Louisiana sagebrush, peavine (*Lathyrus brachycalyx*), and yellow salsify are most conspicuous. Annual forbs constitute the most abundant group on the site. Species such as storksbill, common ragweed, catchweed bedstraw, pale allysum, silene, and biennial thistle (*Cirsium undulatum*) are all common and generally regarded as indicators of poor range condition.

1983 APPARENT TREND ASSESSMENT

Apparent trend for both soil and vegetation is declining. The combination of steep slope, poor quality vegetative cover and intense deer use will continue to result in excessive rates of erosion and soil loss. Vegetative composition, with the exception of bearded bluebunch wheatgrass, consists largely of undesirable species typical of disturbed sites. Virtually all shrub species of at least moderate palatability are heavily hedged. In addition, deer pellet groups are very abundant and four carcasses of winter killed deer from 1982-83 were observed in the immediate area.

1989 TREND ASSESSMENT

The soil is rocky and erodible, but stabilized except on the trails. Ground cover percentages are unchanged. Change on this critical winter range site is limited to an increase in sumac. The sumac shows an increase in both frequency and density. Vigor is generally good with apparently less heavy use than in 1983. Although considered an increaser, the sumac is not undesirable as it provides the bulk of the winter forage on this site.

1997 TREND ASSESSMENT

The soil trend is stable but poor. Erosion appears to be minimal due to the abundant vegetative and litter cover. Browse trend is slightly downward. Broom snakeweed density has nearly tripled since 1989. Vigor is still good for the forage species with increased utilization reported. Herbaceous understory trend is stable. Very little change has occurred in the herbaceous understory over the years. Many annual forbs are present and a better composition is desirable.

TREND ASSESSMENT

soil - stable

browse - slightly downward

herbaceous understory - stable

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 31

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	214	223	247	83	84	88	11.68
G	Avena fatua (a)	-	119	-	-	49	-	-
G	Bromus brizaeformis (a)	-	1	23	-	1	9	.12
G	Bromus japonicus (a)	-	-	21	-	-	8	.09
G	Bromus tectorum (a)	-	-	121	-	-	44	.59
G	Poa bulbosa	a-	b66	c257	-	35	75	12.75
G	Poa secunda	a-	b295	a-	-	90	-	-
Total for Grasses		214	704	669	83	259	224	25.23
F	Alyssum alyssoides (a)	-	-	132	-	-	51	.35
F	Allium spp.	-	-	4	-	-	1	.00
F	Ambrosia psilostachya	a-	a-	b126	-	-	56	2.98
F	Artemisia ludoviciana	b54	ab36	a20	21	19	11	.15
F	Astragalus beckwithii	-	-	2	-	-	1	.15
F	Aster spp.	-	-	3	-	-	1	.38
F	Cirsium undulatum	a1	ab11	b28	1	6	13	.58
F	Cryptantha nana	1	-	-	1	-	-	-
F	Cruciferae	-	10	-	-	6	-	-

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Cymopterus spp.	a-	a-	b17	-	-	7	.49
F	Epilobium paniculatum (a)	-	-	5	-	-	3	.01
F	Erodium cicutarium (a)	-	-	13	-	-	4	.05
F	Erigeron divergens	1	-	-	1	-	-	.00
F	Galium aparine (a)	-	-	37	-	-	16	.18
F	Helianthus annuus (a)	a-	b19	a3	-	9	2	.01
F	Holosteum umbellatum (a)	-	-	32	-	-	14	.07
F	Lathyrus brachycalyx	54	62	57	19	26	21	3.20
F	Lappula occidentalis (a)	-	-	1	-	-	1	.00
F	Lithospermum incisum	a18	b105	a8	6	48	4	.22
F	Lithospermum ruderales	a5	b16	a10	2	8	3	.01
F	Macheranthera commixta	3	-	-	1	-	-	-
F	Phlox longifolia	4	5	11	1	4	5	.02
F	Tragopogon dubius	b29	a-	a5	14	-	2	.04
Total for Forbs		170	264	514	67	126	216	8.94

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 31

Type	Species	Strip Frequency '97	Average Cover % '97
B	Celtis reticulata	3	1.88
B	Gutierrezia sarothrae	31	1.57
B	Rhus glabra cismontana	35	2.25
Total for Browse		69	5.71

BASIC COVER --

Herd unit 17 , Study no: 31

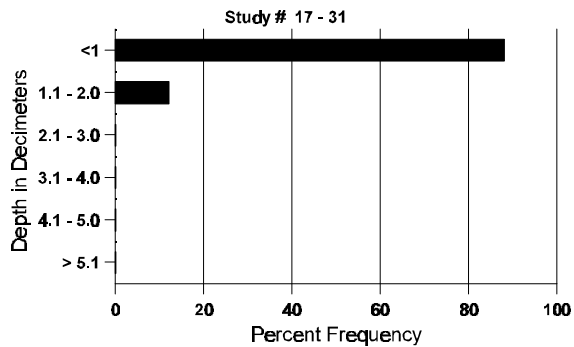
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	343	.75	9.00	39.23
Rock	316	30.25	26.50	22.02
Pavement	269	22.00	24.50	12.78
Litter	385	44.00	37.50	29.04
Cryptogams	51	.50	0	.37
Bare Ground	146	2.50	2.50	3.45

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 31

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.1	53.8 (17.7)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 31

Type	Quadrat Frequency '97
Rabbit	3
Elk	22
Deer	19

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 31

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Celtis reticulata</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	1	-	-	6	-	-	7	-	-	-	140		7	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	-	-	-	1	-	33		1	
	97	1	-	-	-	-	-	-	-	-	-	1	-	-	20		1	
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	39 26	1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	80 225	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		00%			00%			100%			+45%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	-			
												'89	33		-			
												'97	60		-			
<i>Gutierrezia sarothrae</i>																		
S	83	11	-	-	-	-	-	-	-	-	11	-	-	-	366		11	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	44	-	-	-	-	-	-	-	-	44	-	-	-	880		44	
Y	83	30	-	-	-	-	-	-	-	-	30	-	-	-	1000		30	
	89	5	-	-	-	-	-	-	-	-	5	-	-	-	166		5	
	97	67	-	-	-	-	-	-	-	-	54	-	13	-	1340		67	
M	83	24	-	-	-	-	-	-	-	-	24	-	-	-	800	7 4	24	
	89	22	-	-	-	-	-	-	-	-	17	1	4	-	733	8 10	22	
	97	97	-	-	-	-	-	-	-	-	97	-	-	-	1940	9 15	97	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	4	-	-	-	-	-	-	-	-	1	1	2	-	133		4	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-43%							
'89		00%			00%			19%			+69%							
'97		00%			00%			08%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1800	Dec:	0%			
												'89	1032		13%			
												'97	3280		0%			

AGE	Y	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.	
<i>Rhus glabra cismontana</i>																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	1	1	1	-	-	-	-	-	-	3	-	-	-	100		3	
	89	6	7	2	-	-	-	-	-	-	12	3	-	-	500		15	
	97	4	2	2	-	-	-	-	-	-	8	-	-	-	160		8	
M	83	-	7	33	-	-	-	-	-	-	40	-	-	-	1333	50 34	40	
	89	19	23	8	-	-	-	-	-	-	38	12	-	-	1666	66 41	50	
	97	1	24	8	-	-	-	-	1	-	34	-	-	-	680	49 37	34	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	2	1	1	-	-	-	-	-	-	4	-	-	-	133		4	
	97	-	7	4	-	-	2	-	-	-	11	-	-	2	260		13	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	200		10	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		19%			79%			00%			+38%							
'89		45%			16%			00%			-52%							
'97		60%			29%			04%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1433	Dec:	0%				
											'89	2299		6%				
											'97	1100		24%				

DISCUSSION

Trend Study No. 17-32 (27-6)

This site has not been sampled since the initial survey of 1983

The Right Fork-Hobble Creek study is located near the upper limit of normal winter range in the Right Fork of Hobble Creek Canyon. Elevation is approximately 5,640 feet. Slope faces to the south-southeast and is moderately steep. However, the study site itself is on a small bench where the slope is more gentle, perhaps only 10 to 15 percent. The range type is a multi-tiered stand of Gambel oakbrush with individual plants varying from about 1 foot to 15 feet in height. Interspersed within the dominant oak overstory are a few bigtooth maple and Rocky Mountain juniper trees.

Soil is rocky, well-drained and coarse in texture. Depth is somewhat shallower than average for oak communities. Road-cuts in the immediate vicinity reveal an undifferentiated soil profile. The soil resembles a loose conglomerate of variable-sized rocks extending to great depth. Soil parent material is primarily sandstone. Ground cover is generally good with abundant litter and overhead vegetative cover. On the steeper areas there is moderate erosion in the shrub interspaces where bare ground is more prevalent.

The key browse species is Gambel oak. With the exception of Oregon hollygrape, all other shrub species occur infrequently. As previously mentioned, oak comprises a mixed age population. Young plants or sprouts account for 75 percent of measured density with the remainder in the mature category. Vigor is generally high and the level of utilization is light to moderate. Some utilization comes from summer use. Judging from age structure, it appears likely that Gambel oak will become even more dominant in the future. Other valuable shrubs such as antelope bitterbrush and mountain big sagebrush are probably declining in density. Competition with oak and heavy use are the most likely causative factors.

Understory grasses are only moderately abundant and consist predominantly of two species, Kentucky bluegrass and blue wildrye. Both are rather shade tolerant grasses that do best under a canopy. Other perennial grasses include mountain brome, orchard grass, and bluebunch wheatgrass. Except for the latter, these are also shade tolerant. As canopy cover of oak thickens, we can probably expect overall grass density to decrease slightly. Bluebunch wheatgrass, a more sun-loving species, will likely experience the greatest decrease. Annual grasses such as cheatgrass brome and rattlesnake brome are present in small amounts and are unlikely to increase. Grazing use of grasses is nonexistent to light. Although cattle are scattered throughout the Right Fork drainage, they primarily utilize the canyon bottom.

Forbs are less diverse and less abundant than on many other comparable oak types in Utah. The most abundant species tend to be forbs of poor to marginal forage value. Mountain dandelion, Sierra onion, peavine, lambstongue groundsel, milkweed, common houndstongue and dogbane are all examples of this type of forb. More succulent and desirable forbs occur infrequently. The apparent trend for forb composition and density may also be declining. The influence of a thickening oak overstory is very strong.

1983 APPARENT TREND ASSESSMENT

Soil trend is essentially stable even though the soil is potentially erodible. Vegetation and litter cover, resulting primarily from oak and oak leaves, currently provides adequate soil protection. Vegetatively, trend is toward an increasingly dominant population of Gambel oak with a concurrent decline in vigor of the herbaceous understory. Considering the nature of the site and the apparent season long use which it sustains, this trend is probably unfavorable.

Trend Study 17-33-97

Study site name: Maple Canyon

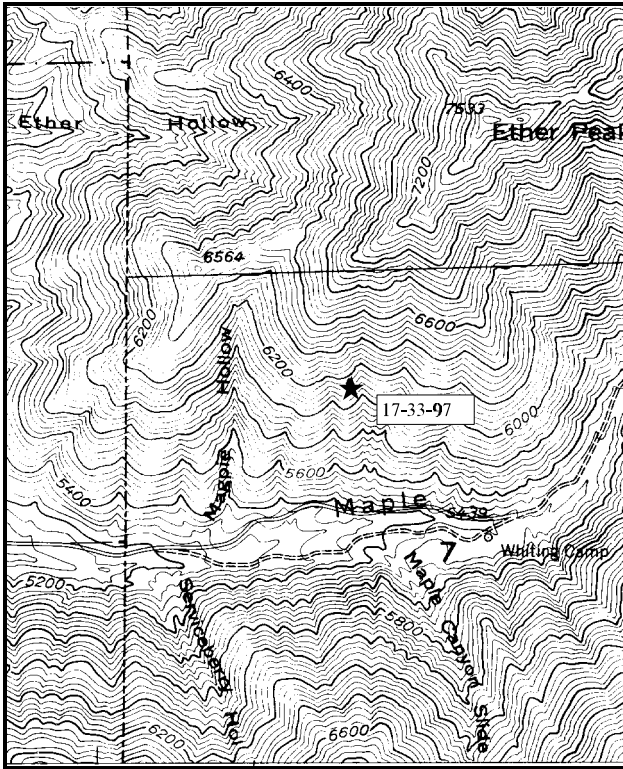
Range type: Gambel Oakbrush

Compass bearing: frequency baseline 345 degrees. (Line 2 246°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11,34 & 71ft), line 2 (59 & 95ft).

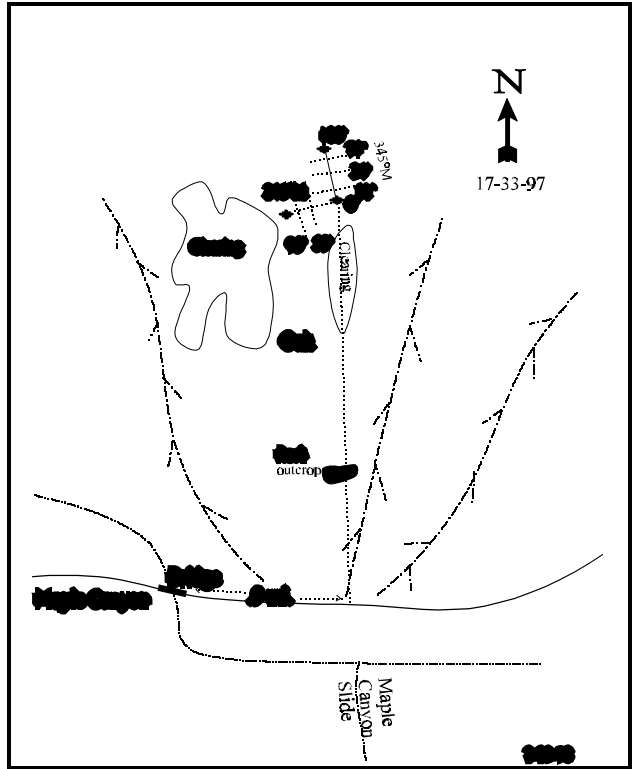
LOCATION DESCRIPTION

From Mapleton, proceed east up Maple Canyon to the first bridge across Maple Creek. From the bridge, proceed an additional 0.80 miles and stop just north of the Maple Canyon Slide. From this point, to the north and upslope is a long clearing within the oakbrush type which runs upslope. From the upper (i.e., northern) edge of the clearing, the O-foot baseline stake is located just inside the edge of the oakbrush. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3919, is attached to the O-foot baseline stake.



Map Name: Springville, Utah

Township 8 S, Range 4 E, Section 7



Diagrammatic Sketch

UTM 4442887.046 N, 454606.221 E

DISCUSSION

Trend Study No. 17-33 (27-7)

The Maple Canyon study samples winter range in Maple Canyon. Downslope and down-canyon from the study site, the spur ridges extending to Maple Creek are relatively barren, eroded, and occupied mainly by annual grasses, annual forbs, and low value perennials. Browse occurs only as remnants, primarily in the draws. The study site is located approximately 800 vertical feet above the canyon bottom at an elevation of 6,400 feet. Exposure is southerly on a moderately steep (60-65%) slope. The range type is mixed mountain brush. When the site was reread in 1997, the location was considered poor for sampling critical winter range due to lack of preferred browse. Further east or down slope are areas with higher densities of Stansbury cliffrose and mahogany that would more accurately reflect range condition and trend with respect to wildlife.

Soil texture is characterized by an abundance of variable-sized sandstone or shale rock. Analysis indicates a loam soil with a neutral pH (6.7). The soil is moderately shallow and loose with abundant rock on the surface. Many of the depleted slopes and ridges below the study site have essentially no remaining surface soil. In these areas, near talus conditions often prevail. However, the site has more vegetative and litter cover with soil condition being measurably better but still substandard. There is little bare soil currently present with vegetative and litter cover adequate to slow erosion.

The principal browse species includes an abundance of low-growing (average height 30 inches) Gambel oak, smaller amounts of true mountain mahogany, and infrequent individuals of Saskatoon serviceberry, mountain big sagebrush, and broom snakeweed. With the increased sample size used in 1997, the estimated density of Gambel oak is 7,040 stems/acre. In 1983, considerable temporary defoliation from grasshoppers and a large caterpillar was noted. Current vigor is good. Estimated density of true mountain mahogany is 100 plants/acre. These plants exhibit heavy hedging, yet good vigor. Broom snakeweed was sampled for the first time on this site in 1997. This is due mostly to the increased sample size. Estimated density is 360 plants/acre, most of which were classified as mature.

Grasses are dominated by cheatgrass. It is found in nearly every quadrat (99%) and contributes to 63% of the total herbaceous understory cover. Additional annual grasses include rattlesnake brome and Japanese brome. Other infrequent grasses include bulbous bluegrass, muttongrass, Sandberg bluegrass, and Kentucky bluegrass. In 1983, intermediate wheatgrass and western wheatgrass were identified, but have not been sampled since.

Forb diversity is higher than reported in the past, although most of the species are infrequent. The most valuable and preferred species are arrowleaf balsamroot, and yellow salsify.

1983 APPARENT TREND ASSESSMENT

Soil trend is slowly declining, especially at the lower edge of the type. Although vegetative cover is fair, the amount of exposed rock and bare soil suggests that smaller soil particles are actively moving downslope. Vegetative condition is fair and trend is stable to declining. Gambel oak is increasing in density while other desirable browse species are declining. Understory forbs and grasses are limited by dry soil conditions. There is an overabundance of annual vegetation which suggests an unacceptably high level of soil disturbance. Deer utilization of the area is intense and occurs primarily in winter with some evidence of spring-fall use.

1989 TREND ASSESSMENT

The very steep slope on this sidehill encourages continued soil and rock movement. As noted in 1983,

conditions are near talus. Ground cover calculations indicate an increase in rock and pavement cover from 28% to 38%. Comparisons of the frequency data indicate no significant species or composition changes. Perennial grass density was already low and shows a 54% decline on the density plots. However, conclusions from this and also the apparent reduction in forbs must be tempered by consideration of the later study date and drought in 1989.

1997 TREND ASSESSMENT

Soil trend is stable. Vegetation and litter provide adequate cover to protect from significant erosion. Very little bare soil is present at this time. Browse has stayed relatively the same over all years. The changes in density for species is more due to the increased sample size rather than any changes in the community. Utilization of Gambel oak continues to be light to moderate with heavy utilization of true mountain mahogany. The browse trend at this time is stable. Herbaceous understory trend is stable although more preferable species are desired.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - stable, but composition has too high a proportion of annual weeds

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 33

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron intermedium	6	-	-	3	-	-	-
G	Agropyron smithii	b ₁₇	a ⁻	a ⁻	6	-	-	-
G	Agropyron spicatum	a ₈₆	b ₁₀₅	a ₃₇	36	41	14	.80
G	Bromus brizaeformis (a)	-	-	25	-	-	10	1.02
G	Bromus japonicus (a)	-	-	1	-	-	1	.00
G	Bromus tectorum (a)	-	-	335	-	-	99	23.73
G	Poa bulbosa	a ⁻	a ⁻	b ₉	-	-	6	.48
G	Poa fendleriana	c ₉₂	b ₄₆	a ₁₄	41	22	5	.72
G	Poa pratensis	-	-	5	-	-	2	.03
G	Poa secunda	a ⁻	a ₂	b ₁₉	-	1	8	.66
Total for Grasses		201	153	445	86	64	145	27.47
F	Agoseris glauca	b ₂₂	a ⁻	a ⁻	10	-	-	-
F	Alyssum alyssoides (a)	-	-	47	-	-	20	.71
F	Allium spp.	13	6	2	6	4	2	.01
F	Artemisia ludoviciana	4	15	5	2	6	2	.18
F	Astragalus spp.	2	-	-	1	-	-	-
F	Balsamorhiza sagittata	15	2	12	5	2	6	3.78

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Camelina microcarpa (a)	-	-	5	-	-	3	.01
F	Calochortus nuttallii	c25	a-	b12	13	-	4	.67
F	Cirsium undulatum	2	-	3	1	-	1	.70
F	Collomia linearis (a)	-	-	1	-	-	1	.00
F	Cruciferae (a)	-	-	25	-	-	14	.32
F	Cryptantha spp.	-	-	25	-	-	12	.30
F	Descurainia pinnata (a)	-	-	12	-	-	5	.05
F	Epilobium paniculatum (a)	-	-	5	-	-	2	.01
F	Erodium cicutarium (a)	-	-	3	-	-	2	.06
F	Erigeron divergens	5	2	-	2	1	-	-
F	Galium aparine (a)	-	-	28	-	-	14	.94
F	Lappula occidentalis (a)	-	-	8	-	-	5	.02
F	Lactuca serriola	a-	b10	b10	-	5	5	.21
F	Lithospermum incisum	3	-	-	1	-	-	-
F	Lomatium spp.	b46	b45	a24	25	25	11	1.38
F	Phlox longifolia	a-	a-	b8	-	-	4	.04
F	Sisymbrium altissimum (a)	-	-	-	-	-	-	.15
F	Tragopogon dubius	b14	a-	b24	7	-	11	.18
F	Unknown forb-perennial	a-	b9	b14	-	5	5	.25
Total for Forbs		151	89	273	73	48	129	10.03

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 33

Type	Species	Strip Frequency '97	Average Cover % '97
B	Cercocarpus montanus	5	1.40
B	Gutierrezia sarothrae	11	.56
B	Quercus gambelii	65	19.96
Total for Browse		81	21.93

BASIC COVER --

Herd unit 17 , Study no: 33

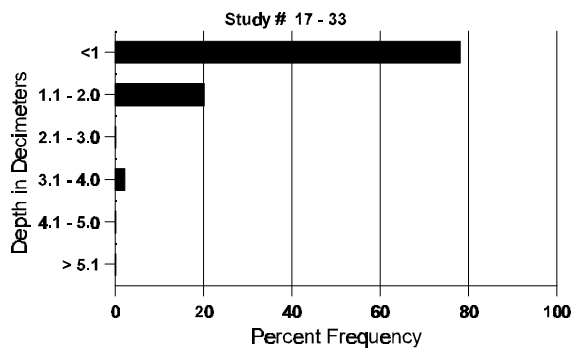
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	349	1.00	4.25	50.90
Rock	276	24.50	33.00	23.09
Pavement	126	3.00	5.25	2.08
Litter	379	52.75	47.50	44.56
Cryptogams	3	.25	0	.03
Bare Ground	116	18.50	10.00	3.98

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 33

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.7	47.0 (17.3)	6.7	41.8	32.4	25.8	2.6	12.8	217.6	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 33

Type	Quadrat Frequency '97
Elk	9
Deer	2

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 33

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Cercocarpus montanus</i>																		
M	83	-	-	-	-	-	-	1	-	-	1	-	-	-	66	67	138	1
	89	-	-	-	-	-	-	1	-	-	1	-	-	-	66	126	118	1
	97	-	1	3	-	-	1	-	-	-	5	-	-	-	100	80	96	5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		00%			00%			00%			+34%							
'97		20%			80%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	66	Dec:	-				
											'89	66		-				
											'97	100		-				
<i>Gutierrezia sarothrae</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	17	-	-	-	-	-	-	-	17	-	-	-	340	13	15	17	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	360		-				

AGE	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Quercus gambelii																	
S	83	17	-	-	-	-	-	-	-	-	6	11	-	-	1133		17
	89	9	-	-	-	-	-	-	-	-	9	-	-	-	600		9
	97	10	-	-	2	-	-	-	-	-	12	-	-	-	240		12
Y	83	30	12	-	-	-	-	-	-	-	36	6	-	-	2800		42
	89	121	60	-	-	-	-	-	-	-	181	-	-	-	12066		181
	97	47	-	-	2	-	-	-	-	-	49	-	-	-	980		49
M	83	7	80	56	-	-	-	1	-	-	114	30	-	-	9600	39 19	144
	89	14	2	1	-	-	-	3	-	-	20	-	-	-	1333	94 53	20
	97	214	80	-	-	-	-	-	-	-	294	-	-	-	5880	30 24	294
D	83	-	-	1	-	-	-	5	-	-	5	-	1	-	400		6
	89	4	1	-	-	-	-	-	-	-	1	-	3	1	333		5
	97	3	5	-	1	-	-	-	-	-	6	-	1	2	180		9
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	900		45
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>			
'83		48%			30%			.52%						+ 7%			
'89		31%			.48%			02%						-49%			
'97		24%			00%			.85%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	12800	Dec:	3%			
											'89	13732		2%			
											'97	7040		3%			

Trend Study 17-34-97

Study site name: Maple Mountain Face .

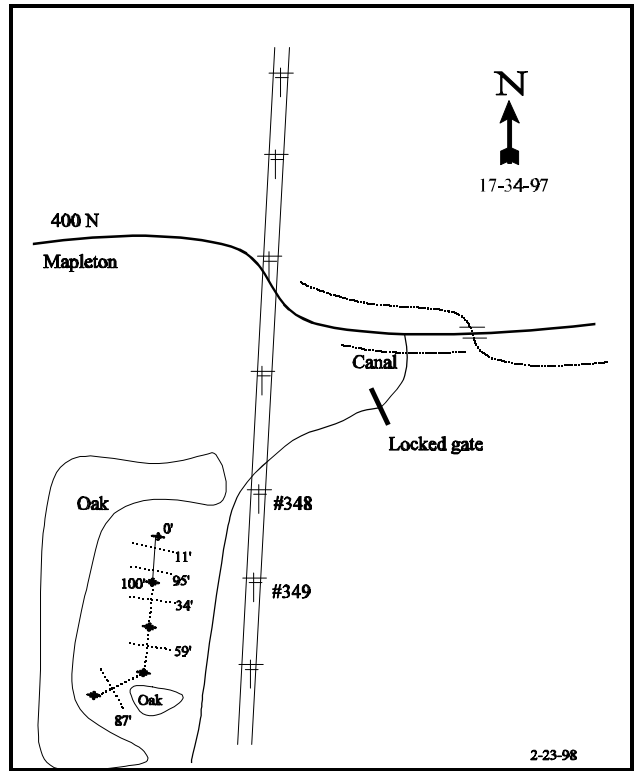
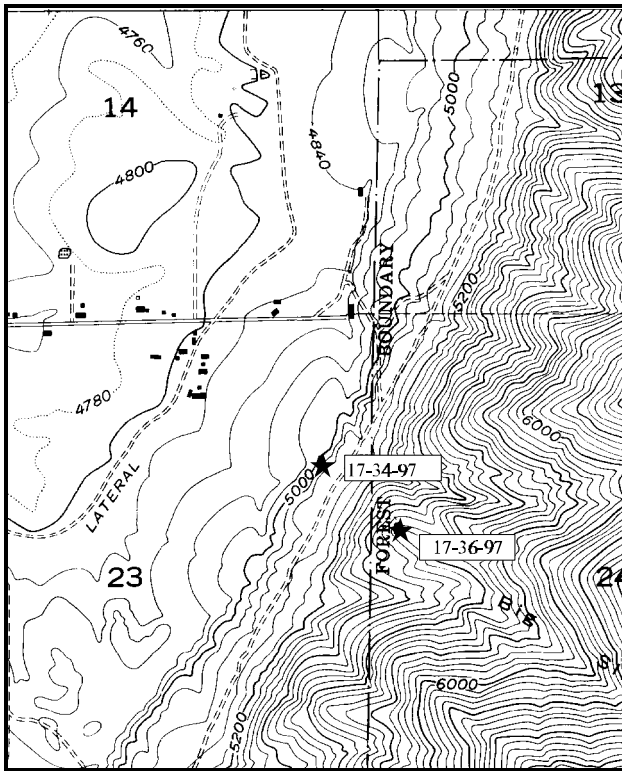
Range Type: Big sagebrush-grass

Compass bearing: frequency baseline 192 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (87ft).

LOCATION DESCRIPTION

Park at the mouth of Maple Canyon, west of the first bridge. There is a locked gate on the powerline road. Walk south along the base of the foothills for approximately 1 3/4 miles to a small sagebrush clearing west of the road. The 0-foot baseline stake is in the north end of the clearing, 33 paces from power pole #349 at an azimuth of 342°M. Study stakes are 12-18" tall green fenceposts.



Map Name: Spanish Fork Peak .

Diagrammatic Sketch

Township 8S, Range 3E, Section 23

UTM 4440078.048 N, 452196.960 E

DISCUSSION

Trend Study No. 17-34 (27-8)

The Maple Mountain Face study samples one of the few remaining sagebrush-grass range types on the severe winter range located on the upper lake terrace southeast of Mapleton. Since it was last inventoried in 1989, a fire had burned through the site. Slope on the site is 1-2% with a south aspect. Elevation is approximately 5,100 feet.

Soils on this lake terrace are a loam with an effective rooting depth (see methods) of over 27 inches. The pH is slightly acidic at 6.3 with an average soil temperature of 51.2°F at nearly 18 inches. Parent material appears to be sandstone or limestone. Very little rock or pavement were encountered on the soil surface or throughout the soil profile, but the upper soil layer was conspicuously compacted. There was no noticeable erosion at this time due to the gentle terrain and vegetative cover, mostly from bulbous bluegrass.

Four shrub species occur in the immediate area. The most prominent preferred species is mountain big sagebrush, the apparent key species. Surrounding the sagebrush openings, and occasionally occurring as isolated clumps within the sagebrush, is Gambel oak. Density of mountain big sagebrush has declined by about 50% since 1989, however all the plants encountered in 1997 were classified as young. Utilization is light, vigor is excellent, and no plants were classified as decadent. Past data indicated that the mountain big sagebrush was moderately hedged and in a state of decline. Density was only 432 plants/acre in 1989 with 84% of the population rated as decadent. Bitterbrush was planted on the site with few surviving. Current density is 120 plants/acre while there were none sampled in the past. Hedging is moderate with excellent vigor. Skunkbush was also planted after the fire and now has an estimated density of 40 plants/acre. Resprouting Gambel oak surrounds the study site and exhibits no sign of hedging at this time.

Grass composition is dominated by bulbous bluegrass with much smaller quantities of Sandberg bluegrass, cheatgrass, orchard grass, and intermediate wheatgrass. Annual grasses were reported to be very abundant in the past and included three species of brome grass and six weeks fescue. Now the annual grasses make up only 1% of the grass cover. In past years it was also reported that there were many grasshoppers on the site, while in 1997 this was not the case.

Forb composition in the past was badly depleted. Seeding after the fire has changed the composition of the herbaceous understory since 1989. The most conspicuous and most abundant forb is arrowleaf balsamroot. This species was lightly used and had suffered considerable grasshopper depredation in the past. At this time there is no noticeable utilization. Some seeded species that have managed to survive the fire include alfalfa and small burnet. Some utilization was noted in 1997. Some invaders or increasers of low to moderate palatability remain.

1983 APPARENT TREND ASSESSMENT

Soil trend is essentially stable although soil is not very fertile and excessively well-drained which leads to early depletion of soil moisture. Vegetative trend is definitely declining. Mountain big sagebrush is slowly being eliminated and replaced by undesirable annual and perennial grasses and forbs.

1989 TREND ASSESSMENT

The percentage of bare soil increased from 1 to 13% of the ground cover. The photo and data comparisons from

this site conclusively illustrate a disappearing mountain big sagebrush stand. From photos it is evident that there is much less sagebrush production now than in 1983. The forb composition is similar except for the occurrence of a new pestiferous weed, bindweed or morning glory. As also observed in the 1983 report, the herbaceous vegetation is suffering the effects of grasshopper defoliation. The arrowleaf balsamroot is the most important forb, receiving some spring deer use, and it has a stable population.

1997 TREND ASSESSMENT

Soil trend is stable. There is no evidence of noticeable erosion and it is unlikely any will occur in the near future. Vegetative cover is abundant and there is only a slight slope. Browse density has declined for some species, but seeding has introduced two species, bitterbrush and skunkbush, that were not previously sampled. Utilization is light on all species except bitterbrush which has moderate utilization. Browse trend is upward. Herbaceous understory trend is upward with many palatable species now present. Arrowleaf balsamroot nested frequency has greatly increased with alfalfa and small burnet now present.

TREND ASSESSMENT

soil - stable

browse - upward, but still only provides 2% of the total vegetative cover

herbaceous understory - upward

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 34

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron intermedium	-	-	4	-	-	2	.03
G	Bromus tectorum (a)	-	-	83	-	-	31	.55
G	Dactylis glomerata	a-	a-	b66	-	-	28	.75
G	Elymus glaucus glaucus	2	-	-	1	-	-	-
G	Poa bulbosa	a360	c395	b372	100	100	97	41.55
G	Poa pratensis	b61	a-	a-	26	-	-	-
G	Poa secunda	b24	a-	c124	11	-	48	3.67
Total for Grasses		447	395	649	138	100	206	46.56
F	Allium spp.	-	-	1	-	-	1	.00
F	Astragalus spp.	-	-	5	-	-	3	.04
F	Balsamorhiza sagittata	a103	a99	b248	52	44	92	34.34
F	Calochortus nuttallii	ab5	a-	b18	2	-	7	.03
F	Convolvulus arvensis	-	1	3	-	1	2	.18
F	Collinsia parviflora (a)	-	-	3	-	-	1	.00
F	Cruciferae	-	-	3	-	-	1	.03
F	Epilobium paniculatum (a)	-	-	3	-	-	1	.00
F	Erodium cicutarium (a)	-	-	3	-	-	1	.00

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Erigeron divergens	_a 7	_a 1	_b 59	2	1	27	1.50
F	Galium aparine (a)	-	-	3	-	-	1	.00
F	Helianthus annuus (a)	-	5	-	-	2	-	-
F	Lathyrus brachycalyx	4	6	8	2	2	3	.09
F	Lactuca serriola	_a -	_b 15	_b 10	-	8	4	.04
F	Linum lewisii	_a -	_a -	_b 8	-	-	5	.02
F	Medicago sativa	_a -	_a -	_b 28	-	-	14	.67
F	Phlox longifolia	_a -	_a -	_b 9	-	-	4	.04
F	Sanguisorba minor	_a -	_a -	_b 98	-	-	40	2.21
F	Sisymbrium altissimum (a)	-	-	15	-	-	6	.10
F	Taraxacum officinale	-	-	3	-	-	1	.03
F	Tragopogon dubius	_b 18	_a -	_{ab} 4	8	-	3	.06
F	Unknown forb-perennial	1	-	-	1	-	-	-
F	Verbascum thapsus	-	-	1	-	-	1	.15
Total for Forbs		138	127	533	67	58	218	39.60

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 34

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	6	.18
B	Purshia tridentata	6	.00
B	Quercus gambelii	2	1.48
B	Rhus trilobata trilobata	2	.06
Total for Browse		16	1.73

BASIC COVER --

Herd unit 17 , Study no: 34

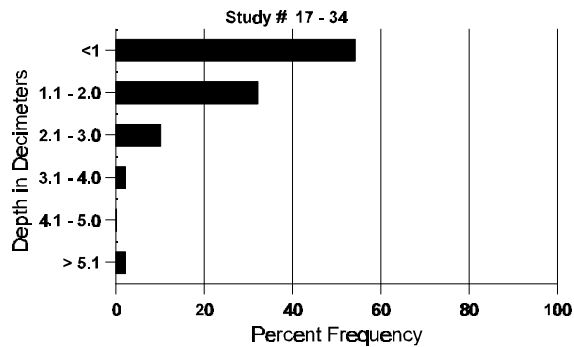
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	395	4.00	50.75	68.12
Rock	71	.75	.75	1.31
Pavement	215	3.00	6.75	6.49
Litter	374	91.00	28.75	18.82
Cryptogams	132	0	0	3.25
Bare Ground	272	1.25	13.00	9.97

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 34

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
27.4	51.2 (17.7)	6.3	45.8	30.4	23.8	2.2	13.6	188.8	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 34

Type	Quadrat Frequency '97
Elk	4
Deer	1
Cattle	9

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 34

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Artemisia tridentata vaseyana																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	10	-	-	-	-	-	-	-	-	10	-	-	-	200		10
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	10	-	-	1	-	-	-	-	-	11	-	-	-	220		11
M	83	-	7	2	-	-	-	-	-	-	8	1	-	-	300	23 32	9
	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66	13 16	2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	13 18	0
D	83	3	2	1	-	-	-	-	-	-	5	1	-	-	200		6
	89	9	-	2	-	-	-	-	-	-	9	-	2	-	366		11
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		60%			20%			00%			-14%						
'89		00%			15%			15%			-49%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	500	Dec:	40%			
											'89	432		85%			
											'97	220		0%			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	14	28	1
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	14	15	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+80%							
'89		00%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	33	Dec:	0%				
											'89	166		60%				
											'97	0		0%				
Purshia tridentata																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	4	-	-	-	-	-	-	-	5	-	-	-	100		5	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	10	11	1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		83%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	120		-				

A G E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
<i>Quercus gambelii</i>																	
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	'97	14	-	-	-	-	-	-	-	-	-	-	-	14	280		14
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>					
	'83	00%			00%			00%				None					
	'89	00%			00%			00%				Appeared					
	'97	00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	280		-		
<i>Rhus trilobata trilobata</i>																	
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	'89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	'97	2	-	-	-	-	-	-	-	-	-	-	-	40	-	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>					
	'83	00%			00%			00%				None					
	'89	00%			00%			00%				Appeared					
	'97	00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	40		-		

Trend Study 17-35-97

Study site name: Hobble Creek Golf Course .

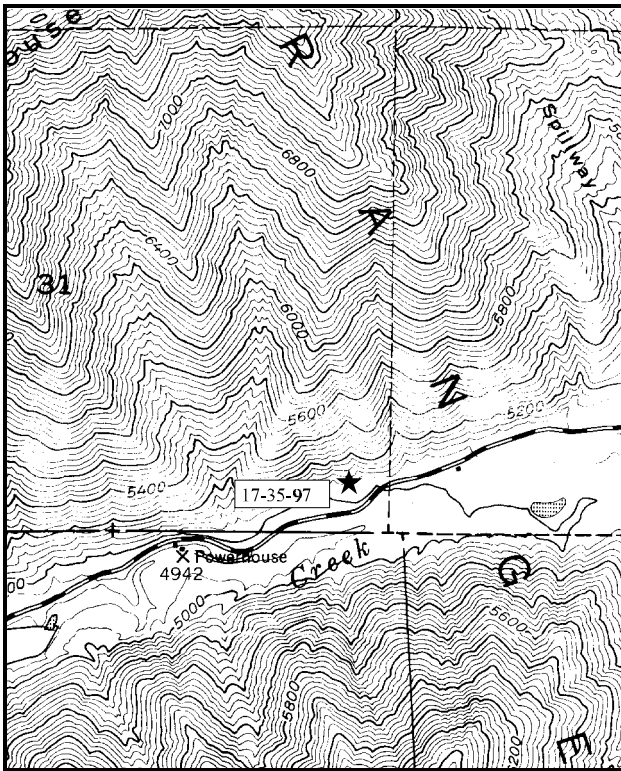
Range type: Gambel Oakbrush

Compass bearing: frequency baseline 348 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11, 34, 59, 71 & 95ft).

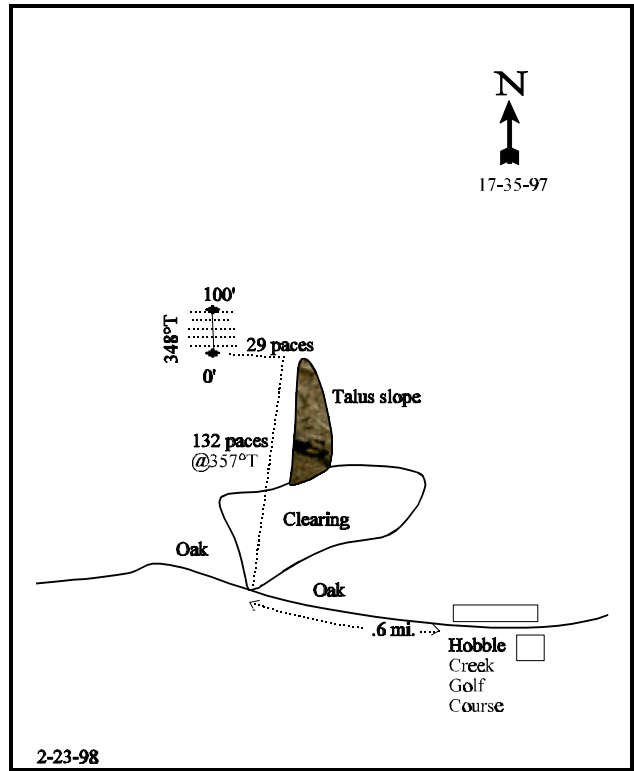
LOCATION DESCRIPTION

From Hobble Creek Golf Course Club House, proceed west toward Springville for 0.60 miles until you come to a clearing in the oakbrush to the north. From the beginning of the clearing, walk 132 paces in a northeasterly direction through the clearing and up a talus draw. Once at the top of the talus draw, the O-foot baseline stake is located 29 paces away at an azimuth of 263 degrees true. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3981, is attached to the O-foot baseline stake.



Map Name: Springville, Utah

Township 7 S , Range 4 E , Section 32



Diagrammatic Sketch

UTM 4445633.846 N, 455750.698 E

DISCUSSION

Trend Study No. 17-35 (27-9)

The Hobble Creek Golf Course study is located on a very dry, south facing slope, immediately north of Hobble Creek Golf Course. The slope is steep (65-70%) and within the limits of severe winter range. Elevation is approximately 5,200 feet. In 1983, heavy and intense past deer use was evidenced by the density of pellet groups, the level of use on key browse species, the presence of antler drops, and the finding of at least five winter-killed deer in the immediate vicinity. By 1997, there is very little wildlife use observable. The range type is sparse mixed mountain brush characterized by scattered clumps of low growing Gambel oak, true mountain mahogany, and Saskatoon serviceberry. However, the bulk of the soil surface is occupied by talus, rimrock, and grass-forb openings.

Soil is shallow to almost nonexistent. Large areas are occupied by talus slopes and much of the remaining surface is in a near talus condition. Variable sized angular rocks are the dominant feature on this site. Drainage is very fast and erosion is a serious problem. Vegetative and litter cover are both sparse.

Shrub density, although very scattered, includes the three species previously named as well as occasional individuals of mountain big sagebrush and the slightly more abundant broom snakeweed. Key species designation should probably include all three of the principal shrubs. Gambel oakbrush density is estimated at 7,900 stems/acre. The density is higher than previously reported because density measurements were made in the same place the vegetative measurements were made. Also, stems for each plant were counted rather than clumps that may have been counted in the past. Saskatoon serviceberry density is currently estimated at 180 plants/acre, a much more representative estimate than the over 2,000 plants/acre estimated in 1989. These plants show light utilization and good vigor. The plants are relatively short, averaging only 28 inches in height, indicating what poor potential the site has. True mountain mahogany was not sampled in 1997. This was due to the increased sample size which is more representative of the area. Broom snakeweed shows a slight increase in density while height and crown measurements have remained nearly the same.

Herbaceous composition is typical of many other depleted, poor condition sites on this unit. Among perennial grasses, bulbous bluegrass is dominant, providing 54% of the grass cover, followed by smaller amounts of bluebunch wheatgrass. In 1997, smooth brome was encountered on the site. Annual grasses are very abundant. Cheatgrass brome, rattlesnake brome, and sixweeks fescue all occur.

Forbs occur infrequently and are generally low or moderate in palatability. Annual bedstraw is the most abundant followed by Louisiana sage, yellow salsify, and longleaf phlox. Also present are a myriad of annual forbs.

1983 APPARENT TREND ASSESSMENT

Most evidence suggests a declining range trend. Soil condition is poor and not improving. Vegetatively, low value grasses and forbs are becoming increasingly dominant. The key browse species are barely holding their own, or as in the case of serviceberry and to a lesser extent mountain mahogany, actually declining.

1989 TREND ASSESSMENT

Early-drying grasses found on this site probably account for the differences found in the percent litter and vegetative cover between 1983 and 1989. The total ground cover is the same between years. Rock and pavement make up a significant 56% of the total, a slight increase since 1983. The three main browse species

on this sparse mountain brush site appear to have improved vigor and less utilization than in 1983. From all signs, the area appears to receive moderate use by big game. Use is limited to winter and spring and cover is fair. The herbaceous component shows little change. Sandberg bluegrass was identified on the site in 1989.

1997 TREND ASSESSMENT

Soil trend on this site is stable, but very poor. There is very little soil on the surface and no erosion is apparent. Cover is dominated by rock and litter. Although density for the browse species may have changed since 1989, this is due to the improved sampling method and much larger sample size used in 1997 which is more reflective of the true densities of the browse. Browse species showed very little utilization this season and show good vigor. Lighter use is also apparent when looking at almost no pellet groups being found on the site. The herbaceous understory composition remains similar to that sampled in previous years. One addition to the grass component in 1997 is smooth brome. The herbaceous understory trend is stable.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - stable

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 35

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron spicatum	_b 134	_a 85	_a 85	54	37	32	2.55
G	Bromus brizaeformis (a)	-	-	56	-	-	23	.31
G	Bromus inermis	_a -	_a -	_b 47	-	-	16	.98
G	Bromus tectorum (a)	-	-	182	-	-	63	3.62
G	Oryzopsis hymenoides	-	7	-	-	3	-	-
G	Poa bulbosa	_a 177	_b 232	_b 245	64	81	86	9.03
G	Poa secunda	_a -	_b 76	_a 7	-	33	3	.31
Total for Grasses		311	400	622	118	154	223	16.81
F	Alyssum alyssoides (a)	-	-	10	-	-	5	.02
F	Allium spp.	-	-	4	-	-	1	.03
F	Artemisia ludoviciana	_a 36	_b 63	_a 42	15	26	18	.45
F	Aster chilensis	2	1	3	1	1	1	.15
F	Cirsium spp.	-	-	3	-	-	1	.00
F	Eriogonum brevicaule	-	1	6	-	1	2	.06
F	Erigeron spp	-	-	2	-	-	2	.01
F	Galium aparine (a)	-	-	55	-	-	22	.27
F	Lathyrus brachycalyx	_b 12	_a -	_{ab} 3	4	-	1	.15

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Lactuca serriola	a-	a1	b22	-	1	10	.19
F	Lomatium dissectum	6	8	1	4	5	1	.15
F	Phlox longifolia	a3	ab10	b17	1	5	7	.22
F	Tragopogon dubius	8	2	4	4	1	3	.01
F	Trifolium gymnocarpon	-	-	8	-	-	3	.01
Total for Forbs		67	86	180	29	40	77	1.76

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 35

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	5	.31
B	Gutierrezia sarothrae	15	1.00
B	Quercus gambelii	70	11.08
Total for Browse		90	12.40

BASIC COVER --

Herd unit 17 , Study no: 35

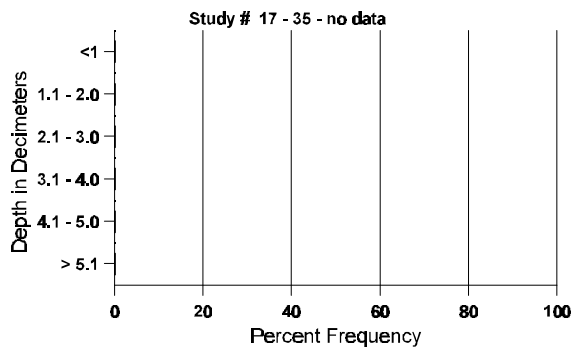
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	341	.25	8.50	33.93
Rock	332	39.50	46.75	36.16
Pavement	128	8.00	8.75	2.91
Litter	366	46.50	30.00	31.53
Cryptogams	-	1.00	0	0
Bare Ground	108	4.75	6.00	2.54

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 35 ***No Soil Data***

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
n/a	n/a (n/a)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 35

Type	Quadrat Frequency '97
Deer	1

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 35

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Amelanchier alnifolia																	
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	-	5	29	-	-	-	-	-	-	5	20	9	-	1133		34
	89	10	10	2	2	2	-	-	-	-	22	2	2	-	866		26
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
M	83	-	-	14	-	-	-	-	-	-	-	2	12	-	466	24 14	14
	89	4	11	10	2	3	-	-	-	-	20	2	7	1	1000	16 10	30
	97	5	1	-	-	-	-	-	-	-	6	-	-	-	120	28 28	6
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	4	2	1	-	-	-	-	-	-	3	-	1	3	233		7
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		10%			90%			44%			+24%						
'89		44%			21%			22%			-91%						
'97		11%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	1599	Dec:	0%		
												'89	2099		11%		
												'97	180		0%		

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Cercocarpus montanus																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	89	7	-	-	-	-	-	-	-	-	7	-	-	-	233		7	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	4	-	-	-	-	-	1	-	5	-	-	-	166	67 63	5	
	89	-	1	-	-	2	-	2	-	-	5	-	-	-	166	87 94	5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
D	83	-	-	1	-	-	-	-	-	-	-	-	1	-	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		50%			13%			13%			+34%							
'89		25%			00%			00%			Died out							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	265	Dec:	12%			
												'89	399		0%			
												'97	0		0%			

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Gutierrezia sarothrae																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
M	83	12	-	-	-	-	-	-	-	-	-	-	-	-	400	15 13	12	
	89	14	-	-	-	-	-	-	-	-	-	-	-	-	466	11 15	14	
	97	34	-	-	-	-	-	-	-	-	-	-	-	-	680	10 17	34	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
	'83	00%			00%			00%			+14%							
	'89	00%			00%			00%			+33%							
	'97	00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	400	Dec:	-			
												'89	466		-			
												'97	700		-			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66		2	
	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	13	-	-	-	-	-	-	-	-	13	-	-	-	260		13	
Y	83	2	30	-	-	-	-	-	-	-	32	-	-	-	1066		32	
	89	29	2	-	6	-	-	-	-	-	35	-	2	-	1233		37	
	97	315	60	-	-	-	-	-	-	-	375	-	-	-	7500		375	
M	83	-	14	1	-	-	-	-	-	-	15	-	-	-	500	58 23	15	
	89	32	6	-	1	-	-	-	-	-	37	1	1	-	1300	30 20	39	
	97	3	1	-	-	-	-	-	-	-	4	-	-	-	80	28 23	4	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	5	5	-	-	-	-	-	-	-	8	-	1	1	333		10	
	97	15	1	-	-	-	-	-	-	-	14	-	-	2	320		16	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	400		20	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		94%			02%			00%			+45%							
'89		15%			00%			06%			+64%							
'97		16%			00%			.50%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1566	Dec:	0%				
											'89	2866		12%				
											'97	7900		4%				

Trend Study 17-36-97

Study site name: Big Slide .

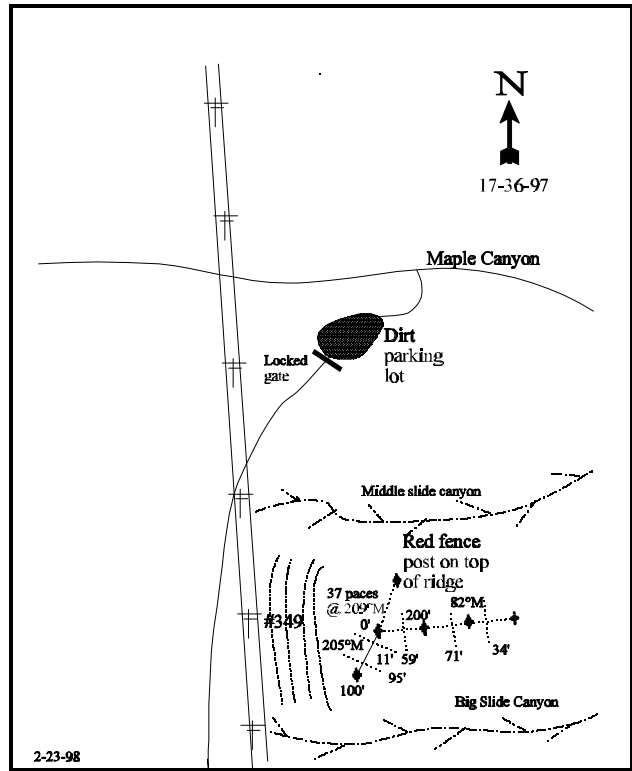
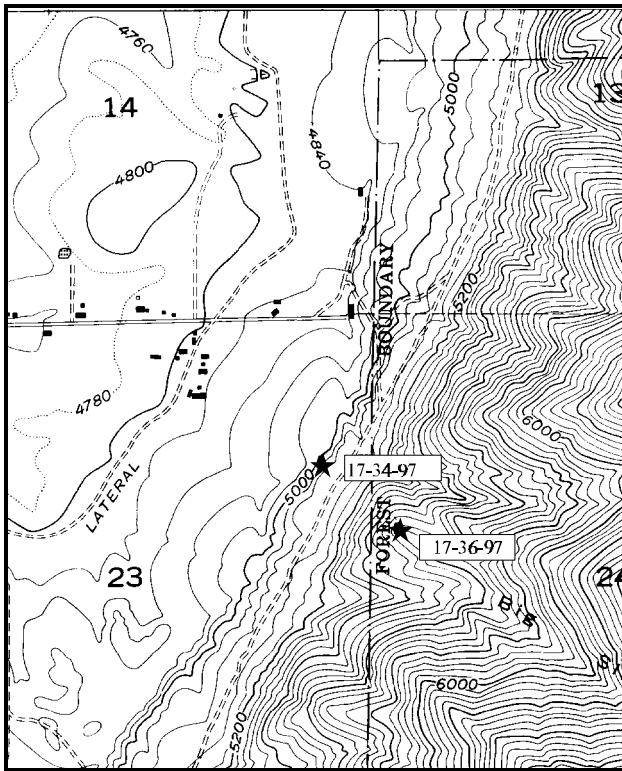
Range Type: Big sagebrush-grass

Compass bearing: frequency baseline 205 M degrees. (Line 2-4 82°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (59ft), line 3 (71ft), line 4 (34ft).

LOCATION DESCRIPTION

From the intersection of 400 North and Main in Mapleton, go east on 400 North towards the mountain. Drive 1.8 miles and stop in the mouth of the canyon past the Forest Service sign. Cross the canal on the south side of the main road. Follow the road south along the foothills to study site #17-34. On the slope above the powerlines there is a small sagebrush opening north of the mouth of Big Slide Canyon. Follow game trails up the slope through the oakbrush to the study site. There is a tall red fence post on the top edge of the small bench, from it the 0-foot baseline stake is 37 paces south (209 degrees). It is marked with browse tag #9086.



Map Name: Spanish Fork Peak .

Diagrammatic Sketch

Township 8S , Range 3E , Section 24

UTM 4439870.243 N , 452357.566 E

DISCUSSION

Trend Study No. 17-36 (27-10)

The Big Slide trend study is located on the slope above the Maple Mountain Face study which was established in 1989. The small open bench has a slope of 35% and an aspect to the southwest. The elevation is 5,400 feet. The slopes and drainages are dominated by clumps of oak with small openings of grass and sagebrush on the more level areas. In early September 1989, a wildfire higher up in Middle Slide Canyon burned both slopes and some timber. It was seeded by helicopter on October 15. In 1994, the site burned as part of the Big Slide Canyon burn. Parts of the mountain were seeded in the fall following the fire. Looking at the herbaceous composition of this area, some of the seeded species became established, although not in abundant numbers. There is currently no livestock grazing on this Forest Service administered site. Although there is very little sign of wildlife on the site, many pellet groups were encountered while hiking up the steep slope to the site. A small fawn was bedded down in some Gambel oakbrush and was flushed out while hiking up the trail.

The soil is moderately shallow and compacted. Near the top of the slope, rocks are a significant source of ground cover. There is no apparent erosion due to the grass and forb cover. Soil textural analysis indicates a clay loam with a neutral pH (6.7). The effective rooting depth (see methods) is almost 14 inches with an average temperature of 55.8°F measured at about 16 inches.

Mountain big sagebrush was encountered in 1989, prior to the 1994 fire. The estimated density in 1989 was 699 plants/acre. Estimated density is now 20 plants/acre. Only 1 young mountain big sagebrush plant is present at this time. Broom snakeweed, which was not previously encountered, now has a density of 160 plants/acre. Apparently, some curleaf mountain mahogany root stock plants were planted along the lower slope of the study site, with approximately a 50% survival rate at this time. Density for curleaf mountain mahogany is 80 plants/acre. Gambel oakbrush was burned and is now resprouting. Some of the taller plants, over 12 feet, were not completely burned. Most plants are classified as young with some seedling and mature. Density was estimated by counting individual stems. Utilization is light at this time.

Most of the ground cover comes from bulbous bluegrass, 43% of the total vegetative cover. Currently, not all plants are producing seed heads this year, with most remaining dormant and low to the ground. Cheatgrass occurs in small patches scattered throughout the area providing 17% of the total vegetative cover. Other grasses include Sandberg bluegrass, orchard grass, and purple threawn.

Forbs include many weedy species that would be expected after a fire. These include storksbill, autumn willoweed, hairy goldaster, Western ragweed, and wavyleaf thistle. Some seeded species have become established, these are mostly alfalfa and small burnet.

1989 TREND ASSESSMENT

Erosion is minimal and the soil trend is stable. As on most other sites along the southern portion of the Wasatch Front, trend for sagebrush is downward due to the high incidence of decadence and lack of recruitment into the old stands.

1997 TREND ASSESSMENT

Soil trend is slightly upward. There is currently less bare soil, rock, and litter cover than estimated in 1989. Litter cover has remained nearly unchanged. Vegetative cover is abundant and there is no erosion apparent at this time. Browse trend is down. Mountain big sagebrush density has plummeted to only 20 plants/acre. The

fire burned all mature plants leaving only 1 young plant sampled in 1997. Gambel oakbrush is resprouting with an estimated 1,200 stems/acre. Broom snakeweed has become established and should be closely monitored as it has the propensity to increase its density quickly on sites like this. The herbaceous understory is stable, although a better composition is desired. Some seeded species have become established, but the winter annuals will provide intense competition and could likely exclude some species from the site in the future.

TREND ASSESSMENT

soil - slightly upward

browse - down, only provides about 6% of the total vegetative cover

herbaceous understory - stable, but poor composition

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 36

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	7	-	2	-	-
G	Aristida purpurea	21	14	9	6	1.43
G	Bromus tectorum (a)	-	314	-	92	12.20
G	Dactylis glomerata	-	*15	-	9	.33
G	Poa bulbosa	383	*346	99	94	31.67
G	Poa pratensis	15	*-	6	-	-
G	Poa secunda	-	*19	-	8	.22
G	Sporobolus cryptandrus	6	-	2	-	-
Total for Grasses		432	708	118	209	45.86
F	Ambrosia psilostachya	13	*47	4	22	1.11
F	Artemisia ludoviciana	40	42	12	17	1.39
F	Asclepias spp.	-	6	-	2	.18
F	Balsamorhiza sagittata	-	2	-	1	.38
F	Calochortus nuttallii	-	1	-	1	.00
F	Cirsium undulatum	4	*45	2	19	2.47
F	Crepis acuminata	-	2	-	1	.15
F	Cruciferae (a)	-	1	-	1	.00
F	Epilobium paniculatum (a)	-	83	-	33	.96
F	Erodium cicutarium (a)	-	114	-	40	4.78
F	Erigeron divergens	-	*31	-	15	.81
F	Eriogonum racemosum	2	1	2	1	.15
F	Helianthus annuus (a)	57	-	24	-	-
F	Heterotheca villosa	-	*68	-	33	4.72

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Lactuca serriola	24	39	11	17	1.23
F	Linum lewisii	-	*8	-	4	.19
F	Lithospermum spp.	39	*-	17	-	-
F	Lomatium spp.	-	*8	-	5	.07
F	Medicago sativa	-	*14	-	6	.95
F	Oenothera spp.	-	2	-	1	.03
F	Phlox longifolia	-	3	-	1	.03
F	Polygonum douglasii (a)	-	5	-	2	.01
F	Sanguisorba minor	-	*14	-	7	.29
F	Tragopogon dubius	36	*135	21	58	2.88
F	Trifolium gymnocarpon	-	*24	-	8	.67
F	Unknown forb-perennial	6	*-	4	-	-
F	Verbascum thapsus	-	-	-	-	.03
F	Zigadenus paniculatus	1	-	1	-	-
Total for Forbs		222	695	98	295	23.53

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

BROWSE TRENDS --

Herd unit 17 , Study no: 36

T y p e	Species	Strip Frequency	Average Cover %
		'97	'97
B	Artemisia tridentata vaseyana	1	-
B	Cercocarpus ledifolius	4	-
B	Gutierrezia sarothrae	2	.15
B	Quercus gambelii	6	4.34
Total for Browse		13	4.49

BASIC COVER --

Herd unit 17 , Study no: 36

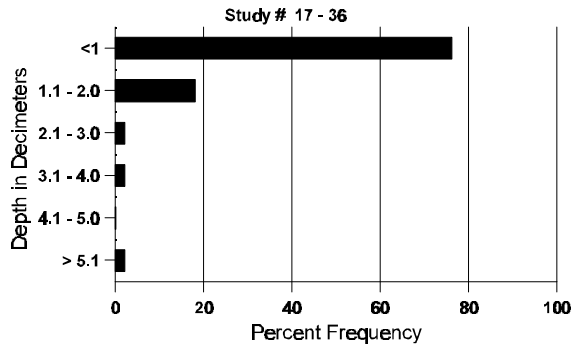
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	394	22.50	57.95
Rock	283	20.25	15.17
Pavement	204	13.00	3.27
Litter	380	36.25	37.15
Cryptogams	47	0	.49
Bare Ground	142	8.00	2.46

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 36

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.7	55.8 (15.5)	6.7	39.4	32.7	27.8	2.7	11.6	195.2	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 36

Type	Quadrat Frequency '97
Elk	5
Deer	4

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 36

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total				
		1	2	3	4							
<i>Artemisia tridentata vaseyana</i>												
Y	89	1	-	-	-	-	-	-	1	1		
	97	1	-	-	-	-	-	-	1	20		
M	89	1	1	-	-	-	-	-	2	66	22	24
	97	-	-	-	-	-	-	-	-	0	-	-
D	89	2	16	-	-	-	-	-	14	600		
	97	-	-	-	-	-	-	-	-	0		
X	89	-	-	-	-	-	-	-	-	0		
	97	-	-	-	-	-	-	-	-	40		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		81%		00%		19%		-97%				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)									'89	699	Dec:	86%
									'97	20		0%
<i>Cercocarpus ledifolius</i>												
Y	89	-	-	-	-	-	-	-	-	0		
	97	4	-	-	-	-	-	-	4	80		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		00%		Appeared				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)									'89	0	Dec:	-
									'97	80		-
<i>Gutierrezia sarothrae</i>												
Y	89	-	-	-	-	-	-	-	-	0		
	97	4	-	-	-	-	-	-	4	80		
M	89	-	-	-	-	-	-	-	-	0	-	-
	97	4	-	-	-	-	-	-	4	80	9	9
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>				
'89		00%		00%		00%		Appeared				
'97		00%		00%		00%						
Total Plants/Acre (excluding Dead & Seedlings)									'89	0	Dec:	-
									'97	160		-

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	89	-	-	-	2	-	-	-	-	-	-	2	-	-	66		2	
	97	-	-	-	-	-	-	5	-	-	-	5	-	-	100		5	
Y	89	-	1	-	5	1	-	2	-	-	9	-	-	300		9		
	97	17	-	-	43	-	-	-	-	-	60	-	-	1200		60		
M	89	2	1	-	-	-	-	-	-	-	1	2	-	100	88 112	3		
	97	-	-	-	1	-	-	-	-	-	1	-	-	20	29 41	1		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	400		20		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		25%			00%			00%			+67%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	400	Dec:	-				
											'97	1220		-				

DISCUSSION

Trend Study No. 17-37 (27-11)

This site has not been sampled since the initial survey of 1983

The Cold Spring study is located on a very steep (75%) west facing slope occupied by dense Gambel oakbrush. The site is within an area reclassified in 1975 as severe winter range (Olsen, 1976). Elevation is 5,250 feet. Use by deer appears light because of the abundant forage available. Pellet groups are numerous but carrying capacity is high.

Soil is shallow and very rocky. Some erosion is occurring, but is kept within reasonable limits by a dense aerial vegetative cover. Litter cover is patchy and generally less extensive than would normally be expected on similar sites. Slope steepness makes litter buildup difficult.

Gambel oak is virtually the only browse species present. Aside from oak, only occasional plants of bigtooth maple and broom snakeweed can be found. Oak stems are dense (11,200/acre) and of a height that is nearly 100% available to deer. Vigor is good and age structure is indicative of a young stand. The young plants may be fire generated resprouts. A number of tall dead oak stems and fire scars suggest the possibility of a fire in the past. Utilization of oak is moderate.

Grass composition is chiefly annuals, such as cheatgrass brome and hairy brome. Perennial grasses are limited to scattered individuals of Sandberg bluegrass, Kentucky bluegrass, and bluebunch wheatgrass. A few plants of orchard grass were observed but not encountered.

Forbs are considerably more abundant and productive than grasses. The three most abundant species; sierra onion, mountain sagebrush, and mountain dandelion are rather poor value forage species. Their chief value is for soil protection. A few other forb species provide slightly better forage quality.

1983 APPARENT TREND ASSESSMENT

In spite of a very steep slope, soil trend appears stable. A dense and perhaps even thickening stand of oak resprouts is moderately effective in protecting the soil. Slightly less effective is mountain sagebrush, a shrub, which like oak is also increasing in density. The vegetative trend is toward decreased diversity, especially among browse plants. Although production is high, almost all available forage comes from Gambel oak. Were it not for the forb component, forage diversity would be almost nil.

Trend Study 17-38-97

Study site name: N. Fork Diamond Creek Cyn .

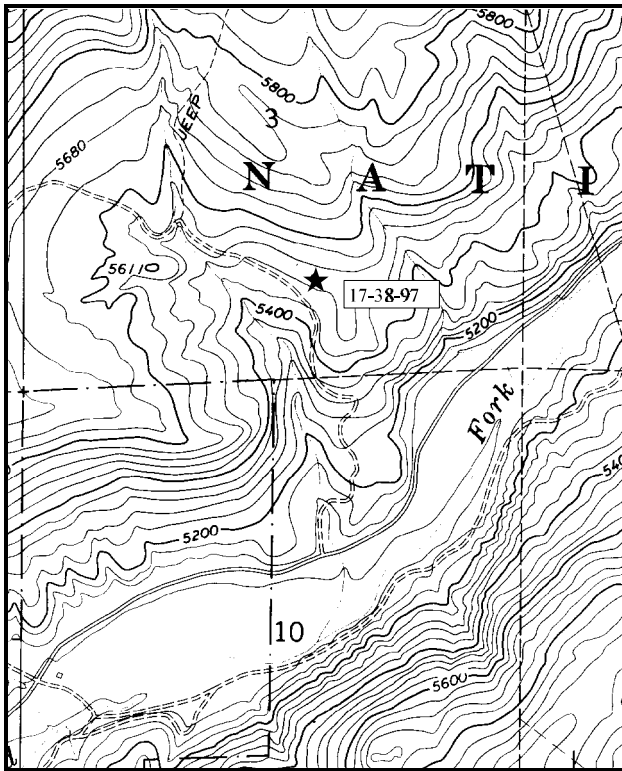
Range type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 15 degrees. (Lines 2-4 330°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

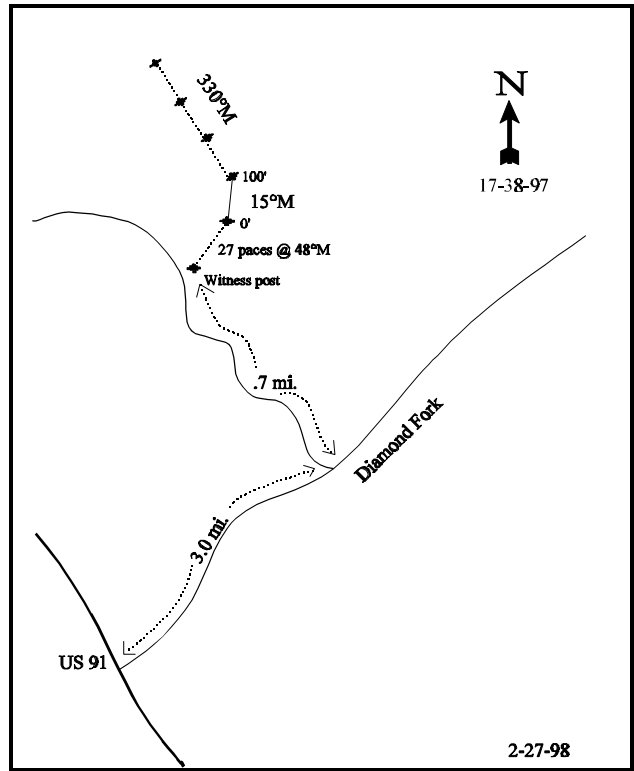
LOCATION DESCRIPTION

From the intersection of U.S. 50-6 and the Diamond Fork road, proceed 3.0 miles up Diamond Fork to an intersection. Turn left and proceed 0.70 miles to a faint road to the right (i.e., northeast). Walk 27 paces up the road to the northeast, then turn and walk 5 paces to the north to the O-foot baseline stake. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3978, is attached to the O-foot baseline stake.



Map Name: Billies Mtn., Utah .

Township 9 S , Range 4 E , Section 3



Diagrammatic Sketch

UTM 4433752.396 N , 460092.793 E

DISCUSSION

Trend Study No. 17-38 (27-12)

The North Fork Diamond Canyon study is located on important deer winter range in the Diamond Fork drainage. The study is at 5,480 feet elevation and on a gentle (10%), south to southeast slope. The range type is mountain big sagebrush-grass with smaller numbers of antelope bitterbrush intermixed throughout. Large numbers of deer pellet groups were reported in the past, but currently they are fairly low for deer and elk. Spring through fall cattle grazing also occurs and appears quite intense. Cattle were on site in 1997 and utilization was apparent on smooth brome. Water is found in several small livestock ponds and the creek, 100 yards to the south.

Soil is moderately deep with textural analysis indicating a clay loam. Soil pH is neutral (7.1) with an effective rooting depth (see methods) of a little over 18 inches. A uniform and moderately dense grass cover provides good soil protection. Shrub cover is poor, it provides only 11% of the vegetative cover and often consists of decadent sagebrush. Trampling and compaction damage from cattle is apparent. Soil erosion is not currently a serious problem, but could easily become so.

The key preferred browse species are mountain big sagebrush and antelope bitterbrush. The mountain big sagebrush density has continued to decline since the initial reading, now it has an estimated density of 340 plants/acre in 1997. There was an estimated 1,833 plants/acre in 1983 and then 766 plants/acre in 1989. Percent decadency has remained relatively the same through the years (around 60%), with 60% of the decadent plants classified as dying. Currently, there is a very large density of dead plants (1,140 plants/acre). They outnumber the live plants by more than 3 to 1. The stand currently exhibits moderate to heavy hedging. Some recruitment is occurring, but may not continue to do so because of the very dense cover of smooth brome providing competition. There does not appear to be any seed production on the sagebrush this season. Bitterbrush density appears lower than in the past, but this is due to the greatly increased sample size used in 1997 for there were no dead plants in the population to explain this loss in numbers. The larger sample size gives significantly better population estimates for browse populations that have distributions that are discontinuous or clumped. In the recent reading, bitterbrush was found only near the beginning of the transect and not in the extended area. Utilization is heavy with an estimated 100 plants/acre. Other browse encountered in low densities include broom snakeweed, rabbitbrush, and skunkbush.

Grasses primarily consist of perennial sod formers, of which two are introduced grasses. Smooth brome and Kentucky bluegrass are both very abundant. Nested frequency of smooth brome significantly increased since 1983 and 1989. It is now found in nearly every quadrat (99%). Western wheatgrass, a native that sometimes acts as an increaser, occurs in patches and has significantly decreased in nested frequency since 1989. As reported in 1983, grasses are highly competitive and are probably a significant factor in the general decline of mountain big sagebrush.

Forbs are numerous but consist largely of aggressive increasers and invaders. Species such as Pacific aster are moderately palatable and heavily grazed. Decreaser forbs are absent from this site. Annuals and biennials consist of false phlox, bur buttercup, autumn willoweed, and yellow salsify.

1983 APPARENT TREND ASSESSMENT

Soil trend is stable but rather precarious. Heavy grazing is reducing grass vigor and preventing litter accumulation. Erosion is currently light but could easily become worse. Vegetative trend is down because of the decline in mountain big sagebrush. Antelope bitterbrush is only maintaining itself. Grasses and increaser forbs, especially Pacific aster, are highly competitive and discourage shrub reproduction.

1989 TREND ASSESSMENT

While litter cover remained about 50% of ground cover, vegetative basal cover increased from 1% to 6%. With the slight increase in rock and pavement cover, the amount of bare soil encountered declined. Although potentially highly erodible, the fine-textured and compacted soil is currently stable. The sagebrush appears to be suffering the effects of an herbicide treatment, but past treatments on this private land are unknown at this time. The sagebrush population is unlikely to recover from whatever ails it, so the value of this particular slope as winter range is low and the vegetative trend is still downward. The opposing north-facing slope supports a model stand of big sagebrush. While density plot data comparisons indicate decreased grass and forb density, the frequency data for these hard-to-count species are similar between years.

1997 TREND ASSESSMENT

Soil trend is slightly upward. There is currently less bare ground, rock, and litter cover than reported in the past. Erosion is still low. Browse trend continues to be downward. Mountain big sagebrush density continues to decline in this decadent population. The combination of competition with grasses and intense utilization will continue to reduce this mountain big sagebrush community. Some scattered patches of Gambel oakbrush surround the site and could provide wildlife escape cover. Herbaceous understory trend is upward, this comes at the detriment to the browse component. Smooth brome nested frequency significantly increased, while western wheatgrass nested frequency significantly declined. Smooth brome is easily out-competing winter annuals like cheatgrass and Japanese brome at this elevation. Most of the forbs are increasers or invaders, similar to previous years.

TREND ASSESSMENT

soil - stable

browse - down, browse only contributes to 5% of the total vegetative cover

herbaceous understory - up, but poor composition

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 38

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	3	-	3	1	-	1	.00
G	Agropyron smithii	_b 183	_b 147	_a 37	72	57	14	.14
G	Bromus inermis	_a 156	_b 195	_c 360	49	60	99	27.53
G	Bromus japonicus (a)	-	-	55	-	-	21	.44
G	Bromus tectorum (a)	-	-	3	-	-	1	.00
G	Oryzopsis hymenoides	1	-	-	1	-	-	-
G	Poa bulbosa	_a -	_a -	_b 115	-	-	37	6.55
G	Poa fendleriana	2	2	-	1	1	-	-
G	Poa pratensis	_{ab} 94	_b 118	_a 81	31	44	31	1.59
G	Poa secunda	_a 5	_{ab} 17	_b 22	2	7	9	.29
Total for Grasses		444	479	676	157	169	213	36.57

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Alyssum alyssoides</i> (a)	-	-	285	-	-	97	1.50
F	<i>Allium</i> spp.	-	-	12	-	-	7	.03
F	<i>Artemisia ludoviciana</i>	_b 55	_b 40	_a 19	23	21	8	.04
F	<i>Aster chilensis</i>	215	230	230	72	72	73	8.43
F	<i>Astragalus convallarius</i>	18	18	15	9	7	5	.21
F	<i>Cardaria draba</i>	-	-	3	-	-	1	.03
F	<i>Camelina microcarpa</i> (a)	-	-	10	-	-	5	.02
F	<i>Calochortus nuttallii</i>	_c 55	_a 9	_b 35	26	6	16	.10
F	<i>Chaenactis douglasii</i>	6	-	-	2	-	-	-
F	<i>Cirsium undulatum</i>	_c 90	_b 58	_a 5	45	27	3	.06
F	<i>Collinsia parviflora</i> (a)	-	-	6	-	-	4	.02
F	<i>Cymopterus</i> spp.	-	5	13	-	2	8	.06
F	<i>Epilobium paniculatum</i> (a)	-	-	41	-	-	17	.11
F	<i>Galium aparine</i> (a)	-	-	3	-	-	1	.00
F	<i>Lactuca serriola</i>	_a -	_a 2	_b 11	-	1	5	.02
F	<i>Microsteris gracilis</i> (a)	-	-	98	-	-	41	.28
F	<i>Oenothera</i> spp.	-	-	3	-	-	1	.03
F	<i>Phlox longifolia</i>	_b 26	_c 53	_a 4	13	24	2	.01
F	<i>Polygonum douglasii</i> (a)	-	-	5	-	-	2	.01
F	<i>Ranunculus testiculatus</i> (a)	-	-	63	-	-	24	.21
F	<i>Sphaeralcea coccinea</i>	_a 58	_b 85	_a 29	25	36	14	.17
F	<i>Tragopogon dubius</i>	_b 39	_a 12	_a 9	20	5	5	.05
Total for Forbs		562	512	899	235	201	339	11.44

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 38

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	13	1.20
B	Chrysothamnus viscidiflorus viscidiflorus	3	.03
B	Gutierrezia sarothrae	5	.04
B	Purshia tridentata	4	1.18
B	Rhus trilobata trilobata	1	.03
Total for Browse		26	2.49

BASIC COVER --

Herd unit 17 , Study no: 38

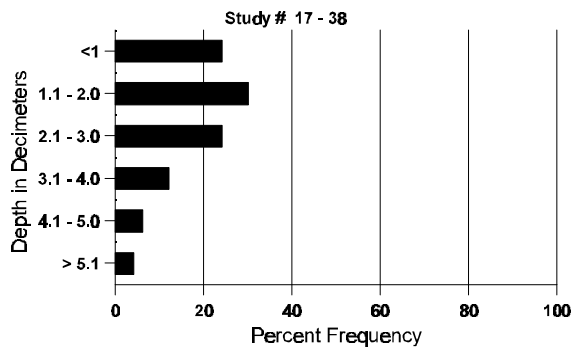
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	391	.75	6.25	47.46
Rock	78	2.25	4.00	.68
Pavement	210	3.25	5.75	1.18
Litter	399	48.00	50.25	46.87
Cryptogams	17	.50	0	.20
Bare Ground	316	45.25	33.75	20.97

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 38

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
18.2	51.0 (17.7)	7.1	31.4	30.7	37.8	3.4	12.1	377.6	.6

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 38

Type	Quadrat Frequency '97
Elk	6
Deer	11
Cattle	8

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 38

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total									
		1	2	3	4		1	2										
<i>Artemisia tridentata vaseyana</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	3	-	-	-	-	-	-	-	3	-	-	-	60		3		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	89	4	-	-	-	-	-	-	-	3	-	1	-	133		4		
	97	1	-	1	-	-	-	-	-	2	-	-	-	40		2		
M	83	-	16	8	-	-	-	-	-	22	2	-	-	800	39 40	24		
	89	1	2	-	-	-	-	-	-	2	-	1	-	100	26 31	3		
	97	-	3	2	-	-	-	-	-	5	-	-	-	100	22 27	5		
D	83	1	14	16	-	-	-	-	-	27	4	-	-	1033		31		
	89	8	8	-	-	-	-	-	-	9	-	-	7	533		16		
	97	4	1	4	-	-	1	-	-	4	-	-	6	200		10		
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	-	-	-	-	-	-	-	-	-	-	-	1140		57		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>										
'83		55%		44%		00%		-58%										
'89		43%		00%		39%		-56%										
'97		24%		47%		35%												
Total Plants/Acre (excluding Dead & Seedlings)										'83	1833	Dec:	56%					
										'89	766		70%					
										'97	340		59%					
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	1	-	-	-	-	-	-	-	1	-	-	-	20		1		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-		
	89	1	-	-	-	-	-	-	-	1	-	-	-	33	14 16	1		
	97	2	-	-	-	-	-	-	-	2	-	-	-	40	12 26	2		
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>										
'83		00%		00%		00%		Appeared										
'89		00%		00%		00%		+45%										
'97		00%		00%		00%												
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-					
										'89	33		-					
										'97	60		-					

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Gutierrezia sarothrae</i>											
S	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	22	-	-	-	-	-	-	22	-	22
Y	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	1	-	1
M	83	3	-	-	-	-	-	-	100	14 16	3
	89	10	-	-	-	-	-	-	333	8 9	10
	97	6	-	-	-	-	-	-	120	6 8	6
D	83	3	-	-	-	-	-	-	100		3
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%		+40%			
'89		00%		00%		00%		-58%			
'97		00%		00%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	200	Dec:	50%		
						'89	333		0%		
						'97	140		0%		
<i>Purshia tridentata</i>											
Y	83	-	-	-	-	-	-	-	0		0
	89	-	1	-	-	-	-	-	33		1
	97	-	-	1	-	-	-	-	20		1
M	83	-	6	5	-	-	-	-	366	20 37	11
	89	-	-	7	-	-	-	-	233	13 33	7
	97	-	1	2	-	-	1	-	80	23 54	4
D	83	-	-	-	-	-	-	-	0		0
	89	-	-	2	-	-	-	-	66		2
	97	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		55%		45%		00%		- 9%			
'89		10%		90%		00%		-70%			
'97		20%		80%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	366	Dec:	0%		
						'89	332		20%		
						'97	100		0%		

A G R E	Y	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.	
Rhus trilobata trilobata																		
M	'83	1	-	-	-	-	-	-	-	-	1	-	-	-	33	37	38	1
	'89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	48	35	1
	'97	-	-	-	1	-	-	-	-	-	1	-	-	-	20	58	80	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+ 0%							
'89		100%			00%			00%			-39%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	33	Dec:	-			
												'89	33		-			
												'97	20		-			

Trend Study 17-39-97

Study site name: Little Diamond Fork .

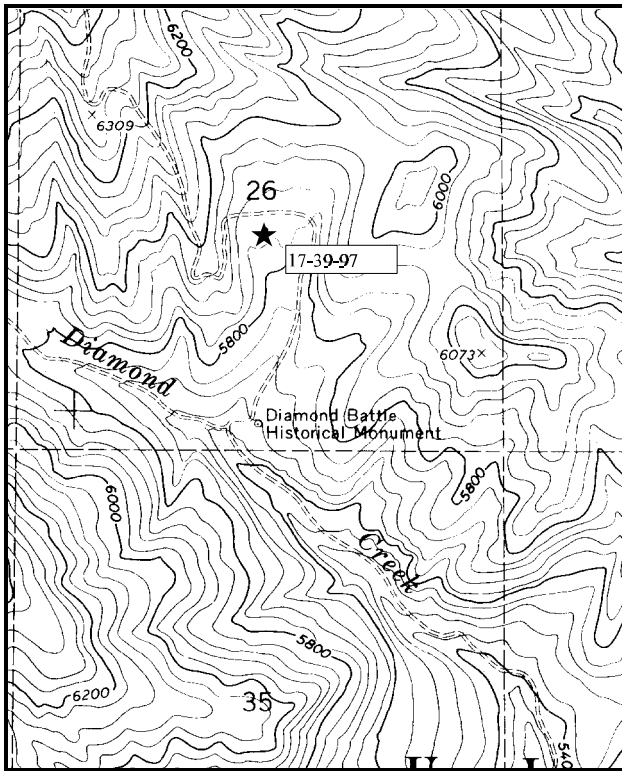
Range type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 154 M degrees. (Line 2-4 201°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

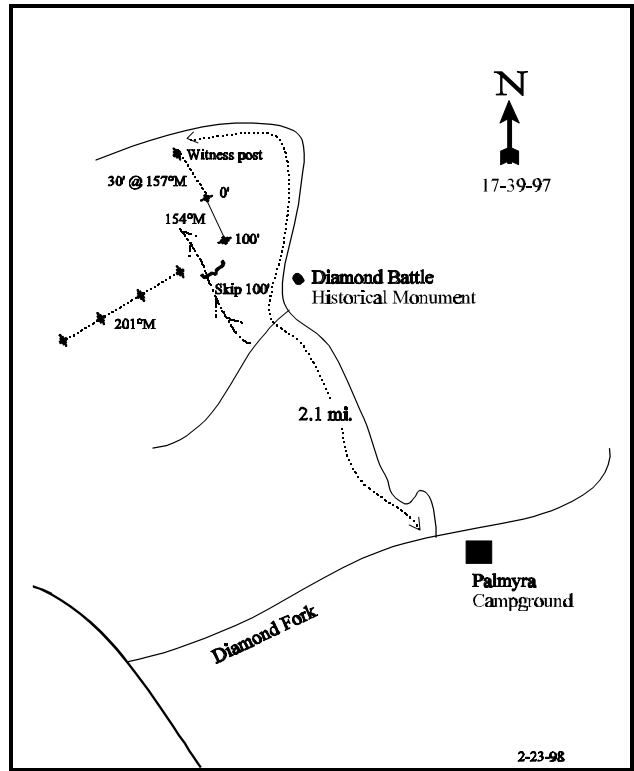
LOCATION DESCRIPTION

From the intersection of U.S. 91 and Diamond Fork Canyon proceed northeasterly up Diamond Fork to Palmyra Campground. From Palmyra Campground take the road to the northwest 2.10 miles up Little Diamond Creek to a distinct sagebrush-grass plateau, and a witness post. From the witness post road, walk 30 feet at 157 degrees magnetic to the O-foot baseline stake. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3923, is attached to the O-foot baseline stake.



Map Name: Billies Mountain, Utah .

Township 9 S , Range 4 E , Section 28



Diagrammatic Sketch

UTM 4433752.396 N, 460092.793 E

DISCUSSION

Trend Study No. 17-39 (27-13)

The Little Diamond Canyon study samples a broad mountain big sagebrush-grass swale located approximately one-half mile north of the "Diamond Battle Historical Monument" in Little Diamond Creek drainage. Aspect is to the south with a slope of 5-10% and an elevation of 5,850 feet. This area is considered important deer and elk winter range. This was part of the Forest Service's 1,500 acre Lower Diamond Revegetation Project. Oak and sagebrush on the study site was chained, then the area was aerially seeded in 1969. The seed mixture included western wheatgrass, smooth brome, intermediate wheatgrass, and orchard grass. There are some differences in grass species identification between study readings, probably due in large part to the heavy utilization by cattle making identification of the similar species difficult. Some deer and elk pellet groups were present with little utilization visible in 1997. When the study was established in 1983, the principal forage users on the area were domestic cattle, which were on the site in late June and early July and were heavily utilizing the grasses.

Soil textural analysis indicates a sandy clay loam with a pH of 5.9, which makes the soil reaction moderately acidic. The effective rooting depth (see methods) is more than 18 inches with an average temperature of 51.0°F at an average depth of 18 inches. An ephemeral stream runs through the middle of the valley cutting a 10-15 foot deep gully through the sagebrush flat. There is no accelerated erosion apparent and nearby gullies have vegetation in their bottoms. Heavy grazing, trampling damage, and the presence of numerous roads and ORV trails in the area are the principal disturbances and the most obvious point erosion sources.

Mountain big sagebrush is the key preferred browse species. Presently, density for sagebrush is estimated at 1,200 plants/acre with 43% classified as decadent. Seventy percent of the population was initially classified as mature, where now it is a more reasonable 42%. The population shows a slight increase with a healthy stand of understory native and introduced grasses. Fifty-eight percent of the decadent plants were classified as dying. However, there were some seedlings (reproductive potential of 7%) and young plants (15%) encountered. The dead to live ratio is almost 1:2. It was reported in 1997 that the death of the sagebrush does not appear to be from livestock or big game over-utilization, but rather from rodent damage. The ground below many of the shrubs appeared disturbed by rodents. Broom snakeweed density is highly variable over all years with no recognized utilization and good vigor. Other species include rabbitbrush, prickly pear cactus, and Wood's rose.

Grass composition continues to be dominated by bulbous bluegrass, a cool season invader with fair forage value in spring, but which is nearly worthless as forage by mid-summer. It is possible that this species was seeded on the site along with intermediate wheatgrass, smooth brome, and Kentucky bluegrass. Western wheatgrass is also an important grass which can be found in scattered patches throughout the area. As a group, grasses provide a vigorous ground cover that offers intense competition to seedling establishment of other species of plants. Smooth brome nested frequency has significantly increased since 1989, as well as that of bulbous bluegrass. The principal species of forbs are increasers such as: Pacific aster, spreading fleabane, and silky lupine. These have fair forage value, yet are nonetheless indicative of the grazing intensity of cattle.

1983 APPARENT TREND ASSESSMENT

The area currently has a relatively stable soil, although it is susceptible to gully erosion. Careful management of livestock grazing as well as gully, road, and ORV trail stabilization will be necessary to help preserve the site. Vegetative trend is not immediately apparent from the data. Our impression however, is that mountain big sagebrush is slowly increasing and broom snakeweed is increasing rapidly. Grass cover is uniform and competitive, yet subject to heavy livestock use. It may become less important if the current browse trend continues.

1989 TREND ASSESSMENT

The ground cover estimations show a significant increase in the percent vegetative basal cover since 1983, from 3% to 16%. However, a decline in litter cover from 83% to 67% resulted in no change in total protective ground cover. Soil trend remains stable. The thick grass understory, which tillers aggressively under the heavy grazing pressure, offers harsh competition to the sagebrush seedlings. Broom snakeweed has increased since 1983, but the population now has a more stable age class structure. There have been only small changes since the 1983 reading, but all of them indicate a downward trend for sagebrush and values as a winter range. Overall, big game use of the site is light, with some deer use in summer in addition to winter. The large gully through the study site is partially vegetated.

1997 TREND ASSESSMENT

Percent bare ground has declined since 1989 with adequate vegetative and litter cover to guard against significant erosion. Soil trend is stable. Browse trend is stable. Density has increased slightly and the decadency rate has declined, but there are a large number of dead plants that were inventoried (660 plants/acre). More seedling and young plants were encountered this year than anytime in the past. The broom snakeweed density is constantly changing and the height and crown of this species is similar over all years. The herbaceous understory is stable with bulbous bluegrass still dominate. Grass sum of nested frequency has declined since 1989, although it is very similar to that of 1983.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - stable, but dominated by the increaser bulbous bluegrass

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 39

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron intermedium	a ⁻	c ²⁶⁷	b ⁵⁷	-	89	17	2.35
G	Agropyron spp.	a ⁻	b ¹⁰	ab ⁷	-	4	2	.41
G	Agropyron smithii	c ²²⁷	a ⁻	b ¹⁰⁵	87	-	36	.89
G	Bromus inermis	a ³	a ¹³	b ⁸⁹	1	5	30	5.55
G	Poa bulbosa	c ³⁶⁴	a ²⁴⁰	b ³²¹	97	84	91	28.03
G	Poa fendleriana	2	7	2	1	2	1	.00
G	Poa pratensis	ab ⁴⁹	a ²⁵	b ⁵⁸	18	8	20	.95
G	Poa secunda	a ⁻	c ¹⁸⁹	b ¹²	-	55	6	.47
Total for Grasses		645	751	651	204	247	203	38.69
F	Agoseris grandiflora	a ⁸	a ³	b ²³	3	1	10	.24
F	Antennaria rosea	-	4	-	-	2	-	-
F	Arabis spp.	-	1	3	-	1	1	.03

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Artemisia ludoviciana</i>	-	-	3	-	-	1	.85
F	<i>Aster chilensis</i>	185	198	165	58	66	52	9.25
F	<i>Astragalus convallarius</i>	9	6	15	4	2	7	.75
F	<i>Astragalus</i> spp.	-	-	1	-	-	1	.00
F	<i>Brodiaea douglasii</i>	2	-	-	1	-	-	-
F	<i>Cirsium</i> spp.	a-	ab4	b12	-	2	5	.13
F	<i>Cirsium undulatum</i>	b10	a-	c20	4	-	11	.80
F	<i>Collomia linearis</i> (a)	-	-	10	-	-	5	.02
F	<i>Collinsia parviflora</i> (a)	-	-	15	-	-	5	.02
F	<i>Cynoglossum officinale</i>	a-	b6	c24	-	4	11	.27
F	<i>Descurainia pinnata</i> (a)	-	-	3	-	-	1	.00
F	<i>Epilobium paniculatum</i> (a)	-	-	3	-	-	2	.01
F	<i>Erodium cicutarium</i> (a)	-	-	1	-	-	1	.00
F	<i>Erigeron divergens</i>	a49	a44	b143	24	23	60	2.08
F	<i>Eriogonum racemosum</i>	7	4	3	4	2	1	.00
F	<i>Eriogonum umbellatum</i>	-	-	4	-	-	1	.03
F	<i>Galium aparine</i> (a)	-	-	2	-	-	1	.00
F	<i>Lactuca serriola</i>	-	-	7	-	-	4	.07
F	<i>Lupinus sericeus</i>	b100	a42	b115	48	22	51	5.40
F	<i>Medicago sativa</i>	-	-	3	-	-	1	.00
F	<i>Oenothera</i> spp.	a-	a-	b16	-	-	7	.11
F	<i>Polygonum douglasii</i> (a)	-	-	42	-	-	19	.12
F	<i>Taraxacum officinale</i>	a-	a-	b27	-	-	10	.27
F	<i>Tragopogon dubius</i>	ab62	a41	b78	27	18	34	.71
F	Unknown forb-annual	-	-	1	-	-	1	.00
F	Unknown forb-perennial	-	2	-	-	1	-	-
F	<i>Verbascum thapsus</i>	4	2	-	2	1	-	-
F	<i>Vicia americana</i>	c50	a-	b18	23	-	7	.16
F	<i>Zigadenus paniculatus</i>	3	1	5	1	1	2	.03
Total for Forbs		489	358	762	199	146	312	21.44

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 39

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	48	6.21
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	2	.00
B	Gutierrezia sarothrae	15	.96
B	Opuntia spp.	3	-
B	Rosa woodsii	4	.15
Total for Browse		73	7.33

BASIC COVER --

Herd unit 17 , Study no: 39

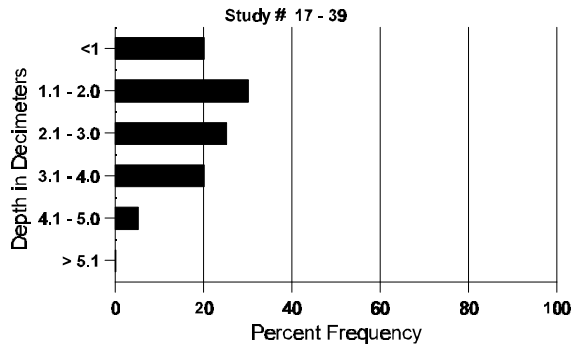
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	377	2.50	16.00	56.77
Rock	25	0	.25	.25
Pavement	150	0	.75	.84
Litter	395	82.50	66.50	36.25
Cryptogams	43	.25	.25	.78
Bare Ground	267	14.75	16.25	8.65

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 39

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
14.8	51.0 (16.2)	5.9	55.4	24.7	19.8	2.4	25.7	579.2	.4

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 39

Type	Quadrat Frequency '97
Elk	3
Deer	3
Cattle	2

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 39

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total			
		1	2	3	4						
Amelanchier alnifolia											
M	83	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	0	22	27	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>			
'83		00%		00%		00%		None			
'89		00%		00%		00%		None			
'97		00%		00%		00%					
Total Plants/Acre (excluding Dead & Seedlings)						'83	0	Dec:	-		
						'89	0		-		
						'97	0		-		

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Artemisia tridentata vaseyana</i>											
S	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	3	-	-	1	-	-	-	4		4
Y	83	1	-	-	-	-	-	-	66		1
	89	-	-	-	-	-	-	-	0		0
	97	9	-	-	-	-	-	-	180		9
M	83	2	5	-	-	-	-	-	466	30 41	7
	89	4	2	-	-	-	-	-	400	22 25	6
	97	22	3	-	-	-	-	-	500	25 37	25
D	83	1	1	-	-	-	-	-	133		2
	89	7	1	-	-	-	-	-	533		8
	97	19	1	-	6	-	-	-	11	- 15	26
X	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	660		33
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>						
'83		60%	00%	00%	+29%						
'89		21%	00%	00%	+22%						
'97		07%	00%	25%							
Total Plants/Acre (excluding Dead & Seedlings)					'83	665	Dec:	20%			
					'89	933		57%			
					'97	1200		43%			
<i>Chrysothamnus nauseosus albicaulis</i>											
M	83	-	-	-	-	-	-	-	0	- -	0
	89	-	-	-	-	-	-	-	0	- -	0
	97	-	1	-	-	-	-	-	1	42 59	1
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>	<u>%Change</u>						
'83		00%	00%	00%	None						
'89		00%	00%	00%	Appeared						
'97		100%	00%	00%							
Total Plants/Acre (excluding Dead & Seedlings)					'83	0	Dec:	-			
					'89	0		-			
					'97	20		-			

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	3	-	-	-	-	-	-	-	-	-	-	-	60	12	14	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'83		00%			00%			00%				None						
'89		00%			00%			00%				Appeared						
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	60		-			
<i>Gutierrezia sarothrae</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	9	-	-	-	-	-	-	-	-	-	-	-	180			9	
Y	83	17	-	-	-	-	-	-	-	-	-	-	-	1133			17	
	89	2	-	-	-	-	-	-	-	-	-	-	-	133			2	
	97	25	-	-	-	-	-	-	-	-	-	-	-	500			25	
M	83	4	-	-	-	-	-	-	-	-	-	-	-	266	11	13	4	
	89	39	-	-	-	-	-	-	-	-	-	-	-	2600	10	7	39	
	97	54	-	-	-	-	-	-	-	-	-	-	-	1080	10	11	54	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	89	5	-	-	-	-	-	-	-	-	-	-	-	333			5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'83		00%			00%			00%				+54%						
'89		00%			00%			00%				-48%						
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1399	Dec:	0%			
												'89	3066		11%			
												'97	1580		0%			

AGE	Y	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	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	6	-	-	-	-	-	-	-	-	6	-	-	-	400		6	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	7	-	-	-	-	-	-	-	-	7	-	-	-	466	7 16	7	
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200	7 23	3	
	97	22	-	-	-	-	-	-	-	-	22	-	-	-	440	7 13	22	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+22%							
'89		00%			00%			00%			-27%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	466	Dec:	-			
												'89	600		-			
												'97	440		-			
Rosa woodsii																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	13	-	-	-	-	-	-	-	-	13	-	-	-	260		13	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20	23 21	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	280		-			

Trend Study 17-40-97

Study site name: Long Hollow .

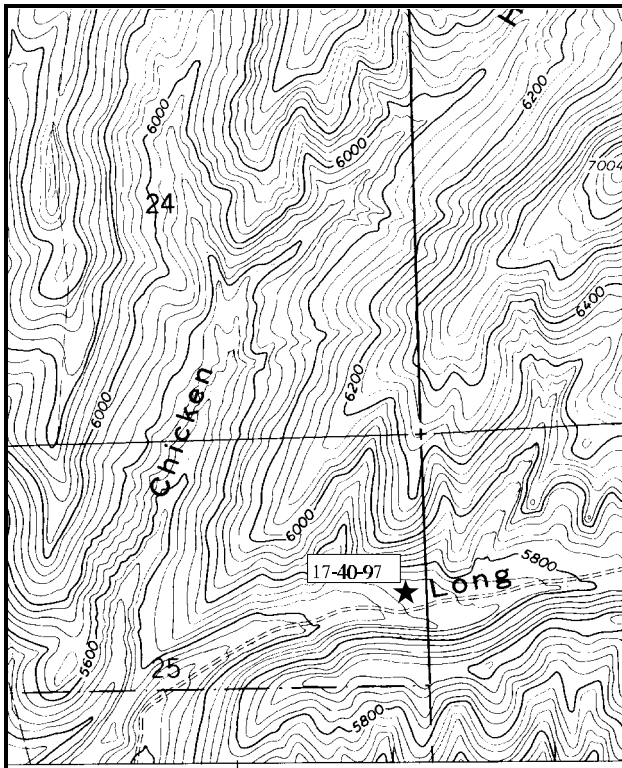
Range type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 354 M degrees. (Line 3-4 71°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

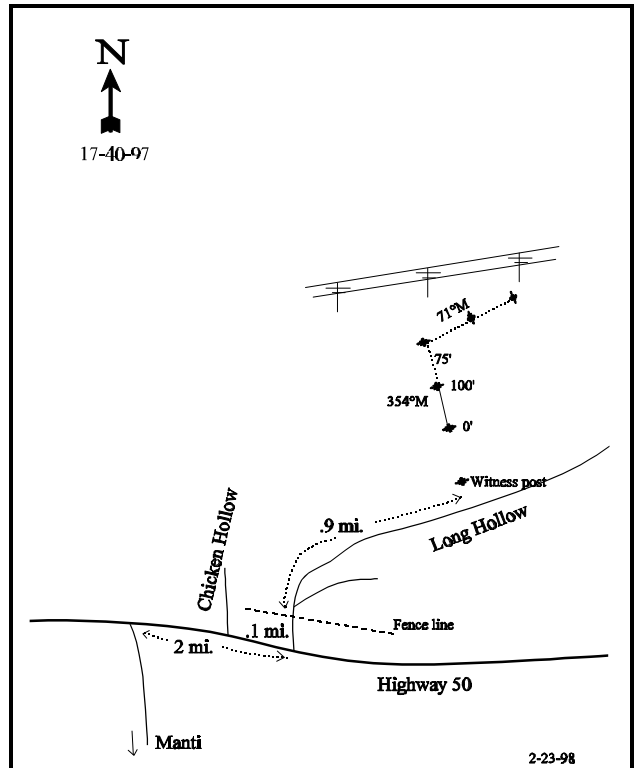
LOCATION DESCRIPTION

Beginning at the intersection of Highway 50 and Long Hollow Road, proceed northerly up Long Hollow for 0.10 miles to a fork. Stay to the left at the fork and proceed an additional 0.90 miles up Long Hollow, to a green steel "T" fencepost on the left side of the road. From the stake, the O-foot marker of the baseline is 15 feet to the north, near a juniper. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3946, is attached to the O-foot baseline stake. High tension powerlines run above the study sight.



Map Name: Billies Mountain, Utah .

Township 9 S , Range 5 E , Section 30



Diagrammatic Sketch

UTM 4428137.048 N, 436903.887 E

DISCUSSION

Trend Study No. 17-40 (27-14)

The Long Hollow study samples critical deer and elk winter range located in Long Hollow, a rather narrow canyon draining directly into the Spanish Fork River. The study is located close to the valley floor on a gentle (5-10%) south slope with an elevation of 5,760 feet. The range type is sagebrush-grass which has been impacted by activities associated with power line construction. Animal use was initially determined as heavy from deer and elk. Cattle and sheep use was reported moderate in the past, but there was no evidence of use in 1997. Long Hollow is obviously an important wintering area for big game as evidenced by the number of pellet groups. Pellet-group quadrat frequency was moderately high for elk (63%) and moderate for deer (32%). Three winter-killed deer carcasses were found on the site in 1983.

Soil is alluvially and colluvially deposited from the surrounding "North Horn" formation, a coarse and well-drained conglomerate. Numerous variable sized cobblestones are distributed throughout the soil profile and on the surface. Soil textural analysis indicates a sandy clay loam with a neutral pH (7.2). Effective rooting depth (see methods) is almost 13 inches with a soil temperature of about 50°F at 14 inches. Vegetative and litter cover are adequate to prevent serious erosion. Percent bare soil accounts for only 2% of the basic ground cover in 1997.

The dominant overstory is a mixed population of basin big sagebrush and mountain big sagebrush, with the latter being the most prevalent. In 1997, the basin big sagebrush and mountain big sagebrush were reported and classified separately in the tables. These were separated by morphological characteristics. As a result, the level of hedging between individual shrubs varies greatly. Also, the new methodology used to estimate density in 1997 shows a reduced combined density of 1,320 plants/acre. Mountain big sagebrush shows light to moderate hedging with all showing good vigor. These plants are not as large as the basin big sagebrush, measuring 26 inches in height and 42 inches in width. Mountain big sagebrush show fairly good biotic potential in 1997 with several seedlings and young plants classified. Basin big sagebrush averages 34 inches in height and 42 inches in width. These plants show little utilization with a slightly higher rate of decadency than mountain big sagebrush. This would be expected with the moderately shallow soils and a species that requires deeper soils to tolerate the long drought we experienced throughout the state (1986-95). Biotic potential for basin big sagebrush was 9%, like that of mountain big sagebrush. Invader and increaser shrubs are also prominent. The past disturbance associated with power line construction and grazing has resulted in substantial populations of broom snakeweed and pricklypear cactus. The white rubber rabbitbrush shows utilization with an estimated density of 3,020 plants/acre. Broom snakeweed density is estimated at 3,840 plants/acre. Other browse includes fourwing saltbush, and stickleaf low rabbitbrush.

Grass composition consists chiefly of cheatgrass and bulbous bluegrass, which together currently provides 72% of the grass cover. Bulbous bluegrass, while scarcely present in 1983, has significantly increased in nested frequency and now provides the bulk of the grass cover. Some seeded grasses remain in the community and include intermediate wheatgrass and crested wheatgrass. Bluebunch wheatgrass nested frequency has slowly increased over all years with a significant increase from 1983 to 1997, but still only contributes only 5% of the grass cover. Sand dropseed nested frequency has remained relatively stable over all years. Other important grasses include bottlebrush squirreltail, Indian ricegrass, bluegrasses, and an occasional patch of Great Basin wildrye.

Forb composition has changed little through the years and is dominated by invaders and increasers. These include stickseed, scarlet globemallow, pale alyssum, storksbill, and white top. Forage value and productivity of the forb component is poor even though it provides 31% of the herbaceous cover.

1983 APPARENT TREND ASSESSMENT

Soil trend is stable or even improving. The extremely rocky and permeable nature of this soil, along with improving shrub cover, limits erosion. Deposition of rocks and soil particles from the upper slopes probably exceeds the erosion rate. The most obvious vegetative trend is a thickening stand of sagebrush which will become increasingly dominated by basin big sagebrush. Differential grazing pressure is allowing it to reproduce faster than mountain big sagebrush. Other shrub species are present but increasing at a slower rate than basin big sagebrush. Grass and forb cover, as well as composition, are fair to poor and relatively stable.

1989 TREND ASSESSMENT

Although extremely rocky and subject to alluvial deposition, the soil on the site has a stable trend. Due to the amount of combined cover (28% rock and pavement cover), there is little bare soil and the overall ground cover is almost unchanged since 1983. Sagebrush shows good recruitment and the age class structure indicates an expanding population. The forbs provide a fairly diverse understory and valuable spring forage for big game. The vegetative trend also appears stable.

1997 TREND ASSESSMENT

Percent bare soil has declined steadily since 1983 to a little less than 2%. At the same time, rock and pavement cover are declining. Vegetation and litter cover are abundant and will prevent serious erosion. Browse trend is stable. Density appears to be lower than reported in the past, but this is a more accurate estimate of the population with a much larger sample size being used. The relatively small number of dead plants cannot explain these estimate losses. Mountain big sagebrush is more highly preferred than basin big sagebrush, therefore it exhibits more utilization. Broom snakeweed and white rubber rabbitbrush have the highest densities at this time. Herbaceous understory trend is up. Nested frequency for grasses has nearly doubled since 1989, with a significant increase in bulbous bluegrass, intermediate wheatgrass, and Kentucky bluegrass. Forb composition is unchanged.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - up, but poor composition, dominated by bulbous bluegrass and cheatgrass

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 40

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	a ²⁷	b ⁵⁰	a ²⁶	12	20	9	2.00
G	Agropyron intermedium	a ⁻	a ⁻	b ³⁶	-	-	11	2.80
G	Agropyron spicatum	a ¹⁸	ab ²¹	b ³⁵	6	9	13	1.68
G	Bromus tectorum (a)	-	-	285	-	-	86	7.91
G	Festuca spp.	a ⁻	a ⁻	b ¹²	-	-	4	.02
G	Oryzopsis hymenoides	-	3	-	-	1	-	-
G	Poa bulbosa	a ⁶	a ¹⁶	b ²²⁹	2	8	66	14.18

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	<i>Poa pratensis</i>	_a 1	_a 2	_b 16	1	1	7	.25
G	<i>Poa secunda</i>	_a 1	_b 40	_a 6	1	16	2	.01
G	<i>Sitanion hystrix</i>	3	8	-	2	3	-	-
G	<i>Sporobolus cryptandrus</i>	76	91	67	32	36	29	1.89
Total for Grasses		132	231	712	56	94	227	30.79
F	<i>Alyssum alyssoides</i> (a)	-	-	69	-	-	29	.22
F	<i>Allium</i> spp.	_a -	_a -	_b 11	-	-	6	.03
F	<i>Arabis</i> spp.	-	1	-	-	1	-	-
F	<i>Artemisia dracunculus</i>	7	5	3	4	2	1	.00
F	<i>Artemisia ludoviciana</i>	_a 101	_b 140	_a 86	39	55	38	2.83
F	<i>Aster</i> spp.	-	8	-	-	2	-	-
F	<i>Astragalus</i> spp.	-	-	4	-	-	2	.01
F	<i>Astragalus utahensis</i>	4	6	3	1	3	1	.15
F	<i>Cardaria draba</i>	-	-	24	-	-	7	2.36
F	<i>Calochortus nuttallii</i>	_{ab} 10	_a 1	_b 18	6	1	9	.06
F	<i>Castilleja</i> spp.	-	-	1	-	-	1	.03
F	<i>Cirsium</i> spp.	14	26	10	7	12	5	.46
F	<i>Cymopterus</i> spp.	-	-	2	-	-	1	.00
F	<i>Cynoglossum officinale</i>	-	-	1	-	-	1	.15
F	<i>Draba</i> spp. (a)	-	-	2	-	-	1	.00
F	<i>Epilobium paniculatum</i> (a)	-	-	1	-	-	1	.00
F	<i>Erodium cicutarium</i> (a)	-	-	64	-	-	24	.63
F	<i>Erigeron divergens</i>	_a -	_a -	_b 16	-	-	7	.37
F	<i>Eriogonum racemosum</i>	3	5	2	3	3	1	.03
F	<i>Hackelia patens</i>	_a 20	_b 51	_c 105	9	27	49	2.51
F	<i>Helianthus annuus</i> (a)	_a -	_b 26	_a 2	-	16	1	.00
F	<i>Lactuca pulchella</i>	_b 50	_a 8	_a 20	24	4	9	.07
F	<i>Lithospermum ruderales</i>	-	4	-	-	3	-	.03
F	<i>Medicago sativa</i>	-	-	2	-	-	1	.45
F	<i>Oenothera</i> spp.	-	-	-	-	-	-	.00
F	<i>Phlox longifolia</i>	_a -	_b 15	_b 9	-	9	4	.02
F	<i>Polygonum douglasii</i> (a)	-	-	9	-	-	3	.01
F	<i>Ranunculus testiculatus</i> (a)	-	-	5	-	-	2	.03

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Sisymbrium altissimum</i> (a)	-	-	3	-	-	1	.03
F	<i>Solidago</i> spp.	_b 16	_a -	_a -	5	-	-	-
F	<i>Sphaeralcea coccinea</i>	_a 44	_a 69	_b 106	19	30	41	3.06
F	<i>Tragopogon dubius</i>	_c 68	_a 1	_b 40	38	1	18	.36
F	<i>Zigadenus paniculatus</i>	1	-	-	1	-	-	-
Total for Forbs		338	366	618	156	169	264	14.00

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 40

Type	Species	Strip Frequency '97	Average Cover % '97
B	<i>Artemisia tridentata</i> <i>tridentata</i>	15	3.11
B	<i>Artemisia tridentata</i> <i>vaseyana</i>	25	4.18
B	<i>Atriplex canescens</i>	7	.19
B	<i>Chrysothamnus nauseosus</i> <i>albicaulis</i>	30	3.86
B	<i>Chrysothamnus viscidiflorus</i> <i>viscidiflorus</i>	1	-
B	<i>Gutierrezia sarothrae</i>	45	.97
B	<i>Juniperus osteosperma</i>	0	1.00
B	<i>Opuntia</i> spp.	6	.04
Total for Browse		129	13.37

BASIC COVER --

Herd unit 17 , Study no: 40

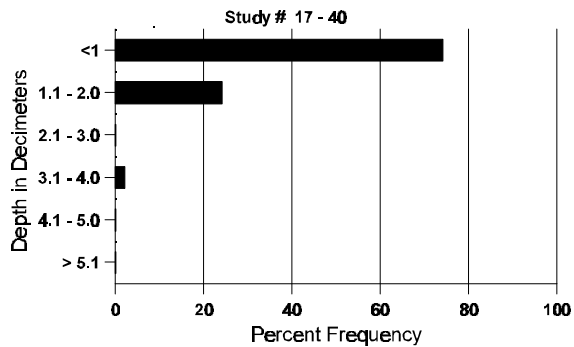
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	383	.50	7.25	48.81
Rock	259	25.50	24.00	17.10
Pavement	141	1.50	4.25	2.41
Litter	394	64.25	59.00	49.95
Cryptogams	150	1.00	1.00	3.50
Bare Ground	94	7.25	4.50	1.49

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 40

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.7	49.2 (14.3)	7.2	51.4	26.7	21.8	2.8	10.6	166.4	.7

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 40

Type	Quadrat Frequency '97
Elk	63
Deer	32

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 40

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Artemisia tridentata tridentata																		
Y	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	2	-	-	-	-	-	2	-	-	-	40		2	
M	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	'97	15	2	-	-	-	-	-	-	-	17	-	-	-	340	34	42	
D	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	3	1	-	-	-	-	-	-	-	2	-	-	2	80		4	
X	'83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	140		7	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		13%			00%			09%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	0%			
												'89	0		0%			
												'97	460		17%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	8	-	-	-	-	-	-	-	-	-	-	-	533			8
	97	4	-	-	-	-	-	-	-	-	-	-	-	80			4
Y	83	35	-	-	-	-	-	-	-	-	-	-	-	2333			35
	89	28	1	-	-	-	-	-	-	-	-	-	-	1933			29
	97	4	-	-	-	-	-	-	-	-	-	-	-	80			4
M	83	18	8	-	-	-	-	-	-	-	-	-	-	1733	26	15	26
	89	27	-	-	2	-	-	-	-	-	-	-	-	1933	23	18	29
	97	13	24	-	-	-	-	-	-	-	-	-	-	740	26	42	37
D	83	2	3	3	-	-	-	-	-	-	-	-	-	533			8
	89	8	3	2	-	-	-	-	-	-	-	-	-	866			13
	97	1	2	-	-	-	-	-	-	-	-	-	-	60			3
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	100			5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		16%			04%			00%			+ 3%						
'89		06%			03%			03%			-81%						
'97		59%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	4599	Dec:	12%		
												'89	4732		18%		
												'97	880		7%		
<i>Atriplex canescens</i>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	9	-	-	-	-	-	-	-	-	-	180	31	33	9
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			None						
'89		00%			00%			00%			Appeared						
'97		00%			90%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-		
												'89	0		-		
												'97	200		-		

A G R E	Y R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus nauseosus albicaulis																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	15	-	-	-	-	-	-	-	-	4	-	-	-	300		15	
M	83	10	-	-	-	-	-	-	-	-	10	-	-	-	666	25 21	10	
	89	6	-	-	-	-	-	-	-	-	6	-	-	-	400	27 31	6	
	97	105	18	5	-	1	-	-	-	-	31	-	1	-	2580	34 35	129	
D	83	13	-	-	-	-	-	-	-	-	13	-	-	-	866		13	
	89	8	1	-	-	-	-	-	-	-	8	-	1	-	600		9	
	97	2	-	4	-	-	-	-	-	1	2	-	-	5	140		7	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	160		8	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-35%							
'89		07%			00%			07%			+67%							
'97		13%			07%			04%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1532	Dec:	57%				
											'89	1000		60%				
											'97	3020		5%				
Chrysothamnus viscidiflorus viscidiflorus																		
M	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200	20 26	3	
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200	13 14	3	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	14 19	1	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	3	-	-	-	-	-	-	-	-	2	-	1	-	200		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+50%							
'89		00%			00%			17%			-95%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	200	Dec:	0%				
											'89	400		50%				
											'97	20		0%				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Gutierrezia sarothrae</i>											
S	83	-	-	-	-	-	-	-	0	0	
	89	-	-	-	-	-	-	-	0	0	
	97	10	-	-	-	-	-	-	200	10	
Y	83	1	-	-	-	-	-	-	66	1	
	89	6	-	-	-	-	-	-	400	6	
	97	104	-	-	-	-	-	-	2080	104	
M	83	44	-	-	-	-	-	-	2933	13 9	44
	89	67	-	-	-	-	-	-	4466	13 13	67
	97	82	-	-	-	-	-	-	1640	11 10	82
D	83	-	-	-	-	-	-	-	0	0	
	89	2	-	-	-	-	-	-	133	2	
	97	6	-	-	-	-	-	-	120	6	
X	83	-	-	-	-	-	-	-	0	0	
	89	-	-	-	-	-	-	-	0	0	
	97	-	-	-	-	-	-	-	20	1	
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>			<u>%Change</u>				
'83		00%	00%	00%			+40%				
'89		00%	00%	00%			-23%				
'97		00%	00%	.52%							
Total Plants/Acre (excluding Dead & Seedlings)					'83	2999	Dec:	0%			
					'89	4999		3%			
					'97	3840		3%			
<i>Opuntia spp.</i>											
Y	83	4	-	-	-	-	-	-	266	4	
	89	8	-	-	-	-	-	-	533	8	
	97	2	-	-	-	-	-	-	40	2	
M	83	7	-	-	-	-	-	-	466	6 10	7
	89	-	-	-	-	-	-	-	0	- -	0
	97	7	-	-	-	-	-	-	140	7 10	7
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>			<u>%Change</u>				
'83		00%	00%	36%			-27%				
'89		00%	00%	00%			-66%				
'97		00%	00%	00%							
Total Plants/Acre (excluding Dead & Seedlings)					'83	732	Dec:	-			
					'89	533		-			
					'97	180		-			

Trend Study 17-41-97

Study site name: Upper Sheep Creek .

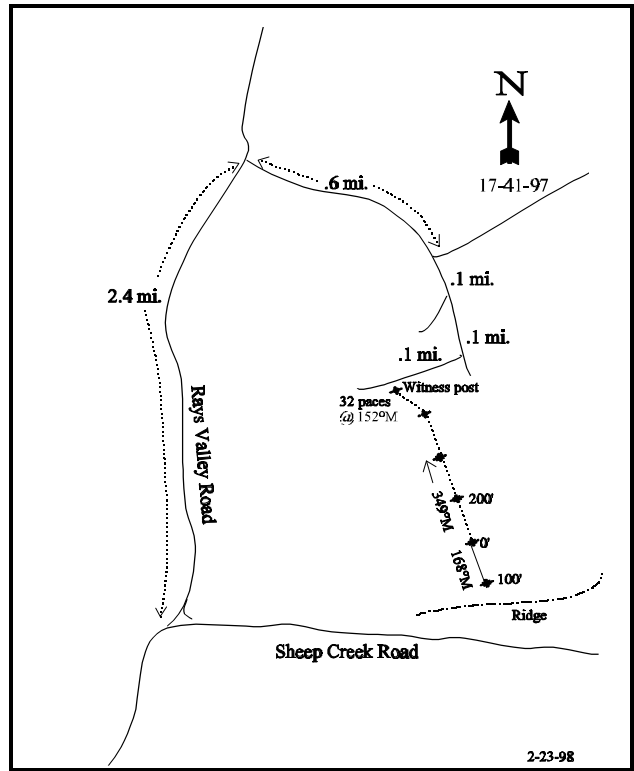
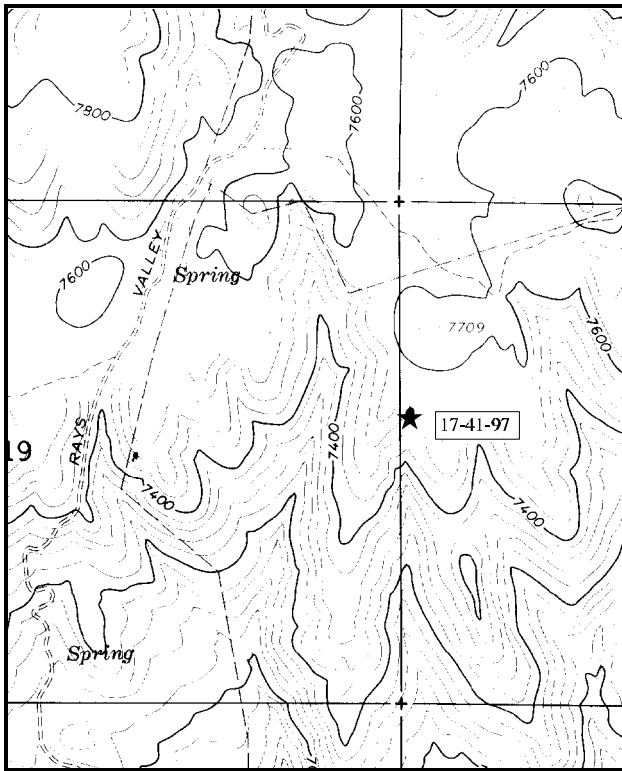
Range type: Mountain Brush

Compass bearing: frequency baseline 168 M degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Beginning at the intersection of Sheep Creek Road and Rays Valley, proceed northerly up Rays Valley Road for 2.40 miles to an intersection (0.20 miles past a cattleguard). Turn right at the intersection and proceed easterly for 0.60 miles to another intersection. Turn right at the intersection and proceed 0.10 miles to a "Y" in the road. Take the left side of the "Y" and proceed another 0.10 miles to a faint road to the right. Turn right on the faint road and proceed 0.10 miles to a green steel "T" fencepost to the left. From the stake, the O-foot stake of the baseline is 32 paces away at an azimuth of 152 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Ray's Valley, Utah .

Diagrammatic Sketch

Township 9 S , Range 5 E , Section 20

DISCUSSION

Trend Study No. 17-41 (27-15)

The Upper Sheep Canyon study is located near the upper limit of deer and elk winter range at 7,400 feet elevation. Due to the elevation, it is unlikely in most winters that any big game are here after mid-November. Some early spring use probably occurs as the snow melts. Wildlife is likely more concentrated near the edge of the ridge where the sun and wind can help keep the snow at a more shallow depth. The study drains to Sheep Creek, but is near the divide with First Water Creek. Slope steepness varies from nearly level to 15% with a south aspect. The vegetation type is mixed mountain brush with the mountain big sagebrush-bitterbrush component being dominant. In 1997, deer pellet groups were moderately abundant, with light use by elk and cattle.

Soil textural analysis indicates a clay soil derived from limestone or shale. Soil pH was neutral (7.2) with an effective rooting depth (see methods) of almost 13 inches and soil temperature of nearly 50°F at 14 inches. Many similar sites in Sheep Creek drainage exhibit considerable erosion. The Sheep Creek drainage is also prone to large land "slumps" or slides. The study area appears fairly stable with good aerial shrub cover and relatively good litter cover. There is currently no erosion apparent.

Browse composition is mixed with excellent production. Currently, mountain big sagebrush density is estimated at 2,160 plants/acre. Utilization is light to moderate, with most plants showing good vigor. As reported in 1983, bitterbrush has a prostrate growth form with a strong layering growth habit. Utilization is moderate to heavy with a mostly mature age structure. Saskatoon serviceberry has an estimated density of 540 plants/acre with excellent biotic potential. Utilization is moderate and plants show good vigor. Density is slightly lower than estimated in the past, but this is due to the improved sampling technique used in 1997. Wyeth eriogonum was sampled for the first time in 1997, while true mountain mahogany was sampled in 1983, but not sampled in 1997. Oregon grape density has increased, yet these plants average only 4 inches in height. Wood's rose density decreased to 840 plants/acre with the much larger sampling size used in 1997, from the estimated 3,732 plants/acre in 1983. Similar to 1983, the remaining shrubs show little evidence of use.

Grass sum of nested frequency has increased since 1983 with significant increases in bluebunch wheatgrass, muttongrass, smooth brome, Kentucky bluegrass, and Letterman's needlegrass. The principal species are all perennials with cheatgrass occurring only occasionally, while only providing one-tenth of one percent of the grass cover. No grass was more than lightly grazed. Nested frequency for forbs increased greatly since 1983. More important forbs on the site include arrowleaf balsamroot and Pacific aster. Overall forage quality of the forb component is good.

1983 APPARENT TREND ASSESSMENT

Overall soil and vegetative trend is stable. Although some sheet erosion and gullying is occurring on the steeper slopes, it is of manageable proportions. Vegetative composition is dominated by a lightly used and vigorous mixture of browse species. Grasses and forbs are subordinate to shrubs, but are still important for the additional forage diversity and soil protection they provide.

1997 TREND ASSESSMENT

Soil trend is stable with abundant vegetative and litter cover to prevent erosion. Browse trend is stable with several palatable species present. Age structure for browse species appear stable with little decadency apparent. Both grass and forb nested frequency values have increased greatly since 1983. This leads to an upward

herbaceous understory trend.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - up

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 41

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'83	'97	'83	'97	
G	Agropyron spicatum	84	*164	41	56	5.03
G	Bromus inermis	-	*45	-	14	1.74
G	Bromus tectorum (a)	-	6	-	2	.01
G	Carex spp.	2	1	2	1	.03
G	Koeleria cristata	-	2	-	1	.03
G	Melica bulbosa	-	*12	-	6	.15
G	Oryzopsis hymenoides	2	4	1	2	.16
G	Phleum pratense	-	9	-	3	.16
G	Poa fendleriana	-	*107	-	43	3.47
G	Poa pratensis	-	*13	-	5	.45
G	Poa secunda	19	*1	9	1	.00
G	Sitanion hystrix	1	-	1	-	-
G	Stipa comata	-	*9	-	4	.36
G	Stipa lettermani	-	*15	-	6	.22
Total for Grasses		108	388	54	144	11.83
F	Achillea millefolium	-	5	-	2	.04
F	Agoseris glauca	-	*32	-	12	.16
F	Allium spp.	1	*107	1	43	1.06
F	Androsace septentrionalis (a)	-	2	-	1	.00
F	Astragalus beckwithii	-	*10	-	5	.22
F	Aster chilensis	-	*19	-	7	.63
F	Aster spp.	9	8	6	3	.04
F	Astragalus spp.	-	*48	-	19	1.56
F	Balsamorhiza sagittata	7	14	4	8	1.12
F	Calochortus nuttallii	-	*18	-	7	.08
F	Castilleja spp.	-	2	-	1	.15

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'83	'97	'83	'97	
F	Chaenactis douglasii	13	*-	7	-	-
F	Cirsium spp.	3	9	1	4	.16
F	Comandra pallida	16	*37	8	16	.22
F	Collinsia parviflora (a)	-	87	-	34	.27
F	Eriogonum umbellatum	9	3	4	1	.15
F	Galium aparine (a)	-	17	-	7	.08
F	Hackelia patens	3	*14	1	7	.37
F	Machaeranthera canescens	6	4	2	3	.01
F	Orobanche fasciculata	-	*30	-	11	.64
F	Orthocarpus spp. (a)	12	*55	6	22	1.28
F	Penstemon humilis	7	7	3	3	.09
F	Penstemon spp.	21	43	11	19	1.00
F	Phlox longifolia	-	*38	-	15	.15
F	Polygonum douglasii (a)	-	49	-	18	.16
F	Senecio integerrimus	-	*58	-	29	.48
F	Streptanthus cordatus	1	-	1	-	-
F	Stanleya pinnata	-	1	-	1	.00
F	Viola spp.	-	*41	-	17	.13
F	Zigadenus paniculatus	-	*14	-	7	.08
Total for Forbs		108	772	55	322	10.43

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 41

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	23	1.68
B	Artemisia tridentata vaseyana	72	12.18
B	Chrysothamnus viscidiflorus viscidiflorus	73	7.76
B	Eriogonum heracleoides	26	1.19
B	Juniperus osteosperma	1	.00
B	Mahonia repens	31	1.91
B	Purshia tridentata	53	12.17
B	Rosa woodsii	14	.99
B	Symphoricarpos oreophilus	68	6.60
Total for Browse		361	44.53

BASIC COVER --

Herd unit 17 , Study no: 41

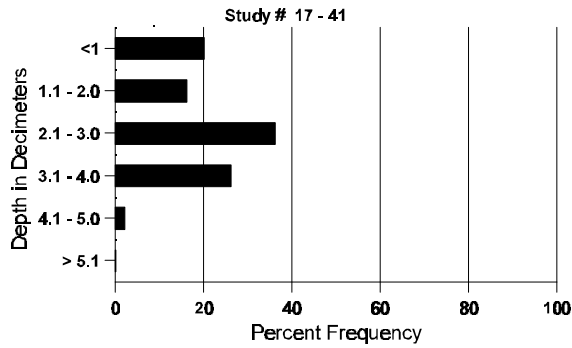
Cover Type	Nested Frequency '97	Average Cover %	
		'83	'97
Vegetation	356	4.25	55.15
Rock	96	7.50	2.80
Pavement	142	16.50	4.88
Litter	396	53.50	54.82
Cryptogams	5	0	.18
Bare Ground	180	18.25	10.18

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 41

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
12.8	41.6 (16.0)	6.6	31.4	22.7	45.8	4.3	17.6	384.0	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 41

Type	Quadrat Frequency '97
Elk	5
Deer	33
Cattle	6

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 41

A Y G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	3	-	-	4	-	-	-	-	-	7	-	-	-	140			7
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	97	3	-	-	1	-	-	-	-	-	4	-	-	-	80			4
M	83	-	17	3	-	-	-	-	-	-	17	-	3	-	1333	30	20	20
	97	11	2	-	2	6	1	-	1	-	23	-	-	-	460	30	35	23
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		77%			14%			14%			-63%							
'97		30%			04%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1466	Dec:	-			
												'97	540		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata vaseyana</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	10	-	-	1	-	-	-	-	-	-	-	-	11	-	-	11	
M	83	13	2	-	-	-	-	-	-	-	-	-	-	8	-	7	15	
	97	59	14	5	1	4	-	-	-	-	-	-	-	83	-	-	83	
D	83	1	1	-	-	-	-	-	-	-	-	-	-	2	-	-	2	
	97	7	5	-	1	1	-	-	-	-	-	-	-	6	-	8	14	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'83		18%			00%			41%				+48%						
'97		22%			05%			07%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	1133	Dec:	12%			
												'97	2160		13%			
<i>Cercocarpus montanus</i>																		
M	83	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'83		100%			00%			00%				Died out						
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	-			
												'97	0		-			
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0			0	
	97	4	-	-	1	-	-	-	-	-	-	-	-	5	-	-	5	
M	83	45	-	-	-	-	-	-	-	-	-	-	-	45	-	-	45	
	97	197	-	-	48	-	-	-	-	-	-	-	-	245	-	-	245	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'83		00%			00%			00%				+40%						
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	3000	Dec:	-			
												'97	5000		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Eriogonum heracleoides</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	1	-	-	-	-	-	3	-	-	-	60		3	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	38	-	-	1	-	-	-	-	-	39	-	-	-	780	6	11	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'97	840		-			
<i>Juniperus osteosperma</i>																		
Y	83	1	-	-	-	-	-	-	-	-	-	1	-	-	66		1	
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
M	83	2	-	-	-	-	-	-	-	-	-	2	-	-	133	55	41	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	115	105	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-90%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	199	Dec:	-			
												'97	20		-			
<i>Mahonia repens</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	24	-	-	5	-	-	-	-	-	29	-	-	-	580		29	
M	83	13	-	-	-	-	-	-	-	-	13	-	-	-	866	4	6	
	97	111	-	-	42	-	-	-	-	-	153	-	-	-	3060	4	6	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+74%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	932	Dec:	-			
												'97	3640		-			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Purshia tridentata</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	2	-	-	5	-	-	-	100		5	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	1	-	-	-	1	-	-	-	3	-	-	-	60		3	
M	83	8	8	-	-	-	-	-	-	-	16	-	-	-	1066	19 26	16	
	97	24	19	20	3	6	3	-	-	-	73	2	-	-	1500	20 43	75	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	1	-	-	-	-	-	-	-	2	-	-	-	40		2	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		50%			00%			00%			+33%							
'97		34%			30%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1066	Dec:	0%				
											'97	1600		3%				
<i>Rosa woodsii</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	1	-	-	-	-	-	1	-	-	-	20		1	
Y	83	52	-	-	-	-	-	-	-	-	42	-	10	-	3466		52	
	97	8	-	-	6	-	-	-	-	-	13	-	-	1	280		14	
M	83	4	-	-	-	-	-	-	-	-	4	-	-	-	266	30 10	4	
	97	16	-	-	11	-	-	-	-	-	26	-	-	1	540	11 12	27	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			18%			-77%							
'97		00%			00%			05%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	3732	Dec:	0%				
											'97	840		2%				

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
Y	83	14	-	-	-	-	-	-	-	-	-	-	-	14	-	-	14	
	97	21	-	-	7	-	-	-	-	-	-	-	-	28	-	-	28	
M	83	64	13	-	-	-	-	-	-	-	-	-	-	74	-	3	77	
	97	141	-	-	49	-	-	-	-	-	-	-	-	190	-	-	190	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	
	97	-	-	1	-	-	-	-	-	-	-	-	1	-	-	20	1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>						<u>%Change</u>				
'83		14%			00%			03%						-28%				
'97		00%			.45%			.45%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	6066	Dec:	0%			
												'97	4380		0%			

Trend Study 17-42-97

Study site name: Tank Hollow .

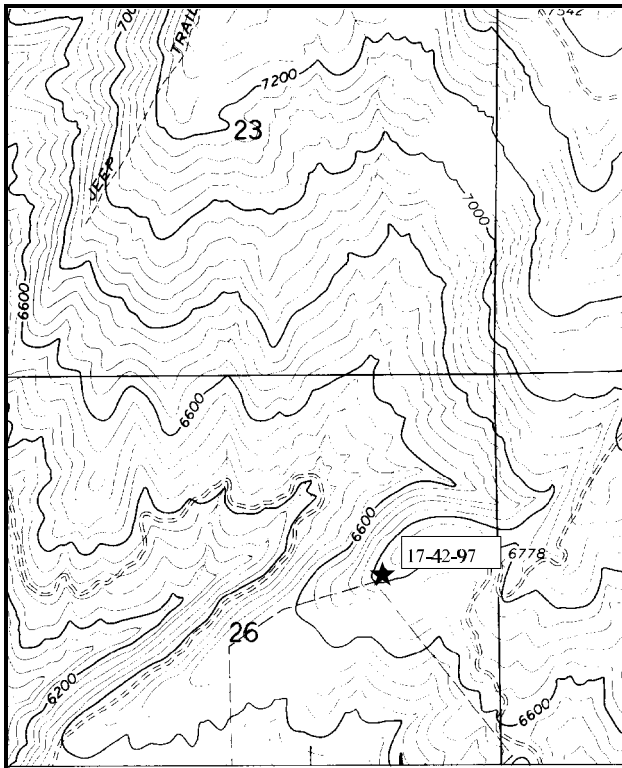
Range Type: Mixed mountain brush

Compass bearing: frequency baseline 191 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

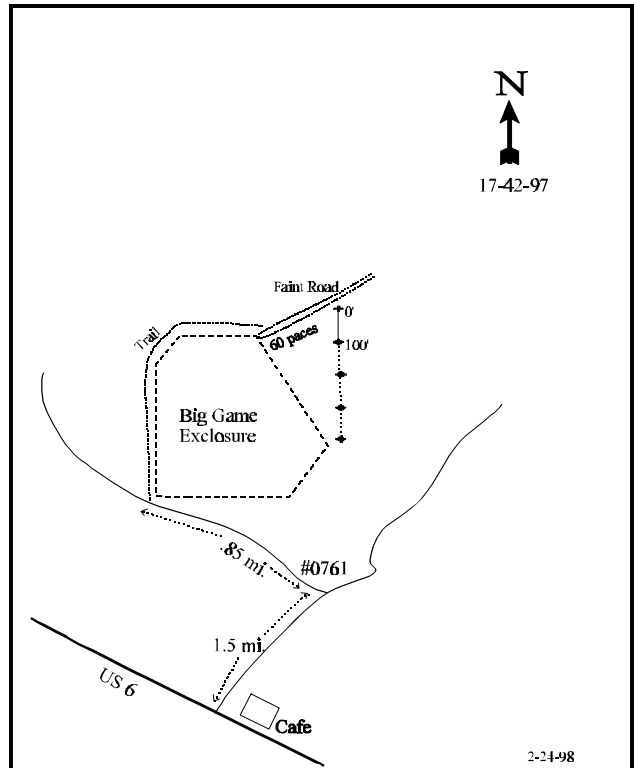
LOCATION DESCRIPTION

Turn north off of Highway US-6 (near mile post 195) onto the new Sheep Creek road. Go 1.5 miles on the paved road to an intersection with Forest Service road #076. Turn left and go west 0.8 miles to a fence. Continue 0.05 miles on the road to the southwest corner of a large enclosure. Park here, and follow the trail along the outside of the enclosure to the northeast corner. Continue 60 paces northeast along an old road, the 0-foot stake is 3 paces off the right side of the road. The study runs south. This study area can also be reached from the north, from Forest Service road #076 (Teat Mountain), but as the secondary road to the enclosure has been closed, it involves a longer hike.



Map Name: Ray's Valley .

Township 9S , Range 5E , Section 26



Diagrammatic Sketch

UTM 4428250.482 N, 471834.146 E

DISCUSSION

Trend Study No. 17-42 (27-16)

The Tank Hollow study is on the south side of a small knoll located immediately north of the large big game exclosure in Tank Hollow. This is a known deer wintering area (38% pellet-group frequency), which in recent years, has experienced increasingly heavy elk use (36% pellet-group frequency). Pellet groups of both species are abundant. Much of the surrounding area is dense oakbrush or north facing mahogany slopes. Below the study site, mixed juniper-pinyon and big sagebrush has been chained and seeded to help improve forage conditions. The study site itself is a mixed mountain brush type on a moderate (20%) south to southeast slope with an elevation of 6,800 feet.

Soil textural analysis indicates it to be a clay loam with a neutral pH (7.1). There are rocks throughout the profile with a B horizon located about 30 inches below the soil surface. Effective rooting depth (see methods) is almost 17 inches and soil temperature is a cool 46 degrees. The soil is limiting for both phosphorous and potassium which could be restrictive to plant development. The site is potentially erodible but currently is relatively stable. A combination of vegetative, litter cover, and moderate slope helps limit erosion. Some slight erosion was reported in the past, but currently there is none apparent.

Mountain big sagebrush density was estimated at 1,720 plants/acre in 1997. Percent decadency, while estimated at 55% in 1989, has dropped to 31% in 1997. The ratio dead to live plants is almost 1 to 5, or 360 plants/acre. It appears that there will be more plants lost in the future with 74% of the decadent plants classified as dying. There were no seedlings, yet a few young plants were encountered (5% of population). Utilization is mostly moderate, where the majority of the use in the past was mostly heavy (56%). The bitterbrush population was currently estimated at 1,960 plants/acre, most of which were classified as mature. Height and crown measurements have doubled since 1989. All plants exhibit good vigor and no decadent or dead plants were encountered. Although true mountain mahogany was mentioned as being on the site in 1983, no plants were sampled until the sample size was greatly enlarged in 1997. The density is now estimated at 320 plants/acre. These plants are heavily hedged but show good vigor. The most abundant shrub is broom snakeweed with an estimated density of 5,420 plants/acre. The age structure of this population would indicate an expanding population at this time. Photo's from all years show an obvious increase in the size of Utah juniper. Point-center quarter data estimates the Utah juniper density at a relatively low 22 trees/acre. Other scattered species include stickyleaf rabbitbrush, snowberry, Gambel oakbrush, Oregon grape, and prickly pear cactus.

Grass composition is moderately diverse with no single species being overly dominate. Sandberg bluegrass nested frequency has significantly increased since 1989. Cheatgrass is scattered throughout the site but is not abundant. Overall, grass utilization is light and vigor is good.

As reported in 1983, forbs are more abundant and certainly more diverse than grasses. Species composition is a mixture that generally is of fair forage value. Utilization of forbs is light and no single species is strongly increasing or decreasing in density.

1983 APPARENT TREND ASSESSMENT

According to the apparent trend evaluation rating, soil trend is stable for all nine graded categories. Vegetative trend is less certain. Mountain big sagebrush may be declining and Utah juniper shows evidence of a slow increase. Other browse species are vigorous but rather heavily hedged. Herbaceous plants are stable and of good quality. The principle threat to this area is increased activity associated with oil and gas exploration and road building activity.

1989 TREND ASSESSMENT

An increase in the percent vegetative basal cover from 1% to 14%, with the concurrent decrease in bare soil from 30 to 23%, indicate a stable trend. On the study site itself, the mountain big sagebrush, bitterbrush, serviceberry and mountain mahogany tend to be heavily hedged, more so than in 1983. The rocky, clay loam soil shows evidence of slight erosion and compaction. With the apparent decline in the key browse species and heavy use on all browse, the vegetative trend is downward. The herbaceous understory is still moderately dense and diverse. The data indicate a fairly stable population.

1997 TREND ASSESSMENT

Soil trend is slightly upward. Vegetative and litter cover are abundant and there is little erosion apparent. Percent bare ground has declined through all years. Browse trend is stable with only slightly less utilization than reported in the past. Biotic potential is low for nearly all species. The herbaceous understory trend is stable. Nested frequency for grasses and forbs has changed only slightly over the years.

TREND ASSESSMENT

soil - slightly upward

browse - stable

herbaceous understory - stable

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 42

T y p e	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	a ₂₉	b ₆₂	b ₈₀	11	23	27	5.39
G	Agropyron intermedium	a ₃₇	b ₅₂	b ₄₉	17	18	16	2.48
G	Agropyron spicatum	48	51	27	20	17	11	1.02
G	Bromus carinatus	6	3	5	2	1	2	.06
G	Bromus tectorum (a)	-	-	70	-	-	27	.93
G	Oryzopsis hymenoides	6	5	6	4	3	2	.06
G	Poa fendleriana	14	13	3	8	5	2	.01
G	Poa pratensis	-	-	5	-	-	2	.66
G	Poa secunda	a ₋	a ₄	b ₄₃	-	2	17	1.38
G	Sitanion hystrix	3	-	-	1	-	-	-
Total for Grasses		143	190	288	63	69	106	12.02
F	Agoseris glauca	-	-	-	-	-	-	.01
F	Allium spp.	a ₁₀	b ₈₃	a ₁₉	6	38	12	.06
F	Arabis spp.	b ₂₉	a ₄	a ₈	14	2	3	.04
F	Artemisia dracunculus	3	-	-	1	-	-	-
F	Astragalus beckwithii	-	-	4	-	-	3	.21

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	<i>Aster chilensis</i>	23	17	24	8	6	8	.93
F	<i>Astragalus convallarius</i>	a-	a-	b10	-	-	4	.04
F	<i>Astragalus</i> spp.	-	-	2	-	-	1	.00
F	<i>Balsamorhiza sagittata</i>	-	-	1	-	-	1	.15
F	<i>Castilleja linariaefolia</i>	-	-	4	-	-	2	.03
F	<i>Camelina microcarpa</i> (a)	-	-	14	-	-	6	.05
F	<i>Chenopodium album</i>	-	-	2	-	-	1	.00
F	<i>Chaenactis douglasii</i>	ba62	a7	a-	31	3	-	-
F	<i>Cirsium</i> spp.	55	36	50	29	18	25	1.75
F	<i>Collomia linearis</i> (a)	-	-	8	-	-	4	.02
F	<i>Comandra pallida</i>	ab19	b27	a3	8	12	2	.02
F	<i>Collinsia parviflora</i> (a)	-	-	23	-	-	8	.04
F	<i>Crepis acuminata</i>	a7	b45	b56	4	23	26	.57
F	<i>Cryptantha</i> spp.	7	-	-	4	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	7	-	-	3	.01
F	<i>Eriogonum brevicaule</i>	ab8	b9	a-	3	5	-	-
F	<i>Erigeron pumilus</i>	-	-	1	-	-	1	.00
F	<i>Hackelia patens</i>	58	69	79	26	35	36	3.04
F	<i>Lappula occidentalis</i> (a)	-	-	5	-	-	2	.01
F	<i>Linum lewisii</i>	a42	a27	b161	20	16	61	6.36
F	<i>Lithospermum ruderales</i>	6	16	5	5	6	2	.33
F	<i>Lomatium</i> spp.	a-	b44	b33	-	22	18	.24
F	<i>Machaeranthera canescens</i>	b75	a3	a7	39	2	3	.06
F	<i>Microsteris gracilis</i> (a)	-	-	5	-	-	2	.01
F	<i>Penstemon humilis</i>	19	11	8	8	7	3	.06
F	<i>Phlox longifolia</i>	b86	b102	a45	38	39	20	.29
F	<i>Polygonum douglasii</i> (a)	-	-	1	-	-	1	.00
F	<i>Senecio multilobatus</i>	3	4	7	1	2	4	.09
F	<i>Streptanthus cordatus</i>	6	4	9	2	2	3	.16
F	<i>Taraxacum officinale</i>	-	3	-	-	2	-	-
F	<i>Tragopogon dubius</i>	b30	a4	a17	19	2	7	.06
F	<i>Veronica biloba</i> (a)	-	-	155	-	-	49	1.44
F	<i>Vicia americana</i>	a21	a23	b74	10	12	31	1.54

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Viola spp.	-	-	3	-	-	1	.00
F	Zigadenus paniculatus	_{ab} 2	_b 9	_a -	2	5	-	-
Total for Forbs		571	547	850	278	259	353	17.74

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 42

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	8	.56
B	Artemisia tridentata vaseyana	63	13.34
B	Cercocarpus montanus	12	1.14
B	Chrysothamnus viscidiflorus viscidiflorus	23	1.96
B	Gutierrezia sarothrae	53	1.99
B	Juniperus osteosperma	4	2.49
B	Mahonia repens	1	.03
B	Opuntia spp.	1	-
B	Purshia tridentata	55	9.88
B	Quercus gambelii	3	.41
B	Symphoricarpos oreophilus	25	2.11
Total for Browse		248	33.94

BASIC COVER --

Herd unit 17 , Study no: 42

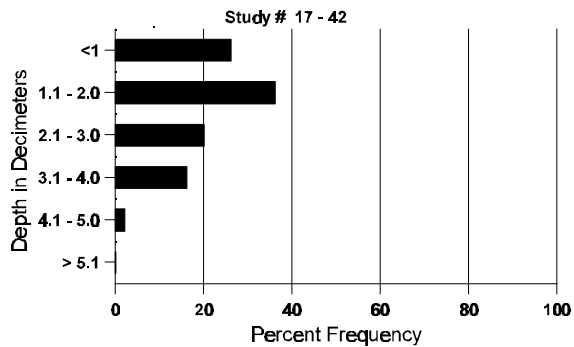
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	358	1.25	14.00	52.99
Rock	155	4.50	5.75	4.18
Pavement	155	3.25	6.25	1.67
Litter	396	61.00	51.25	53.51
Cryptogams	26	0	0	.31
Bare Ground	234	30.00	22.75	11.94

SOIL ANALYSIS DATA --

Herd Unit 17 Study no: 42

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
16.5	46.4 (17.3)	7.1	25.4	34.7	39.8	3.4	6.9	64.0	.7

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 42

Type	Quadrat Frequency '97
Rabbit	1
Elk	36
Deer	38

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 42

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Amelanchier alnifolia																	
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	1	-	-	1	-	-	2	-	-	-	40		2
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	2	2	-	-	-	-	-	-	-	4	-	-	-	80		4
M	83	-	1	-	-	-	-	-	-	-	1	-	-	-	66	25 17	1
	89	-	-	-	-	1	-	-	-	-	1	-	-	-	66	23 15	1
	97	2	-	1	2	-	1	-	-	-	6	-	-	-	120	32 33	6
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	1	-	-	1	-	-	-	66		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		100%			00%			00%			+50%						
'89		50%			00%			00%			+34%						
'97		20%			20%			00%									
Total Plants/Acre (excluding Dead & Seedlings)												'83	66	Dec:	0%		
												'89	132		50%		
												'97	200		0%		

AGE	Y	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.		
<i>Artemisia tridentata vaseyana</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	1	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	2	-	-	2	-	-	-	-	-	4	-	-	-	80		4	
M	83	4	12	10	-	-	-	-	-	-	26	-	-	-	1733	31 37	26	
	89	1	5	11	-	1	-	-	-	-	18	-	-	-	1200	24 43	18	
	97	14	29	8	2	2	-	-	-	-	55	-	-	-	1100	30 46	55	
D	83	1	6	3	-	-	-	-	-	-	10	-	-	-	666		10	
	89	6	5	13	-	-	1	-	-	-	19	-	1	5	1666		25	
	97	3	16	3	3	2	-	-	-	-	7	-	-	20	540		27	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	360		18	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		50%			36%			00%			+20%							
'89		27%			56%			13%			-43%							
'97		57%			13%			23%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	2399	Dec:	28%			
												'89	2999		56%			
												'97	1720		31%			
<i>Cercocarpus montanus</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	-	3	10	-	-	2	-	-	-	14	1	-	-	300	33 40	15	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		19%			75%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	320		-			

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total		
		1	2	3	4		1	2			
<i>Chrysothamnus viscidiflorus viscidiflorus</i>											
S	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	20		1
Y	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	5	-	-	-	-	-	-	100		5
M	83	6	-	-	-	-	-	-	400	10 17	6
	89	8	-	-	-	-	1	-	600	11 13	9
	97	68	-	-	-	-	-	-	1360	12 17	68
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>			<u>%Change</u>				
'83		00%	00%	00%			+33%				
'89		00%	00%	00%			+59%				
'97		00%	00%	00%							
Total Plants/Acre (excluding Dead & Seedlings)					'83	400	Dec:				
					'89	600					
					'97	1460					
<i>Gutierrezia sarothrae</i>											
S	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	20	-	-	-	-	-	-	400		20
Y	83	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	0		0
	97	60	-	-	-	-	-	-	1200		60
M	83	36	-	-	-	-	-	-	2400	12 8	36
	89	42	-	-	5	-	1	-	3200	10 10	48
	97	210	-	-	-	-	-	-	4200	10 10	210
D	83	-	-	-	-	-	-	-	0		0
	89	8	-	-	-	-	-	-	533		8
	97	1	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>	<u>Heavy Use</u>	<u>Poor Vigor</u>			<u>%Change</u>				
'83		00%	00%	00%			+36%				
'89		00%	00%	07%			+31%				
'97		00%	00%	00%							
Total Plants/Acre (excluding Dead & Seedlings)					'83	2400	Dec:				
					'89	3733		14%			
					'97	5420		0%			

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Juniperus osteosperma</i>																		
M	83	1	-	1	-	-	-	-	-	-	2	-	-	-	133	67	12	2
	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66	106	79	1
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	82	79	4
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			50%			00%			-50%							
'89		00%			00%			00%			+18%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	133	Dec:	-				
											'89	66		-				
											'97	80		-				
<i>Mahonia repens</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20			1
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	3	-	-	3	-	-	-	60	3	6	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	80		-				
<i>Opuntia spp.</i>																		
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	4	5	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	20		-				

AGE	Y	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.		
<i>Purshia tridentata</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20		1	
Y	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	89	-	-	-	1	-	-	-	-	-	1	-	-	-	66		1	
	97	6	7	1	-	-	-	-	-	-	14	-	-	-	280		14	
M	83	20	4	4	-	-	-	-	-	-	27	1	-	-	1866	16 19	28	
	89	-	7	12	-	3	1	-	-	-	23	-	-	-	1533	15 24	23	
	97	4	22	19	2	22	15	-	-	-	84	-	-	-	1680	29 49	84	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	1	5	1	-	-	-	-	-	-	7	-	-	-	466		7	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		13%			13%			00%			- 0%							
'89		48%			45%			00%			- 5%							
'97		52%			36%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	2066	Dec:	0%				
											'89	2065		23%				
											'97	1960		0%				
<i>Quercus gambelii</i>																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	1	-	-	1	-	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	51 35	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'89	0		-				
											'97	140		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Symphoricarpos oreophilus																	
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	83	7	-	-	-	-	-	-	-	-	7	-	-	-	466		7
	89	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5
M	83	27	-	-	-	-	-	-	-	-	27	-	-	-	1800	19 14	27
	89	3	6	-	6	1	-	13	-	-	13	-	-	16	1933	15 14	29
	97	17	-	-	28	-	-	-	-	-	45	-	-	-	900	18 36	45
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			- 6%						
'89		22%			00%			50%			-53%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	2266	Dec:	-			
											'89	2133		-			
											'97	1000		-			

Trend Study 17-43-97

Study site name: Tie Fork .

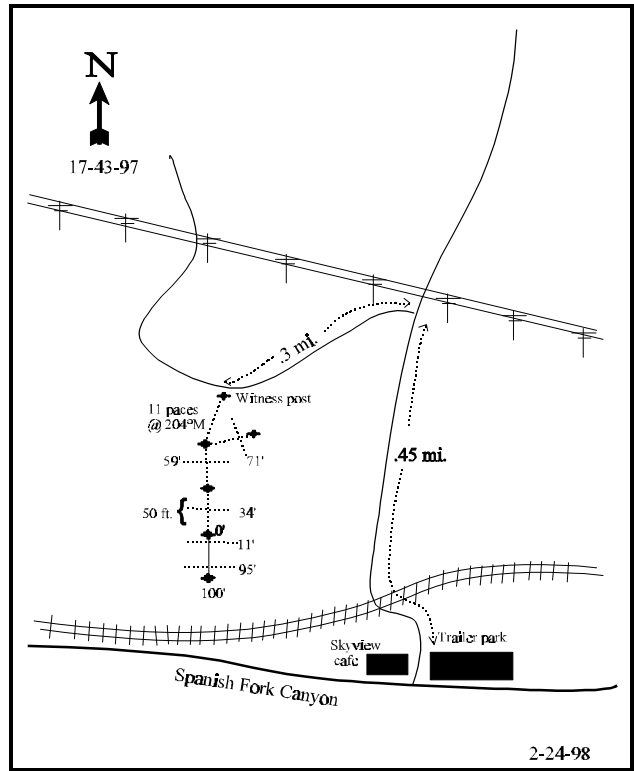
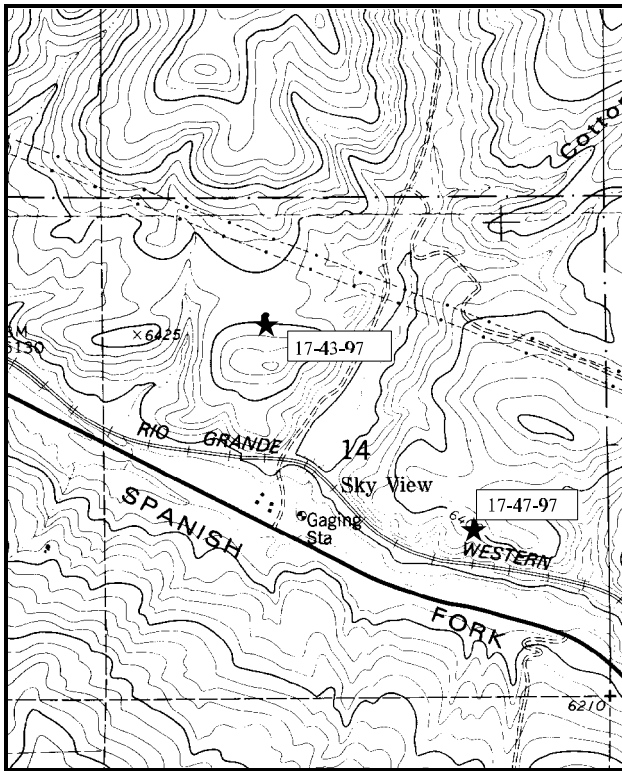
Range type: Pinyon-Juniper

Compass bearing: frequency baseline 180 degrees. (Line 4 85°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the intersection of the road in Spanish Fork Canyon and Tie Fork, proceed north, up Tie Fork to where the road crosses the railroad tracks. From the railroad crossing, continue northward up Tie Fork for an additional 0.45 miles to an intersection just before the powerlines. Turn left (i.e., west) and proceed 0.30 miles to where the road turns sharply northward. A stake is located on the left side of the road just before the bend. From the stake, the 300-foot baseline stake is located 11 paces away at an azimuth of 204 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Tucker, Utah .

Diagrammatic sketch

Township 10 S , Range 6 E , Section 14

DISCUSSION

Trend Study No. 17-43 (27-17)

The Tie Fork study is located on deer winter range in lower Tie Fork Canyon. Much of the surrounding area is badly eroded and depleted of quality forage plants. This site may be a poor representation of winter range (perhaps the reason the site was not inventoried in 1989) and should be closely looked at before sampling again in the future. Typically, juniper-pinyon predominates but is interrupted periodically by mountain brush slopes and sagebrush in the canyon bottoms. The study samples a slightly more productive juniper-pinyon type located on a moderate north facing slope (15-20%) at an elevation of 6,200 feet. Deer pellet group frequency was moderately high in 1997 (35%). During 1983, two deer carcasses, three antler drops, and at least 12 sets of deer legs were observed. During 1997, deer legs were again encountered and likely came from a nearby deer camp.

Soil is in relatively good condition when compared to surrounding south and west slopes, which are badly eroded and support almost no understory species. Textural analysis indicates a sandy clay loam with an effective rooting depth of almost 18 inches with a low soil temperature of only 44%. Phosphorous could be limiting to plant development with a value less than 10 ppm (8.7 ppm). Erosion is rapid enough to quickly move pellet groups and loose litter downslope, but this is localized and not wide spread.

Browse composition is divided into two levels of availability. Juniper and pinyon are abundant but largely unavailable because of excessive height. Point-center quarter data estimates 212 Utah juniper trees/acre, 33 pinyon trees/acre, and 27 Gambel oakbrush stems/acre. Most of the available browse comes from sub-dominant shrubs such as mountain big sagebrush, snowberry, stickyleaf low rabbitbrush, low growing Gambel oak, Saskatoon serviceberry, Wood's rose, true mountain mahogany, and an occasional antelope bitterbrush. The key preferred management species are mountain big sagebrush and true mountain mahogany. Together they only provide 3% of the total browse cover. Both were reported heavily hedged in 1983, but now exhibit light to moderate hedging. In 1983, mountain big sagebrush had poor vigor and consisted primarily of decadent plants. Vigor has improved, although 50% of the population are still classified as decadent. Currently the dead to live ratio is almost 2 dead for every live plant. Mahogany is in better vigor with only mature plants classified. The population is much less than originally estimated, but this is because of the much larger sample sized giving significantly better estimates for shrub populations that have discontinuous distributions, for there are no dead plants in the population to explain the decline. Snowberry provides a significant percentage of the forage as it contributes to 29% of the total browse cover and shows light to moderate use and good vigor.

Nested frequency for grass species has increased significantly since 1983. Many more palatable grasses that were not present in 1983 were now sampled. Nearly all grasses have significantly increased in nested frequency. The principle species include bluebunch wheatgrass, Kentucky bluegrass, Indian ricegrass, and crested wheatgrass.

Similar to the grasses, forb nested frequency has also greatly increased. The most common species include longleaf phlox, starwort, Hoods phlox, Utah fewflower peavine, and blue-eyed Mary. Utilization of forbs is uniformly light.

1983 APPARENT TREND ASSESSMENT

Although in better condition than most of the surrounding area, the study site still has a slight declining trend. The rate of soil erosion although steady, is not rapid. However, it is great enough to prevent any significant litter buildup. Vegetatively, juniper and pinyon appear to continue to thicken, while mountain big sagebrush is

rapidly declining. Other browse species appear stable, or in some cases, even increasing. The herbaceous understory is stable or slightly declining in density.

1997 TREND ASSESSMENT

Erosion is still slight and will probably always occur on this site due to the majority of the vegetative cover being aerial cover not herbaceous cover. Protective cover closer to the ground is more effective than aerial cover. Soil trend is stable. Browse trend is slightly upward. Mountain big sagebrush vigor has improved, although there are currently more dead plants than live plants. The age structure for most species indicate stable populations with little biotic potential. The herbaceous understory trend is upward with an increase in nested frequency for grasses and forbs. Many new grasses were encountered in 1997 that were not previously encountered.

TREND ASSESSMENT

soil - stable

browse - stable, stable for most species, but down for sagebrush which now only makes up 2% of the browse cover

herbaceous understory - up

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 43

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'83	'97	'83	'97	
G	Agropyron cristatum	3	*32	1	12	.93
G	Agropyron spicatum	32	*110	16	38	3.11
G	Bromus tectorum (a)	-	*19	-	7	.09
G	Oryzopsis hymenoides	-	*50	-	20	1.44
G	Poa fendleriana	-	*21	-	10	.20
G	Poa pratensis	35	59	17	19	1.62
G	Stipa comata	-	*25	-	9	.78
G	Stipa lettermani	-	*24	-	9	.34
Total for Grasses		70	340	34	124	8.52
F	Achillea millefolium	8	18	3	8	.31
F	Agoseris glauca	-	*18	-	7	.03
F	Alyssum alyssoides (a)	-	11	-	6	.17
F	Allium spp.	-	1	-	1	.00
F	Androsace septentrionalis (a)	13	*4	7	2	.01
F	Arabis spp.	5	-	3	-	-
F	Astragalus convallarius	4	*24	2	12	.25
F	Calochortus nuttallii	-	2	-	2	.01

T y p e	Species	Nestcd Frequency		Quadrat Frequency		Average Cover % '97
		'83	'97	'83	'97	
F	Collomia linearis (a)	-	9	-	3	.01
F	Collinsia parviflora (a)	-	78	-	32	.33
F	Cymopterus spp.	-	17	-	8	.12
F	Cynoglossum officinale	3	-	1	-	-
F	Delphinium bicolor	-	33	-	17	.11
F	Eriogonum umbellatum	4	8	3	4	.09
F	Geranium spp.	12	1	5	1	.00
F	Hackelia patens	3	6	1	2	.06
F	Ipomopsis aggregata	-	3	-	1	.00
F	Lathyrus pauciflorus	6	*47	2	17	2.27
F	Machaeranthera canescens	7	-	3	-	.00
F	Opuntia spp.	-	3	-	1	.00
F	Penstemon caespitosus	-	*26	-	11	.64
F	Phlox hoodii canescens	14	*57	5	21	2.21
F	Phlox longifolia	6	*105	3	40	.85
F	Polygonum douglasii (a)	-	4	-	2	.01
F	Schoenrambe linifolia	-	5	-	2	.03
F	Senecio integerrimus	-	4	-	4	.02
F	Solidago spp.	2	1	1	1	.03
F	Stipa comata	-	2	-	1	.03
F	Stellaria jamesiana	-	*79	-	26	1.83
F	Taraxacum officinale	-	6	-	3	.04
F	Tragopogon dubius	-	2	-	1	.00
F	Viola spp.	-	*5	-	4	.02
Total for Forbs		87	579	39	240	9.57

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

BROWSE TRENDS --

Herd unit 17 , Study no: 43

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	1	-
B	Artemisia tridentata vaseyana	8	.33
B	Cercocarpus montanus	2	.15
B	Chrysothamnus depressus	6	.21
B	Chrysothamnus viscidiflorus viscidiflorus	40	4.14
B	Juniperus osteosperma	15	5.94
B	Opuntia spp.	4	.03
B	Pinus edulis	1	.15
B	Quercus gambelii	21	2.44
B	Rosa woodsii	4	-
B	Symphoricarpos oreophilus	70	5.63
B	Tetradymia canescens	1	.15
Total for Browse		173	19.19

BASIC COVER --

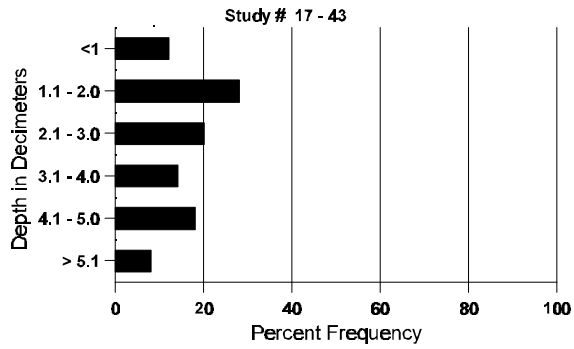
Herd unit 17 , Study no: 43

Cover Type	Nested Frequency '97	Average Cover % '83 '97	
Vegetation	345	.50	31.01
Rock	53	4.00	1.14
Pavement	123	1.00	3.32
Litter	396	60.75	44.08
Cryptogams	148	1.50	4.92
Bare Ground	229	32.25	23.31

SOIL ANALYSIS DATA --
 Herd Unit 17, Study no: 43

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
17.8	43.8 (17.5)	7.3	55.4	20.7	23.8	4.4	8.7	339.2	.6

Stoniness Index



PELLET GROUP FREQUENCY --
 Herd unit 17 , Study no: 43

Type	Quadrat Frequency '97
Rabbit	15
Elk	5
Deer	35

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 43

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
<i>Amelanchier alnifolia</i>																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	2	-	-	-	40		2	
D	83	-	1	-	-	-	-	-	-	-	1	-	-	66		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		100%		00%		00%		-39%									
'97		00%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	66	Dec:	100%				
										'97	40		0%				
<i>Artemisia tridentata vaseyana</i>																	
M	83	2	-	-	-	-	-	-	-	1	-	1	-	133	24	16	2
	97	4	-	-	-	-	-	-	-	4	-	-	-	80	20	29	4
D	83	-	3	-	-	-	-	-	-	-	-	3	-	200		3	
	97	4	-	-	-	-	-	-	-	3	-	-	1	80		4	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	300		15	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		60%		00%		80%		-52%									
'97		00%		00%		13%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	333	Dec:	60%				
										'97	160		50%				
<i>Cercocarpus montanus</i>																	
M	83	-	4	4	-	-	-	-	-	8	-	-	-	533	39	33	8
	97	-	2	-	-	-	-	-	-	2	-	-	-	40	22	24	2
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>									
'83		50%		50%		00%		-92%									
'97		100%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'83	533	Dec:	-				
										'97	40		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus depressus																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	23	-	-	-	-	-	-	-	-	23	-	-	-	460	7	14	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	0	Dec:	-				
											'97	500		-				
Chrysothamnus viscidiflorus viscidiflorus																		
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	14	-	-	-	-	-	-	-	-	14	-	-	-	280		14	
M	83	20	-	-	-	-	-	-	-	-	20	-	-	-	1333	17	19	
	97	115	-	-	-	-	-	-	-	-	115	-	-	-	2300	14	15	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+44%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1466	Dec:	0%				
											'97	2620		2%				

AGE	Y	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.		
Juniperus osteosperma																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	83	1	-	-	-	-	-	-	1	-	-	-	2	-	133	67	44	2
	97	18	-	-	-	-	-	-	-	-	18	-	-	-	360	-	-	18
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			100%			+67%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	133	Dec:	-				
											'97	400		-				
Opuntia spp.																		
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
M	83	5	-	-	-	-	-	-	-	-	5	-	-	-	333	3	12	5
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100	4	11	5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-50%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	399	Dec:	-				
											'97	200		-				
Pinus edulis																		
S	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
Y	83	3	-	-	-	-	-	-	-	-	3	-	-	-	200		3	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-90%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	200	Dec:	-				
											'97	20		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Quercus gambelii																		
S	83	2	-	-	-	-	-	-	-	-	2	-	-	-	133		2	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
Y	83	22	-	-	-	-	-	-	-	-	22	-	-	-	1466		22	
	97	49	2	-	-	-	-	-	-	-	51	-	-	-	1020		51	
M	83	2	9	-	18	9	-	-	-	-	35	-	3	-	2533	67 20	38	
	97	106	2	-	-	-	-	-	-	-	108	-	-	-	2160	50 34	108	
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	2	-	-	-	-	-	-	-	2	-	-	-	40		2	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	12	-	-	-	-	-	-	-	-	12	-	-	-	620		31	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		30%			00%			05%			-19%							
'97		04%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	3999	Dec:	0%				
											'97	3220		1%				
Rosa woodsii																		
Y	83	9	-	-	-	-	-	-	-	-	6	3	-	-	600		9	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3	
M	83	1	-	-	-	-	-	-	-	-	-	1	-	-	66	17 12	1	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	17 14	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			-82%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	666	Dec:	-				
											'97	120		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
<i>Symphoricarpos oreophilus</i>													
S	83	3	-	-	-	-	-	-	3	200		3	
	97	15	-	-	-	-	-	-	15	300		15	
Y	83	77	-	-	-	-	-	-	77	5133		77	
	97	78	-	-	-	-	-	-	78	1560		78	
M	83	57	27	-	-	-	-	-	74	5600	21 16	84	
	97	255	-	-	-	-	-	-	255	5100	16 24	255	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		17%		00%		06%		-38%					
'97		00%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	10733	Dec:	-
										'97	6660		-
<i>Tetradymia canescens</i>													
M	83	-	-	-	-	-	-	-	-	0	- -	0	
	97	-	2	-	-	-	-	-	2	40	8 10	2	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'83		00%		00%		00%		Appeared					
'97		100%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'83	0	Dec:	-
										'97	40		-

Trend Study 17-44-97

Study site name: Billies Mountain .

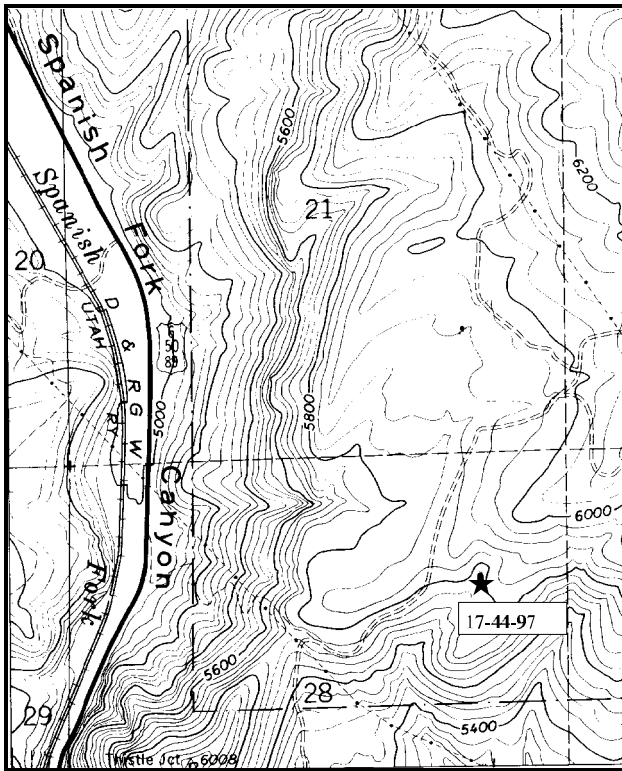
Range Type: Big sagebrush-grass

Compass bearing: frequency baseline 204 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

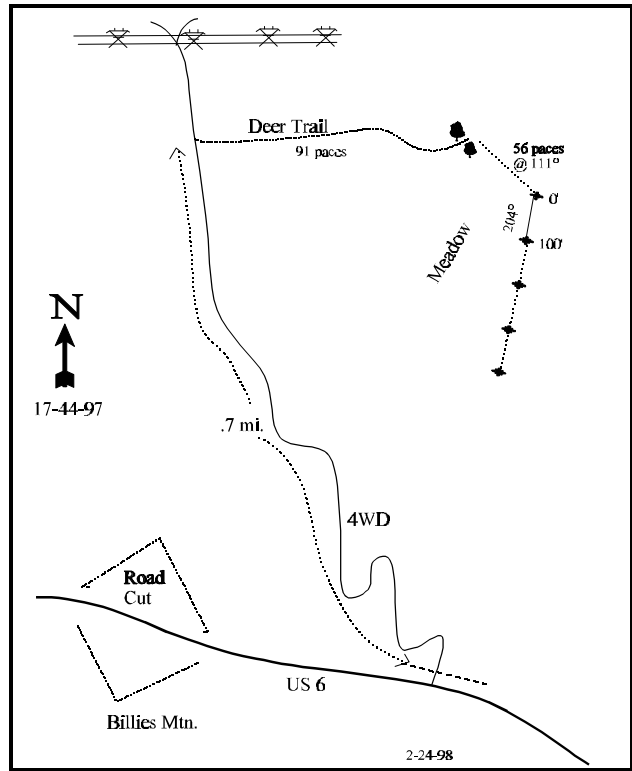
LOCATION DESCRIPTION

On Highway 6 and 89, east of the new road cut through Billies Mountain and 0.9 miles west of the junction of Route 89 south to Manti and US 6, turn north onto a dirt road. Cross a cattle guard and follow the road up 0.7 miles to where it breaks out into a sagebrush/grass flat. On the right, at the head of a small drainage, a game trail heads east towards a small meadow. Follow this trail approximately 150 yards to 2 large junipers at the edge of the meadow. From the junipers, walk up the near slope 56 paces bearing 111 degrees to the 0-foot baseline stake. This fencepost is marked by browse tag number 3951.



Map Name: Billies Mountain .

Township 9S , Range 4E , Section 28



Diagrammatic Sketch

UTM 4428269.689 N , 458870.125 E

DISCUSSION

Trend Study No. 17-44 (27-18)

The Billies Mountain study is located east of the deep road cut constructed in 1983 due to the Billies Mountain mudslide. The study samples deer winter range at 5,800 feet elevation. Slope varies from 5 to 20% with a south, southwest aspect. The range type is big sagebrush-grass with a variety of other shrubs interspersed throughout. In 1983, deer use was moderate to heavy while elk and cattle use was light. In 1989, it was reported that deer were using the site year round with little elk sign evident. The allotment was rested in 1989 from livestock use. Presently, deer and elk use appears moderate to heavy with little cattle use.

Soil is relatively deep, grey in color, and only lightly rocky. Textural analysis indicates a clay soil with an effective rooting depth (see methods) of 21 inches. Temperature measured at 18 inches is 49°F. Soil phosphorous is quite low and could be limiting to plant development. The study site is located near the head of a small swale where sedimentation is common. Ground cover from vegetation is good with no erosion apparent at this time.

The key browse species is mountain big sagebrush. This population appears to have some basin big sagebrush characteristics but was identified as mountain big sagebrush. A more accurate density estimate made in 1997 indicates 1,260 plants/acre. Utilization is moderate and percent decadency has decreased since 1989. This is still a mostly decadent stand with a dead to live ratio of 1:1½. It appears that this trend will continue with 74% of the decadent plants classified as dying. Currently, the bitterbrush density is estimated at 540 plants/acre. This is a mature population with heavy utilization but still maintaining good vigor. Other browse species include gray horsebrush, snowberry, Wood's rose, broom snakeweed, chokecherry, white rubber rabbitbrush, stickyleaf rabbitbrush, dwarf rabbitbrush, and Saskatoon serviceberry. These populations have changed very little since 1983.

As reported in 1983, grass composition remains exceptionally diverse. Cheatgrass is present but will likely not expand due to competition with other species. Bluebunch wheatgrass nested frequency has increased in all years and provides 20% of the herbaceous cover. Bulbous bluegrass nested frequency has significantly increased since 1989 as has Sandberg bluegrass. Although Kentucky bluegrass nested frequency has declined since 1989, it still provides 15% of the herbaceous cover.

Forbs are also abundant and diverse. In addition to those forbs in the data summary, species such as arrowleaf balsamroot, Lewis flax, false aster, and oneflower helianthella can be found. Nested frequency for perennial forbs has increased each year since 1983 with average forage quality and composition.

1983 APPARENT TREND ASSESSMENT

Soil trend is stable. Ground cover, in the form of vegetation and litter, is good to excellent and only minimal erosion is occurring. Vegetative trend is declining. Mountain big sagebrush is in poor health and not adequately reproducing. In contrast, grasses, forbs and to a lesser extent mountain snowberry appear to all be expanding. Intense spring livestock grazing might be a viable management option to encourage reproduction of shrubs.

1989 TREND ASSESSMENT

The soil trend is stable. Although disturbed soil has a high erosion hazard, the protective cover maintains minimal erosion. The browse trend is slightly downward. Although the causes are not clear at this time, the big sagebrush appears to be continuing its decline through increased decadence and lack of recruitment. As with several other studies on this herd unit, the data shows an increased percentage of vegetative ground cover. The herbaceous understory, still very diverse and productive, does not appear to have expanded significantly. Grass frequency is the same, while forb frequency only slightly increased.

1997 TREND ASSESSMENT

The soil trend is slightly upward. Erosion was noticeable in the past but it does not appear to be occurring at this time. Percent bare soil has declined and there is adequate vegetative and litter cover to protect the soil. The browse trend is slightly upward as well. Utilization and percent decadency of the key species, mountain big sagebrush, has declined. Past heavy utilization and the growing competition of the herbaceous understory are likely the cause of this decadent mountain big sagebrush stand which has only marginal reproductive potential (seedlings 2%) and replacement plants (only 5% young plants). Other species, with the exception of bitterbrush, are only lightly utilized and do not appear to be expanding at this time. The herbaceous understory trend is slightly upward with an increase in nested frequency for grasses and forbs.

TREND ASSESSMENT

soil - slightly upward

browse - down for sagebrush which contributes 37% of the browse cover

herbaceous understory - slightly upward

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 44

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	Agropyron cristatum	-	-	11	-	-	5	.48
G	Agropyron smithii	a-	ab6	b13	-	2	5	.05
G	Agropyron spicatum	a149	ab182	b202	55	69	66	8.94
G	Agropyron trachycaulum	a9	b22	a-	3	10	-	-
G	Bromus inermis	-	-	7	-	-	2	.30
G	Bromus tectorum (a)	-	-	60	-	-	21	.87
G	Carex spp.	6	-	-	2	-	-	-
G	Elymus glaucus glaucus	b9	a-	ab3	4	-	1	.63
G	Koeleria cristata	24	4	26	9	3	9	.70
G	Melica bulbosa	14	24	38	6	12	13	1.52
G	Oryzopsis hymenoides	4	2	-	2	1	-	-
G	Poa bulbosa	a5	a7	b58	2	3	19	1.60
G	Poa fendleriana	b37	a16	a13	17	6	6	.66

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
G	<i>Poa pratensis</i>	_a 99	_b 156	_{ab} 126	39	61	41	6.76
G	<i>Poa secunda</i>	_a -	_a 1	_b 69	-	1	30	1.58
G	<i>Sitanion hystrix</i>	_{ab} 16	_b 23	_a 7	9	10	2	.06
G	<i>Stipa lettermani</i>	_{ba} 44	_a 22	_a 10	21	9	5	.31
Total for Grasses		416	465	643	169	187	225	24.50
F	<i>Achillea millefolium</i>	_b 89	_a 32	_a 33	37	17	16	1.06
F	<i>Alyssum alyssoides</i> (a)	-	-	2	-	-	1	.00
F	<i>Allium</i> spp.	_a 3	_b 15	_b 22	1	10	10	.05
F	<i>Antennaria rosea</i>	10	-	-	3	-	-	-
F	<i>Artemisia ludoviciana</i>	37	55	42	15	21	17	1.49
F	<i>Astragalus convallarius</i>	68	82	58	30	36	24	.78
F	<i>Aster chilensis</i>	_b 301	_b 310	_a 225	97	97	74	8.27
F	<i>Astragalus</i> spp.	3	7	-	1	4	-	-
F	<i>Astragalus utahensis</i>	12	14	14	5	7	6	.25
F	<i>Camelina microcarpa</i> (a)	-	-	16	-	-	6	.13
F	<i>Calochortus nuttallii</i>	11	19	21	7	13	11	.05
F	<i>Cirsium</i> spp.	_a 7	_a 21	_b 47	6	11	23	1.50
F	<i>Collomia linearis</i> (a)	-	-	7	-	-	4	.02
F	<i>Comandra pallida</i>	_a -	_a -	_b 11	-	-	6	.03
F	<i>Crepis acuminata</i>	-	-	6	-	-	3	.02
F	<i>Cymopterus</i> spp.	_a -	_a -	_b 9	-	-	5	.07
F	<i>Cynoglossum officinale</i>	-	-	5	-	-	3	.01
F	<i>Epilobium paniculatum</i> (a)	-	-	81	-	-	33	.51
F	<i>Eriogonum brevicaule</i>	4	6	11	2	3	5	.10
F	<i>Eriogonum umbellatum</i>	-	3	5	-	1	2	.01
F	<i>Galium aparine</i> (a)	-	-	29	-	-	11	.56
F	<i>Hackelia patens</i>	11	2	12	5	1	6	.03
F	<i>Helianthus annuus</i> (a)	1	-	-	1	-	-	-
F	<i>Lactuca serriola</i>	_a -	_b 12	_c 33	-	6	14	.24
F	<i>Lithospermum ruderale</i>	-	-	1	-	-	1	.03
F	<i>Melilotus officinalis</i>	_c 113	_b 10	_a -	33	4	-	-
F	<i>Medicago sativa</i>	_a -	_a -	_b 18	-	-	7	.35
F	<i>Petradora pumila</i>	_a -	_a -	_b 25	-	-	11	1.05

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover % '97
		'83	'89	'97	'83	'89	'97	
F	Phlox longifolia	_a 4	_c 128	_b 67	2	56	27	.21
F	Polygonum douglasii (a)	-	-	2	-	-	1	.00
F	Taraxacum officinale	1	1	-	1	1	-	-
F	Tragopogon dubius	12	16	31	7	10	12	.90
F	Vicia americana	_a -	_a -	_b 131	-	-	48	2.65
F	Viguiera multiflora	17	22	30	12	11	14	.56
Total for Forbs		704	755	994	265	309	401	21.01

Values with different subscript letters are significantly different at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 44

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	2	.03
B	Artemisia tridentata vaseyana	50	4.69
B	Chrysothamnus depressus	7	.03
B	Chrysothamnus nauseosus albicaulis	21	.48
B	Chrysothamnus viscidiflorus viscidiflorus	24	1.67
B	Gutierrezia sarothrae	17	.31
B	Juniperus osteosperma	2	1.78
B	Prunus virginiana	1	.15
B	Purshia tridentata	14	1.89
B	Rosa woodsii	3	.15
B	Symphoricarpos oreophilus	9	1.16
B	Tetradymia canescens	9	.30
Total for Browse		159	12.67

BASIC COVER --

Herd unit 17 , Study no: 44

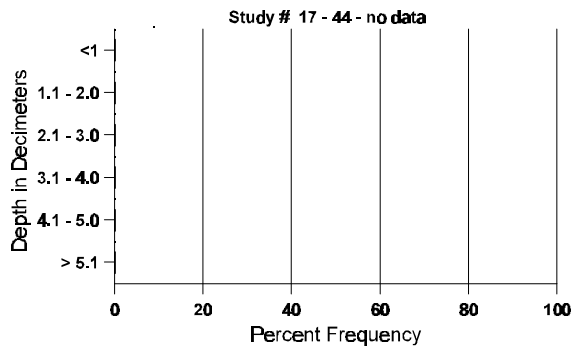
Cover Type	Nested Frequency '97	Average Cover %		
		'83	'89	'97
Vegetation	377	5.25	12.50	46.86
Rock	56	.50	.75	.68
Pavement	197	1.25	4.75	1.09
Litter	398	64.00	58.25	54.79
Cryptogams	52	0	0	1.70
Bare Ground	251	29.00	23.75	14.87

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 44

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
21.1	49.0 (17.7)	7.4	23.4	20.7	55.8	2.2	4.6	323.2	.7

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 44

Type	Quadrat Frequency '97
Elk	25
Deer	37
Cattle	2

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 44

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total								
		1	2	3	4		1	2									
<i>Amelanchier alnifolia</i>																	
Y	83	-	1	-	-	-	-	-	-	1	-	-	-	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	2	-	-	-	-	-	-	-	-	-	66	34	40	2
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	1	-	-	-	-	-	-	-	2	-	-	40	21	25	2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		33%			67%			00%			Died out						
'89		00%			00%			00%			Appeared						
'97		50%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	99	Dec:	-				
										'89	0		-				
										'97	40		-				
<i>Artemisia tridentata vaseyana</i>																	
S	83	3	-	-	-	-	-	-	-	-	3	-	-	100		3	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	20		1	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	60		3	
M	83	4	19	10	-	-	-	-	-	-	25	-	8	1100	22	34	33
	89	3	3	4	-	-	-	-	-	-	9	1	-	333	24	20	10
	97	8	18	-	-	-	-	-	-	-	26	-	-	520	27	37	26
D	83	5	19	13	-	-	-	-	-	-	1	-	36	1233		37	
	89	10	38	15	-	-	-	-	-	-	51	3	1	2100		63	
	97	17	15	1	1	-	-	-	-	-	9	-	-	680		34	
X	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	860		43	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		54%			33%			63%			+ 4%						
'89		56%			26%			12%			-48%						
'97		52%			02%			40%									
Total Plants/Acre (excluding Dead & Seedlings)										'83	2333	Dec:	53%				
										'89	2433		86%				
										'97	1260		54%				

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total
		1	2	3	4	5	6	7	8	9	1	2	3	4			
Chrysothamnus depressus																	
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
M	83	4	-	-	-	-	-	-	-	-	4	-	-	-	133	9 11	4
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0
	97	22	-	-	-	-	-	-	-	-	22	-	-	-	440	8 11	22
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		00%			00%			00%			Died out						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	133	Dec:	-			
											'89	0		-			
											'97	460		-			
Chrysothamnus nauseosus albicaulis																	
Y	83	1	1	-	-	-	-	-	-	-	2	-	-	-	66		2
	89	5	-	-	-	-	-	-	-	-	5	-	-	-	166		5
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
M	83	6	3	-	-	-	-	-	-	-	9	-	-	-	300	18 13	9
	89	9	-	-	1	-	-	-	-	-	10	-	-	-	333	20 17	10
	97	29	1	-	-	-	-	-	-	-	30	-	-	-	600	19 19	30
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	89	6	1	-	-	-	-	-	-	-	6	1	-	-	233		7
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'83		36%			00%			00%			+50%						
'89		05%			00%			00%			-10%						
'97		03%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'83	366	Dec:	0%			
											'89	732		32%			
											'97	660		0%			

AGE	YGR	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																		
Y	83	3	-	-	-	-	-	-	-	-	3	-	-	-	100			3
	89	10	-	-	1	-	-	-	-	-	11	-	-	-	366			11
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	83	22	-	-	-	-	-	-	-	-	22	-	-	-	733	16	13	22
	89	35	-	-	-	-	-	-	-	-	35	-	-	-	1166	14	16	35
	97	33	-	-	-	-	-	-	-	-	33	-	-	-	660	15	18	33
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	5	-	-	-	-	-	-	-	-	4	-	1	-	166			5
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+51%							
'89		00%			00%			02%			-59%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	833	Dec:	0%			
												'89	1698		10%			
												'97	700		3%			
Gutierrezia sarothrae																		
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
M	83	10	-	-	-	-	-	-	-	-	10	-	-	-	333	9	8	10
	89	19	-	-	-	-	-	-	-	-	19	-	-	-	633	9	10	19
	97	30	-	-	-	-	-	-	-	-	30	-	-	-	600	9	8	30
D	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	89	1	-	-	-	-	-	-	-	-	-	-	-	1	33			1
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			+40%							
'89		00%			00%			05%			+28%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	399	Dec:	0%			
												'89	666		5%			
												'97	920		4%			

AGE	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Juniperus osteosperma																		
S	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	40		-			
Prunus virginiana																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	83	-	4	-	-	-	-	-	-	-	3	-	1	-	133		4	
	89	6	-	-	-	-	-	-	-	-	6	-	-	-	200		6	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60	16 16	3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		100%			00%			25%			+34%							
'89		00%			00%			00%			-70%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	133	Dec:	-			
												'89	200		-			
												'97	60		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Purshia tridentata</i>																		
Y	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	83	2	3	2	-	-	-	-	-	-	7	-	-	-	233	16 33	7	
	89	8	1	-	-	-	-	-	-	9	-	-	-	300	16 29	9		
	97	1	6	14	-	3	-	-	-	24	-	-	-	480	20 37	24		
D	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	-	1	1	-	-	-	-	-	-	-	-	2	40		2		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		38%			25%			00%			+11%							
'89		11%			00%			00%			+44%							
'97		37%			56%			07%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	266	Dec:	0%			
												'89	300		0%			
												'97	540		7%			
<i>Rosa woodsii</i>																		
Y	83	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0		0		
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	83	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0		
	89	-	-	-	-	-	-	-	-	-	-	-	-	0	- -	0		
	97	3	-	-	-	-	-	-	-	3	-	-	-	60	10 13	3		
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			None							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'83	0	Dec:	-			
												'89	0		-			
												'97	100		-			

A G E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
S	83	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	83	25	1	-	-	-	-	-	-	-	22	4	-	-	866			26
	89	17	-	-	-	-	-	-	-	-	17	-	-	-	566			17
	97	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
M	83	6	6	1	-	-	-	-	-	-	8	4	1	-	433	13	14	13
	89	14	-	-	9	-	-	-	-	-	23	-	-	-	766	17	11	23
	97	4	-	-	1	-	-	-	-	-	5	-	-	-	100	20	47	5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		18%			03%			03%			+ 2%							
'89		00%			00%			00%			-76%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	1299	Dec:	-				
											'89	1332		-				
											'97	320		-				
Tetradymia canescens																		
Y	83	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	5	-	-	1	-	-	-	-	-	6	-	-	-	120			6
M	83	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	20	-	-	-	-	-	-	-	-	20	-	-	-	400	10	14	20
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'83		00%			00%			00%			Died out							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'83	66	Dec:	-				
											'89	0		-				
											'97	520		-				

Trend Study 17-45-97

Study site name: North Bench .

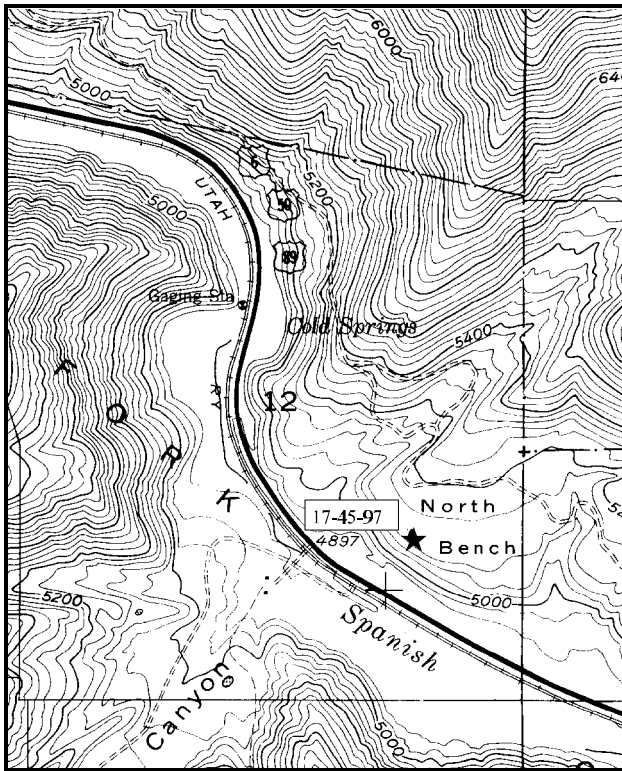
Range Type: Big sagebrush

Compass bearing: frequency baseline 162 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

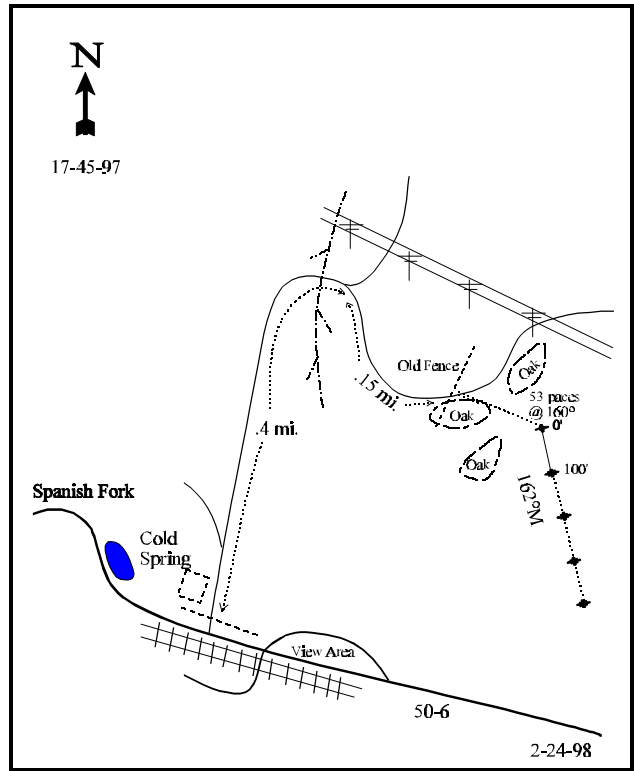
LOCATION DESCRIPTION

From the west side of the view area in lower Spanish Fork Canyon (about 3.5 miles up from the mouth) look for a dirt road going up through a gate and by an old corral. Take this rough road for 0.4 miles to an intersection. Turn right and go 0.15 miles to the top of the bench and an old fence line. From the wood post near the left hand side of the road, walk 53 paces bearing 160 degrees into the sage flat. The first stake marks the 0-foot end of the baseline. The remainder of the study stakes are south at 100 foot intervals.



Map Name: Spanish Fork Peak .

Township 9S , Range 3E , Section 12



Diagrammatic Sketch

UTM 4432580.314 N, 453862.333 E

DISCUSSION

Trend Study No. 17-45 (27-19)

The North Bench trend was established in 1989 and is located on a 40 acre piece of private land in lower Spanish Fork Canyon. The study samples a sagebrush/grass flat. These type of communities are a limited type in the bottom of the oakbrush dominated canyon and should be the first areas to reflect the pressures of increasing deer use. In both 1989 and 1997, deer sign has been reportedly light. The top of the bench cannot be seen from the major highway and Spanish Fork River below. The bench has a south southeast aspect and gentle slope of 3-5% and an elevation of 5,100 feet.

Soil textural analysis indicates a loamy soil with a slightly acidic pH (6.1). Effective rooting depth (see methods) is estimated to be 20 inches with an average temperature of 44.6°F at about 18 inches. Few rocks were encountered in the soil profile and there is an argillic horizon about 10 inches below the soil surface. There are currently no erosion problems due to abundant and well dispersed vegetative cover in conjunction with the gentle slope.

Mountain big sagebrush is the obvious key species with an estimated density of 5,500 plants/acre in 1997. Percent decadency was high in 1989 and the population has since recovered to where it is only at 8%. These plants continue to be vigorous with light hedging. Many seedlings were encountered (reproductive potential of 27%) and 56% of the population were classified as young. This population appears to be expanding with few decadent plants encountered. Mountain big sagebrush cover is estimated to be nearly 9% in 1997, or 88% of the browse cover. The broom snakeweed population is also healthy and appears that the proportions of plants (seedlings and young) indicate it to be an expanding population. A single white rubber rabbitbrush plant was encountered in 1997. Clumps of large mature oak occur on the slopes near the bench and dominate the hills above, providing escape and thermal cover until leaf-drop.

Bulbous bluegrass is the dominate grass providing an almost continuous ground cover. Nested frequency for several species, including bulbous bluegrass and Kentucky bluegrass, have significantly increased in 1997. Conversely, Sandberg bluegrass nested frequency has significantly declined. Cheatgrass was encountered but is in low abundance.

Forb abundance and cover are low with yellow salsify, autumn willoweed, hairy goldaster, curlycup gumweed, and common dandelion. Most of these species indicate past excessive grazing and even with rest they will persist a long time on the site.

1989 APPARENT TREND ASSESSMENT

The soil trend is stable. As with several other studies on this herd unit, trend indicators point to a declining big sagebrush population. It is an older, decadent stand with only fair vigor and many dying plants. The sagebrush are not overused, there is just no reproduction. A year favorable to seedling establishment could quickly change the direction of long-term trend.

1997 TREND ASSESSMENT

The soil trend continues to be stable. Dense vegetative cover provided by bulbous bluegrass will prevent erosion as well as the gentle slope. Browse trend is upward with a more healthy stand of mountain big sagebrush after some self thinning with the extended drought. The population is still relatively dense. Many young and seedling plants were encountered indicating an expanding population. Broom snakeweed also has a healthy population

with an age class distribution indicating it will likely expand. The herbaceous understory trend is upward. Many new species were encountered in 1997, greatly raising the nested frequency for forbs. A better species composition would be desired.

TREND ASSESSMENT

soil - stable

browse - upward, even with the losses to sagebrush because its density is still relatively high

herbaceous understory - upward

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 45

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	202	198	73	67	9.33
G	Bromus tectorum (a)	-	14	-	4	.07
G	Dactylis glomerata	5	12	2	6	.70
G	Poa bulbosa	144	*358	55	96	31.65
G	Poa pratensis	43	*135	17	45	4.02
G	Poa secunda	314	*13	91	6	.45
Total for Grasses		708	730	238	224	46.24
F	Artemisia ludoviciana	-	3	-	1	.15
F	Aster chilensis	-	4	-	2	.15
F	Cirsium spp.	-	*25	-	12	.68
F	Comandra pallida	1	-	1	-	-
F	Collinsia parviflora (a)	-	2	-	1	.00
F	Cynoglossum officinale	-	*63	-	27	.72
F	Epilobium paniculatum (a)	-	152	-	61	.40
F	Erigeron pumilus	1	*31	1	14	.15
F	Grindelia squarrosa	25	*80	8	35	1.09
F	Helianthus annuus (a)	35	28	19	12	.25
F	Heterotheca villosa	-	131	-	54	3.53
F	Lactuca serriola	6	6	2	3	.01
F	Lithospermum spp.	47	*-	21	-	-
F	Lupinus sericeus	-	*20	-	10	.95
F	Melilotus officinalis	-	4	-	2	.15
F	Medicago sativa	1	*14	1	6	.90
F	Polygonum douglasii (a)	-	3	-	1	.00
F	Taraxacum officinale	-	*53	-	23	1.07

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Tragopogon dubius	61	*205	31	80	2.44
Total for Forbs		177	824	84	344	12.69

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

BROWSE TRENDS --

Herd unit 17 , Study no: 45

Type	Species	Strip Frequency '97	Average Cover % '97
B	Artemisia tridentata vaseyana	89	8.82
B	Chrysothamnus nauseosus albicaulis	1	-
B	Gutierrezia sarothrae	27	1.20
Total for Browse		117	10.02

BASIC COVER --

Herd unit 17 , Study no: 45

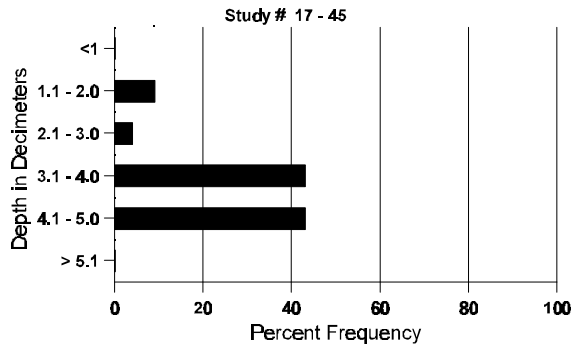
Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	396	24.00	59.20
Rock	20	.75	.10
Pavement	88	1.25	.28
Litter	394	58.25	39.26
Cryptogams	86	0	.97
Bare Ground	259	15.75	10.44

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 45

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
20.0	44.6 (17.7)	6.1	36.7	36.4	26.8	1.7	27.3	227.2	.4

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 45

Type	Quadrat Frequency '97
Deer	1
Cattle	2

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 45

A Y E	G R	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.	
<i>Artemisia tridentata vaseyana</i>																		
S	89	4	-	-	-	-	-	-	-	-	4	-	-	-	266		4	
	97	73	-	-	1	-	-	-	-	-	74	-	-	-	1480		74	
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	66		1	
	97	155	-	-	-	-	-	-	-	-	155	-	-	-	3100		155	
M	89	14	4	-	-	-	-	-	-	-	16	2	-	-	1200	29	31	18
	97	88	8	-	-	-	-	-	-	-	95	1	-	-	1920	36	42	96
D	89	23	3	-	-	-	-	-	-	-	24	-	2	-	1733		26	
	97	23	1	-	-	-	-	-	-	-	12	-	-	12	480		24	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	860		43	
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>										
'89		16%		00%		04%		+45%										
'97		03%		00%		04%												
Total Plants/Acre (excluding Dead & Seedlings)												'89	2999	Dec:	58%			
												'97	5500		9%			

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus nauseosus albicaulis</i>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20	27	46	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	20		-			
<i>Gutierrezia sarothrae</i>																	
S	89	7	-	-	-	-	-	-	-	-	-	-	-	466			7
	97	55	-	-	-	-	-	-	-	-	-	-	-	1100			55
Y	89	3	-	-	-	-	-	-	-	-	-	-	-	200			3
	97	66	-	-	-	-	-	-	-	-	-	-	-	1320			66
M	89	3	-	-	-	-	-	-	-	-	-	-	-	200	6	8	3
	97	101	-	-	-	-	-	-	-	-	-	-	-	2020	6	7	101
D	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	3	-	-	-	-	-	-	-	-	-	-	-	60			3
X	89	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			+88%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	400	Dec:	0%			
											'97	3400		2%			

Trend Study 17-46-97

Study site name: Lower Tank Hollow .

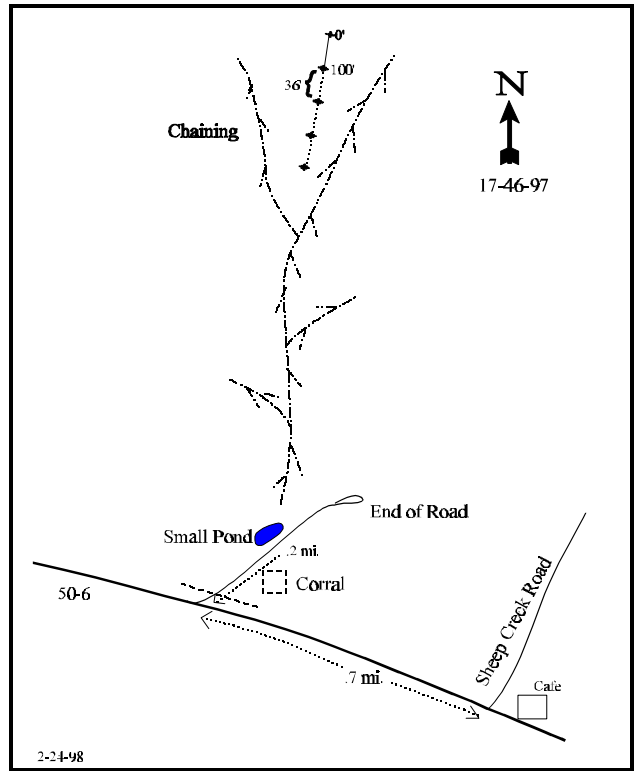
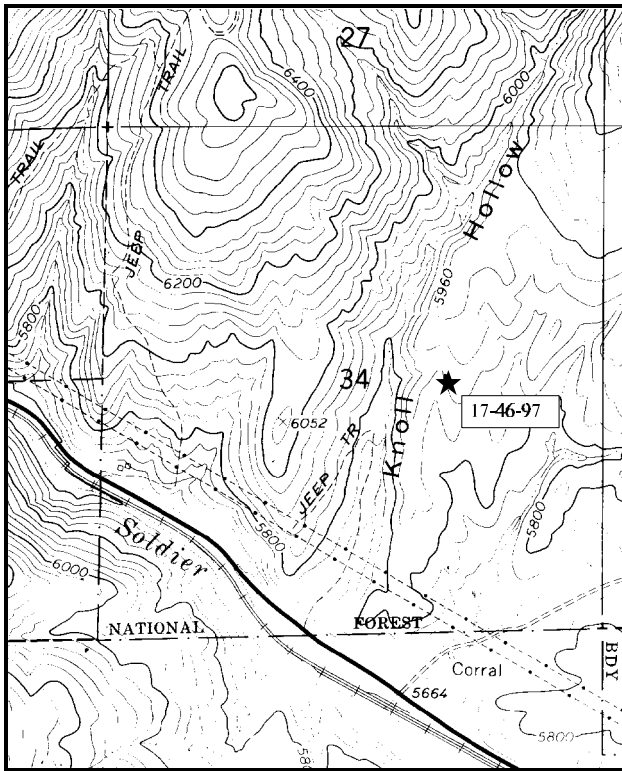
Range Type: Chained, reseeded P-J .

Compass bearing: frequency baseline 192 degrees.

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

Turn north up Tank Hollow, which is 0.7 miles west of the Sheep Creek road and cafe on Highway 6. Drive about 0.2 miles and stop by a small stock pond in the forks of the drainage. From here, walk north about 1/2 mile up the left fork, and keep left at two other major forks. Where the wash starts to flatten out at the head, there should be a chained ridge to the right. The study site is on the ridge, about 20 paces from the center of the drainage. The 0-foot baseline stake is near the highest point on the ridge.



Map Name: Mill Fork .

Diagrammatic Sketch

Township 9S, Range 5E, Section 34

UTM 4426473.359 N, 470081.922 E

DISCUSSION

Trend Study No. 17-46 (27-20)

The Lower Tank Hollow trend study samples the chaining in Lower Tank Hollow. The 600 acre chaining and seeding treatment was completed in 1971. This Forest Service land is in the Diamond Fork cattle allotment. When not rested, it appears to receive moderate use. Judging by deer pellet groups on the small ridge where the study is located, there is moderate to heavy deer use and light elk use. Tank Hollow is considered a critical area for wintering deer. The study is located on a small ridge representative of the long, sloping ridges in the treated area. The bottoms tend to be dominated by grass, while further down into the bottom's basin big sagebrush occurs, whereas there is a variety of browse on the ridges. The slope is 10% with a southerly aspect and an elevation of 5,600 feet.

Soil textural analysis indicates a clay loam with a shale substrate. The effective rooting depth (see method) is about 13 inches with a neutral pH (7.2). Phosphorous is low (6.8 ppm) and could limit plant development on the site. The soil is moderately deep in most places and is dark in color. There is evidence of past substantial erosion from the site in the exposed roots and pedestaled plants, but there does not appear to be excessive erosion at this time.

Pre-treatment vegetation was a predominantly mature stand of pinyon and juniper. Juniper appears to be renewing its dominance in the chaining, and although they are fairly large trees, density remains low at an estimated 57 trees/acre. Basin big sagebrush is one of the key browse species as it provides 8% of the browse cover. It was reportedly heavily hedged in 1989 but now shows only light hedging. Vigor has increased and percent decadency has decreased. Estimated density is currently 420 plants/acre. Other palatable browse includes low densities of bitterbrush, snowberry, and serviceberry. Even though bitterbrush has a relatively low density, it provides 12% of the browse cover which is more than sagebrush. The most abundant browse is stickyleaf rabbitbrush with an estimated density of 1,320 plants/acre which contributes 15% of the total browse cover.

The dominant grass is crested wheatgrass which has significantly increased in nested frequency since 1989 and now provides 64 of the grass cover or almost 50% of the total herbaceous cover. Other seeded grasses include intermediate wheatgrass, smooth brome, and orchard grass. The grasses still provide abundant forage and good erosion control. Pacific aster is the most common forb. Diversity is fair, but the forage value of most species is low. Total nested frequency for perennial forbs and grasses has increased since 1989.

1989 APPARENT TREND ASSESSMENT

The soil trend is stable. The trend for the desirable and preferred browse species is down. The herbaceous understory appears stable but a better composition is desired.

1997 TREND ASSESSMENT

Soil trend is upward with less percent bare ground available to erosion in 1997 than in 1989. The grasses still provide abundant forage but only fair erosion control. Photos show more ground cover and fewer bare areas as well. Browse trend is stable with little change in the composition and density of many of the browse species, with most changes due to the much larger sample size giving better population estimates for clumped or discontinuous populations. Herbaceous understory trend is slightly upward with an increase in nested frequency for perennial grass and forbs. Grass understory composition is good, but a better composition of forbs is desired.

TREND ASSESSMENT

soil - upward

browse - stable

herbaceous understory - slightly upward

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 46

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron cristatum	71	*164	28	54	12.57
G	Agropyron intermedium	31	19	11	7	.18
G	Agropyron spicatum	7	*36	3	14	2.79
G	Bromus inermis	30	*7	13	3	.21
G	Bromus tectorum (a)	-	29	-	14	.51
G	Dactylis glomerata	-	1	-	1	.03
G	Leucopoa kingii	11	*-	6	-	-
G	Oryzopsis hymenoides	56	*30	29	13	.68
G	Poa fendleriana	36	*1	14	1	.03
G	Poa pratensis	-	*59	-	19	1.44
G	Poa secunda	-	*20	-	8	.55
G	Stipa comata	4	-	2	-	-
G	Stipa lettermani	-	*14	-	4	.72
Total for Grasses		246	380	106	138	19.73
F	Achillea millefolium	-	1	-	1	.00
F	Agoseris glauca	-	5	-	2	.01
F	Alyssum alyssoides (a)	-	63	-	22	1.16
F	Allium spp.	-	10	-	3	.02
F	Aster chilensis	-	*53	-	20	.52
F	Astragalus convallarius	13	25	7	11	.36
F	Aster spp.	100	*40	42	16	.64
F	Astragalus spp.	3	-	1	-	-
F	Astragalus utahensis	5	4	2	3	.06
F	Castilleja linariaefolia	-	8	-	3	.04
F	Camelina microcarpa (a)	-	13	-	6	.03
F	Carduus nutans (a)	-	22	-	13	.37
F	Calochortus nuttallii	-	2	-	2	.01
F	Chaenactis douglasii	2	*19	2	7	.12

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	Cirsium spp.	39	*22	23	11	.45
F	Comandra pallida	-	*32	-	12	.40
F	Crepis acuminata	-	1	-	1	.00
F	Descurainia pinnata (a)	-	4	-	4	.02
F	Epilobium paniculatum (a)	-	1	-	1	.00
F	Eriogonum brevicaule	21	*10	12	4	.33
F	Erigeron pumilus	27	*-	11	-	-
F	Hackelia patens	4	4	2	3	.04
F	Hedysarum boreale	-	4	-	2	.18
F	Lappula occidentalis (a)	-	10	-	4	.19
F	Lithospermum ruderales	-	*18	-	9	.46
F	Lomatium spp.	-	3	-	3	.01
F	Machaeranthera canescens	9	*-	5	-	-
F	Penstemon caespitosus	-	7	-	3	.33
F	Phlox hoodii canescens	15	16	10	7	.42
F	Phlox longifolia	11	11	4	4	.02
F	Ranunculus testiculatus (a)	-	4	-	2	.01
F	Salsola pestifer (a)	8	-	4	-	-
F	Sphaeralcea coccinea	-	3	-	1	.15
F	Taraxacum officinale	-	2	-	1	.00
F	Tragopogon dubius	2	*17	1	9	.10
F	Verbascum thapsus	-	5	-	2	.03
F	Vicia americana	-	*35	-	14	.27
F	Viola spp.	-	3	-	1	.15
Total for Forbs		259	477	126	207	6.99

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 46

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier utahensis	4	.78
B	Artemisia tridentata tridentata	17	1.04
B	Chrysothamnus depressus	13	.43
B	Chrysothamnus nauseosus albicaulis	3	.00
B	Chrysothamnus viscidiflorus viscidiflorus	34	1.88
B	Gutierrezia sarothrae	10	.36
B	Juniperus osteosperma	10	6.30
B	Opuntia spp.	3	.18
B	Purshia tridentata	5	1.49
B	Symphoricarpos oreophilus	3	.15
Total for Browse		102	12.64

BASIC COVER --

Herd unit 17 , Study no: 46

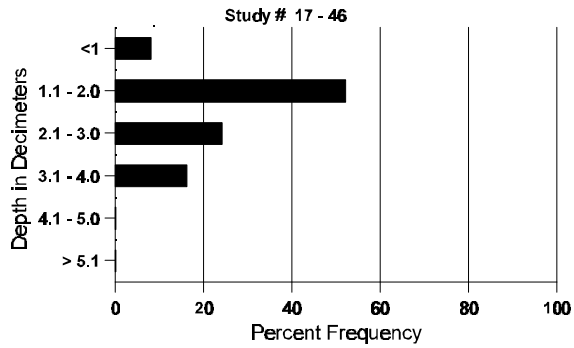
Cover Type	Nested Frequency '97	Average Cover % '89 '97	
Vegetation	326	6.00	36.93
Rock	73	1.25	.73
Pavement	207	9.75	5.83
Litter	389	45.25	41.37
Cryptogams	57	0	1.41
Bare Ground	263	37.75	24.28

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 46

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
13.2	45.8 (15.5)	7.2	40.7	21.4	37.8	3.2	6.8	275.2	.5

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 17 , Study no: 46

Type	Quadrat Frequency '97
Rabbit	3
Elk	11
Deer	30
Cattle	1

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 46

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.	Total	
		1	2	3	4				
Amelanchier utahensis									
Y	89	-	-	-	-	-	-	0	0
	97	2	-	-	-	-	-	40	2
M	89	-	-	-	-	-	-	0	-
	97	-	-	1	-	2	-	60	28 36
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>	
'89		00%		00%		00%		Appeared	
'97		00%		60%		00%			
Total Plants/Acre (excluding Dead & Seedlings)						'89	0	Dec:	-
						'97	100		-

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Artemisia tridentata tridentata</i>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5	
M	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33	26	22	1
	97	7	1	1	4	-	-	-	-	-	13	-	-	-	260	40	38	13
D	89	-	-	1	-	-	-	-	-	-	-	-	1	-	33		1	
	97	2	1	-	-	-	-	-	-	-	1	-	-	2	60		3	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	60		3	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			67%			33%			+76%							
'97		10%			05%			10%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	99	Dec:	33%				
											'97	420		14%				
<i>Chrysothamnus depressus</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	38	-	-	1	-	-	-	-	-	39	-	-	-	780	6	14	39
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	860		-				
<i>Chrysothamnus nauseosus albicaulis</i>																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	1	-	-	1	-	-	-	-	-	1	1	-	-	40		2	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	24	27	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+45%							
'97		33%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	60		-				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
Chrysothamnus viscidiflorus viscidiflorus																	
Y	89	7	-	-	-	-	-	-	-	-	7	-	-	-	233		7
	97	4	-	-	2	-	-	1	-	-	7	-	-	-	140		7
M	89	76	-	-	-	-	-	-	-	-	76	-	-	-	2533	11 12	76
	97	48	-	-	4	-	-	-	-	-	52	-	-	-	1040	14 14	52
D	89	8	-	-	-	-	-	-	-	-	3	-	-	5	266		8
	97	4	-	1	1	-	-	-	-	-	5	-	-	1	140		7
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>						<u>%Change</u>					
'89		00%		00%		05%						-56%					
'97		00%		02%		02%											
Total Plants/Acre (excluding Dead & Seedlings)										'89		3032	Dec:		9%		
										'97		1320			11%		
Eriogonum microthecum																	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	4 8	1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>						<u>%Change</u>					
'89		00%		00%		00%						Died out					
'97		00%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'89		33	Dec:		-		
										'97		0			-		
Gutierrezia sarothrae																	
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	3	-	-	-	-	-	-	-	-	3	-	-	-	60		3
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100		5
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0
	97	18	-	-	-	-	-	-	-	-	18	-	-	-	360	11 11	18
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>						<u>%Change</u>					
'89		00%		00%		00%						Appeared					
'97		00%		00%		00%											
Total Plants/Acre (excluding Dead & Seedlings)										'89		0	Dec:		0%		
										'97		480			4%		

AGE	Y	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.		
Juniperus osteosperma																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	1	-	-	2	-	-	-	40		2	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	3	-	-	1	-	-	-	-	-	4	-	-	-	80		4	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	4	-	1	2	-	-	-	-	-	7	-	-	-	140	74	101	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40		2	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			09%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	220		-				
Opuntia spp.																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40		2	
M	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33	7	9	
	97	4	-	-	1	-	-	-	-	-	5	-	-	-	100	3	15	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			+76%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	140		-				
Purshia tridentata																		
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	-	-	1	-	-	-	-	-	-	1	-	-	-	33	10	35	
	97	-	-	-	-	1	4	-	-	-	5	-	-	-	100	16	55	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			100%			00%			+73%							
'97		17%			67%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	33	Dec:	-				
											'97	120		-				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Symphoricarpos oreophilus																		
M	'89	-	1	-	-	-	-	-	-	-	1	-	-	-	33	15	17	1
	'97	4	-	-	-	-	-	-	-	-	4	-	-	-	80	22	35	4
D	'89	-	-	1	-	-	-	-	-	-	-	-	1	-	33			1
	'97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		50%			50%			50%			+18%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	66	Dec:	50%			
												'97	80		0%			

Trend Study 17-47-97

Study site name: Tie Fork East

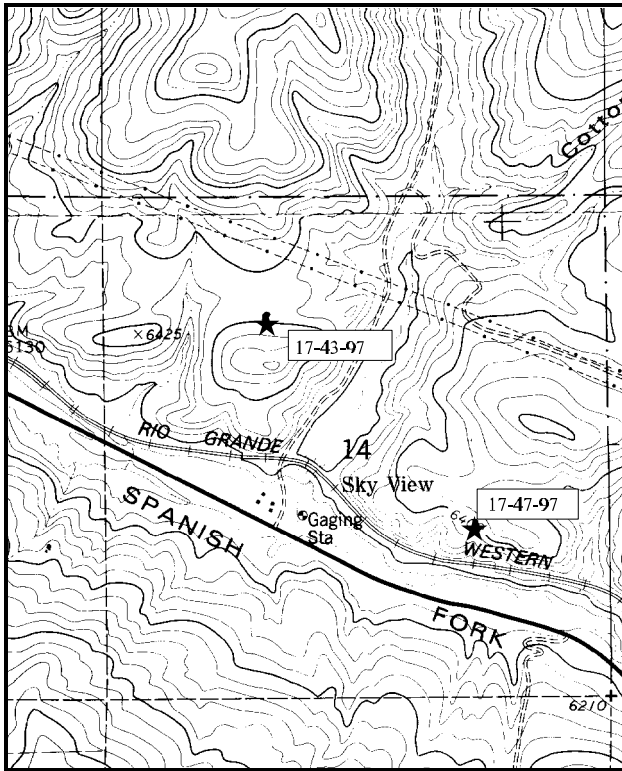
Range Type: Mixed Mountain Brush

Compass bearing: frequency baseline 15 degrees. (Line 2 272°M, line 3 296°M, line 4 259°M)

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

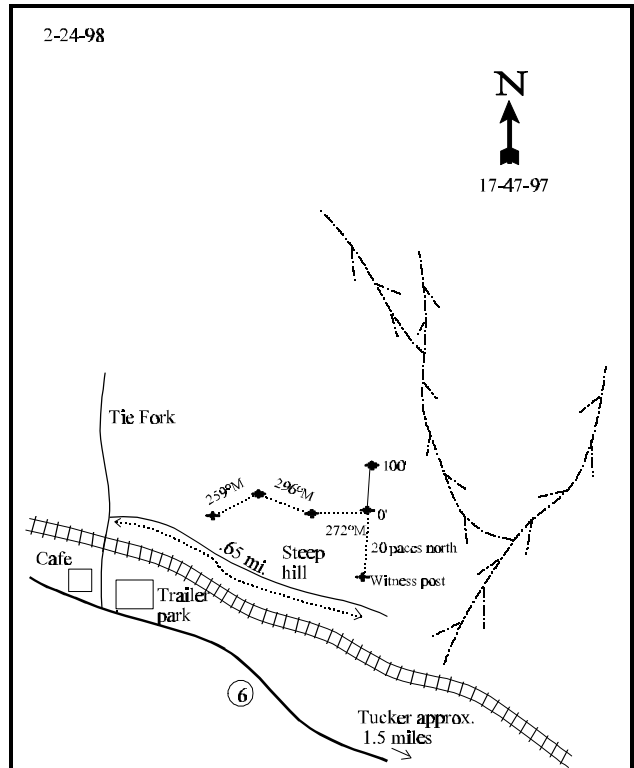
LOCATION DESCRIPTION

From the intersection of Highway U.S. 6 and Tie Fork at Sky View, go north up to the railroad tracks. Cross the tracks and turn right. Follow the road along the railroad tracks for 0.65 miles. Stop at a pullout at the mouth of a small side canyon. Walk up the ridge to the west 200 yards to a witness post in a small rock outcrop on the bare ridgetop. From the witness post walk 20 paces north (5 degrees) to the 0-foot baseline stake.



Map Name: Tucker

Township 10S, Range 6E, Section 14



Diagrammatic Sketch

UTM 4427993.796 N, 482212.499 E

DISCUSSION

Trend Study No. 17-47 (27-21)

The Tie Fork range trend study was established in the Tie Fork (17-43) area in 1983. However, since the site was not considered representative of the large critical wintering area in Tie Fork, a new study, Tie Fork East (17-47) was set up in 1989. The new study is on a more xeric site, supporting less oak and pinyon on a moderately steep slope than on the Tie Fork (17-43) site. The new Tie Fork East site is basically sparse juniper with a mountain brush understory, more representative of the winter range in the area. The lower end of Tie Fork is private land along the railroad. No livestock are currently grazed in the area but sheep are thought to trail through the area. The area receives considerably heavy winter use by deer, with light to moderate use by elk.

This study is on a north, northeast facing slope at an elevation of 6,440 feet. The slope varies between 10 and 15%. Litter and organic matter buildup is good beneath the shrubs and along with the vegetative cover, helps to reduce erosion. However, there are still areas of localized erosion with active gullies forming below the site. The soil is light gray in color and lacks structure. Soil textural analysis indicates a clay loam with a neutral pH (7.3). The effective rooting depth is 16 inches with an average temperature of 45.4°F at about 15 inches. Phosphorous again is shown to be low (8.3 ppm) and could be limiting to plant development.

The browse community is a combination of large juniper and pinyon in association with an important shrub understory. The prevalent juniper forage is largely unavailable due to height and past highlining. Juniper has a density (from the point-centered quarter method) of 105 trees/acre, with most measuring over 8 feet in height. Pinyon is less common on this site with a density of 22 trees/acre. Gambel oakbrush density is estimated to be 34 stems/acre. Saskatoon serviceberry density is estimated to be 300 plants/acre. Percent decadency has declined with many young plants encountered in both years. True mountain mahogany density is estimated to be 540 plants/acre. Utilization is moderate to heavy with all plants showing good vigor. Mountain big sagebrush density is estimated to be only 160 plants/acre. Utilization is light to moderate. Percent decadency is still high with 50% of the plants classified as decadent. There are more dead plants on the site than live plants at this time with them only contributing to 2% of the browse cover. Snowberry density is estimated to be 5,300 plants/acre with moderate utilization. This is a mature population with few seedling or young plants encountered. Other scattered browse species include white rubber rabbitbrush, stickyleaf rabbitbrush, bitterbrush, Wood's rose, and gray horsebrush.

Total herbaceous cover is relatively low on this site compared to others within the immediate area. Grass nested frequency increased slightly for perennial species since 1989. Indian ricegrass and bluebunch wheatgrass provide the bulk of the grass cover (62%). Cheatgrass is present but not in high amounts. Forb cover is sparse with high diversity and low abundance. Several annual species were encountered with many of the species being increasers or invaders.

1989 APPARENT TREND ASSESSMENT

With continued soil loss and no signs of an increasing understory or herbaceous component, the soil trend is downward. While appearing more stable than the comparable study #18-7-83, the vegetative trend on this site also has downward indicators such as increasing juniper and continued heavy use of the preferred browse. Still, there is fair reproduction and significant amounts of unutilized browse forage (especially on the sagebrush).

1997 TREND ASSESSMENT

Erosion is still apparent, but is not excessive. This vegetative type will likely always have some erosion occurring, so establishment of herbaceous understory should be encouraged. Soil trend is stable. The browse trend is stable as well. There is little change in any of the browse species. The mountain big sagebrush population is 50% decadent with similar utilization and vigor as reported in 1989. It is still only a minor component of the browse composition at this time. The herbaceous understory trend is slightly upward with an increase in nested frequency for both perennial grasses and forbs.

TREND ASSESSMENT

soil - stable

browse - stable

herbaceous understory - slightly upward

HERBACEOUS TRENDS --

Herd unit 17 , Study no: 47

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
G	Agropyron spicatum	8	*42	3	20	2.20
G	Bromus tectorum (a)	-	101	-	38	.48
G	Carex spp.	6	*25	4	11	1.14
G	Oryzopsis hymenoides	121	*77	49	30	3.03
G	Poa pratensis	24	19	8	7	.13
G	Poa secunda	-	6	-	2	.30
G	Sitanion hystrix	7	16	4	7	.13
G	Stipa columbiana	10	7	3	3	.41
G	Stipa lettermani	1	*20	1	8	.67
Total for Grasses		177	313	72	126	8.53
F	Achillea millefolium	5	6	2	2	.18
F	Agoseris glauca	-	1	-	1	.00
F	Antennaria rosea	7	7	2	2	.41
F	Astragalus convallarius	3	8	2	5	.02
F	Castilleja chromosa	2	-	2	-	.01
F	Carduus nutans (a)	-	13	-	7	.42
F	Chenopodium album	-	1	-	1	.00
F	Chaenactis douglasii	7	4	4	2	.03
F	Cirsium spp.	4	*21	4	11	.28
F	Collinsia parviflora (a)	-	13	-	6	.03
F	Cryptantha spp.	4	1	2	1	.03

T y p e	Species	Nested Frequency		Quadrat Frequency		Average Cover % '97
		'89	'97	'89	'97	
F	<i>Cynoglossum officinale</i>	107	*50	43	19	.99
F	<i>Delphinium bicolor</i>	-	1	-	1	.00
F	<i>Descurainia pinnata</i> (a)	-	29	-	13	.09
F	<i>Epilobium paniculatum</i> (a)	-	3	-	1	.00
F	<i>Erigeron</i> spp.	-	2	-	2	.01
F	<i>Hackelia patens</i>	-	*16	-	7	.41
F	<i>Lappula occidentalis</i> (a)	-	1	-	1	.00
F	<i>Machaeranthera canescens</i>	11	*27	6	12	.13
F	<i>Melilotus officinalis</i>	-	1	-	1	.00
F	<i>Penstemon humilis</i>	16	*-	6	-	-
F	<i>Penstemon</i> spp.	58	*101	29	43	1.96
F	<i>Phlox longifolia</i>	3	3	1	2	.01
F	<i>Ranunculus testiculatus</i> (a)	-	3	-	1	.00
F	<i>Schoenocrambe linifolia</i>	-	*16	-	9	.16
F	<i>Senecio multilobatus</i>	3	2	1	1	.03
F	<i>Streptanthus cordatus</i>	-	-	-	-	.00
F	<i>Taraxacum officinale</i>	-	2	-	1	.00
F	<i>Tragopogon dubius</i>	-	*6	-	4	.04
F	Unknown forb-perennial	3	-	1	-	-
F	<i>Verbascum thapsus</i>	-	7	-	3	.07
Total for Forbs		233	345	105	159	5.39

* Indicates significant difference at $\alpha = 0.10$ (annuals excluded)

BROWSE TRENDS --

Herd unit 17 , Study no: 47

Type	Species	Strip Frequency '97	Average Cover % '97
B	Amelanchier alnifolia	13	.21
B	Artemisia tridentata tridentata	0	.15
B	Artemisia tridentata vaseyana	8	.30
B	Cercocarpus montanus	22	2.58
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	4	.06
B	Juniperus osteosperma	10	2.23
B	Mahonia repens	1	-
B	Opuntia spp.	3	-
B	Purshia tridentata	1	.01
B	Quercus gambelii	9	2.01
B	Rosa woodsii	11	.57
B	Symphoricarpos oreophilus	58	11.46
B	Tetradymia canescens	2	-
Total for Browse		143	19.61

BASIC COVER --

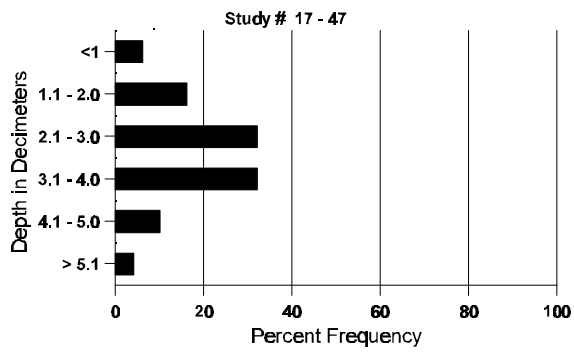
Herd unit 17 , Study no: 47

Cover Type	Nested Frequency '97	Average Cover %	
		'89	'97
Vegetation	314	7.25	31.06
Rock	115	2.25	4.31
Pavement	176	13.50	4.74
Litter	395	50.50	50.47
Cryptogams	39	0	.70
Bare Ground	203	26.50	15.30

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 47

Effective rooting depth (inches)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	PPM P	PPM K	dS/m
16.1	45.4 (15.4)	7.3	26.7	34.4	38.8	4.5	8.3	112.0	.5

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 17 , Study no: 47

Type	Quadrat Frequency '97
Rabbit	23
Elk	12
Deer	38

BROWSE CHARACTERISTICS --

Herd unit 17 , Study no: 47

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Amelanchier alnifolia</i>																		
Y	89	2	-	-	4	-	-	1	-	-	7	-	-	-	233		7	
	97	9	-	-	4	-	-	-	-	-	13	-	-	-	260		13	
M	89	-	-	1	2	-	-	-	-	-	3	-	-	-	100	27	20	3
	97	-	-	-	-	1	1	-	-	-	2	-	-	-	40	26	29	2
D	89	-	1	-	-	2	-	-	-	-	2	-	-	1	100		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		23%			08%			08%			-31%							
'97		07%			07%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	433	Dec:	23%				
											'97	300		0%				
<i>Artemisia tridentata vaseyana</i>																		
S	89	1	-	-	1	-	-	-	-	-	2	-	-	-	66		2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	4	-	-	1	-	-	-	-	-	5	-	-	-	166		5	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	3	-	-	-	-	-	-	-	-	3	-	-	-	100	20	10	3
	97	1	2	1	-	-	-	-	-	-	4	-	-	-	80	27	32	4
D	89	5	1	1	-	-	-	-	-	-	6	-	-	1	233		7	
	97	2	1	-	1	-	-	-	-	-	3	-	-	1	80		4	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	260		13	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		07%			07%			07%			-68%							
'97		38%			13%			13%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	499	Dec:	47%				
											'97	160		50%				

A G R E	Y R	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Cercocarpus montanus																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Y	89	6	-	-	-	-	-	-	-	-	6	-	-	-	200		6	
	97	2	-	-	-	-	1	-	-	-	3	-	-	-	60		3	
M	89	-	-	10	-	-	-	-	-	-	10	-	-	-	333	67 79	10	
	97	1	2	4	1	7	6	-	-	-	21	-	-	-	420	33 29	21	
D	89	-	1	2	-	-	-	-	-	-	2	-	1	-	100		3	
	97	-	-	-	1	1	1	-	-	-	3	-	-	-	60		3	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		05%			63%			05%			-15%							
'97		37%			44%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	633	Dec:	16%				
											'97	540		11%				
Chrysothamnus nauseosus albicaulis																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
M	89	1	-	1	-	-	-	-	-	-	2	-	-	-	66	35 22	2	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24 23	0	
D	89	1	1	1	-	-	-	-	-	-	3	-	-	-	100		3	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		17%			33%			00%			-90%							
'97		00%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	199	Dec:	50%				
											'97	20		100%				

A Y G R E	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
	1	2	3	4	5	6	7	8	9	1	2	3	4				
<i>Chrysothamnus viscidiflorus viscidiflorus</i>																	
Y	89	27	-	-	4	-	-	-	-	-	31	-	-	-	1033		31
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
M	89	20	-	-	-	-	-	1	-	-	21	-	-	-	700	18 24	21
	97	5	-	-	-	-	-	-	-	-	5	-	-	-	100	12 12	5
D	89	7	-	-	-	-	-	-	-	-	7	-	-	-	233		7
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			-95%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	1966	Dec:	12%			
											'97	100		0%			
<i>Juniperus osteosperma</i>																	
S	89	-	-	-	1	-	-	-	-	-	1	-	-	-	33		1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0
Y	89	1	-	-	1	-	-	-	-	-	2	-	-	-	66		2
	97	6	-	-	-	-	-	-	-	-	6	-	-	-	120		6
M	89	-	-	-	-	-	-	-	-	1	1	-	-	-	33	197 122	1
	97	4	-	-	-	-	-	-	1	-	5	-	-	-	100	3 5	5
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			33%			00%			+55%						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	99	Dec:	-			
											'97	220		-			
<i>Mahonia repens</i>																	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	3 5	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>						
'89		00%			00%			00%			Appeared						
'97		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-			
											'97	20		-			

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Opuntia spp.																		
Y	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20		1	
M	89	2	-	-	-	-	-	-	-	-	2	-	-	-	66	5	6	2
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	5	7	1
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	1	-	-	-	-	-	-	-	-	-	-	1	20		1		
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			-39%							
'97		00%			00%			33%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	99	Dec:	0%				
											'97	60		33%				
Purshia tridentata																		
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	1	-	-	-	-	-	-	-	1	-	-	-	20	12	24	1
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	-				
											'97	20		-				

A Y G R E	Form Class (No. of Plants)	Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total				
		1	2	3	4		1	2					
Quercus gambelii													
S	89	1	-	-	-	-	-	-	-	1	33		1
	97	2	-	-	-	-	-	-	-	2	40		2
Y	89	-	-	-	-	-	-	-	-	-	0		0
	97	7	6	-	1	-	-	-	-	14	280		14
M	89	-	-	-	-	-	-	-	-	-	0	-	0
	97	20	3	-	-	-	3	-	-	26	520	49 29	26
D	89	-	-	-	-	-	-	-	-	-	0		0
	97	-	1	-	-	-	-	-	-	1	20		1
X	89	-	-	-	-	-	-	-	-	-	0		0
	97	-	-	-	-	-	-	-	-	-	60		3
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'89		00%		00%		00%		Appeared					
'97		24%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	0	Dec:	0%
										'97	820		2%
Ribes cereum inebrians													
M	89	-	-	-	-	2	-	-	-	-	66	18 22	2
	97	-	-	-	-	-	-	-	-	-	0	-	0
% Plants Showing		<u>Moderate Use</u>		<u>Heavy Use</u>		<u>Poor Vigor</u>		<u>%Change</u>					
'89		100%		00%		00%		Died out					
'97		00%		00%		00%							
Total Plants/Acre (excluding Dead & Seedlings)										'89	66	Dec:	-
										'97	0		-

AGE	Y	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.		
<i>Rosa woodsii</i>																		
S	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	4	-	-	-	-	-	-	-	-	4	-	-	-	80		4	
Y	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	12	-	-	11	-	-	-	-	-	23	-	-	-	460		23	
M	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	
	97	4	-	-	5	-	-	-	-	-	9	-	-	-	180	22	14	
D	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	1	-	-	-	1	-	-	-	20		1	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		00%			00%			00%			Appeared							
'97		00%			03%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	0	Dec:	0%				
											'97	660		3%				
<i>Symphoricarpos oreophilus</i>																		
S	89	1	-	-	-	-	-	-	-	-	1	-	-	-	33		1	
	97	3	4	-	-	-	-	-	-	-	6	-	-	1	140		7	
Y	89	8	2	1	-	-	-	12	-	-	23	-	-	-	766		23	
	97	29	-	-	-	-	-	-	-	-	29	-	-	-	580		29	
M	89	36	21	5	33	6	-	15	-	-	116	-	-	-	3866	20	26	
	97	148	40	11	37	-	-	-	-	-	236	-	-	-	4720	43	62	
D	89	-	2	1	-	-	-	-	-	-	3	-	-	-	100		3	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
X	89	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	80		4	
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>			<u>%Change</u>							
'89		22%			05%			00%			+11%							
'97		15%			04%			00%										
Total Plants/Acre (excluding Dead & Seedlings)											'89	4732	Dec:	2%				
											'97	5300		0%				

A G R E	Y	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches) Ht. Cr.		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4				
Tetradymia canescens																		
M	'89	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	'97	-	3	-	-	-	-	-	-	-	-	-	3	-	60	13	11	3
% Plants Showing		<u>Moderate Use</u>			<u>Heavy Use</u>			<u>Poor Vigor</u>				<u>%Change</u>						
'89		00%			00%			00%				Appeared						
'97		100%			00%			00%										
Total Plants/Acre (excluding Dead & Seedlings)												'89	0	Dec:	-			
												'97	60		-			

TREND SUMMARY UNIT - 17 - WASATCH MOUNTAINS

Site	1997		
	Soil	Browse	Grasses & forbs
17-21 Box Elder Canyon	-	0	0
17-22 Schoolhouse Springs	0	0	-
17-23 Oak Hollow	Site	Was	Moved
17-24 Heisetts Hollow	0	-	+
17-25 North Battle Creek	0	0	-
17-26 Orem Water Tank	0	0	0
17-28 Spring Hollow	0	0	-
17-29 Above Edgemont	0	-	0
17-30 Spring Canyon	0	0	0
17-31 Round Mountain	0	-	0
17-33 Maple Canyon	0	0	0
17-34 Maple Mountain Face	0	+	+
17-35 Hobble Creek Golf Course	0	0	0
17-36 Big Slide	+	-	0
17-38 North Fork Diamond Cyn	0	-	+
17-39 Little Diamond Canyon	0	0	0
17-40 Long Hollow	0	0	+
17-41 Upper Sheep Canyon	0	0	+
17-42 Tank Hollow	+	0	0
17-43 Tie Fork	0	0	+
17-44 Billies Mountain	+	-	+
17-45 North Bench	0	+	+
17-46 Lower Tank Hollow	+	0	+
17-47 Tie Fork East	0	0	+

+ = upward trend, - = downward trend, 0 = stable trend

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