

HARRIS CANYON - TREND STUDY NO. 4-6-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA461UT](#)

Land Ownership: DWR

Elevation: 6,254 ft (1,902 m)

Aspect: South

Slope: 35%

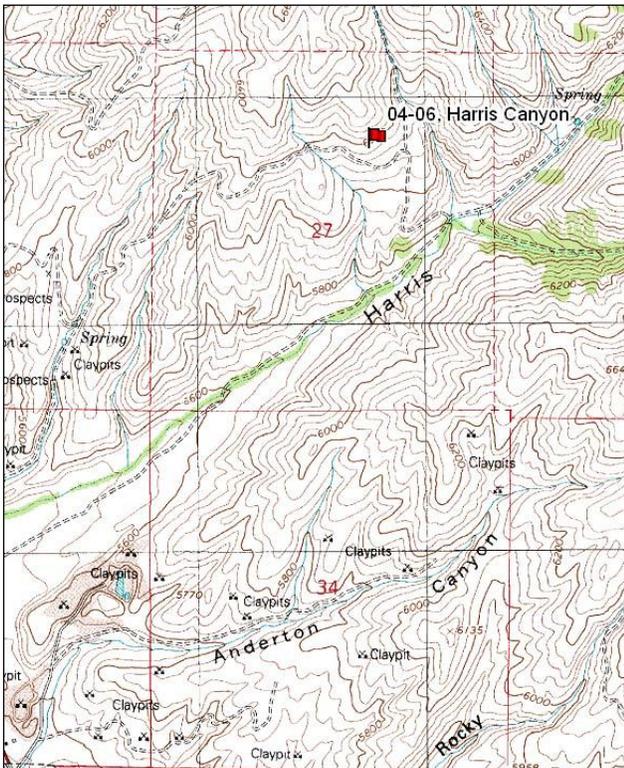
Transect bearing: 164° magnetic

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

Directions:

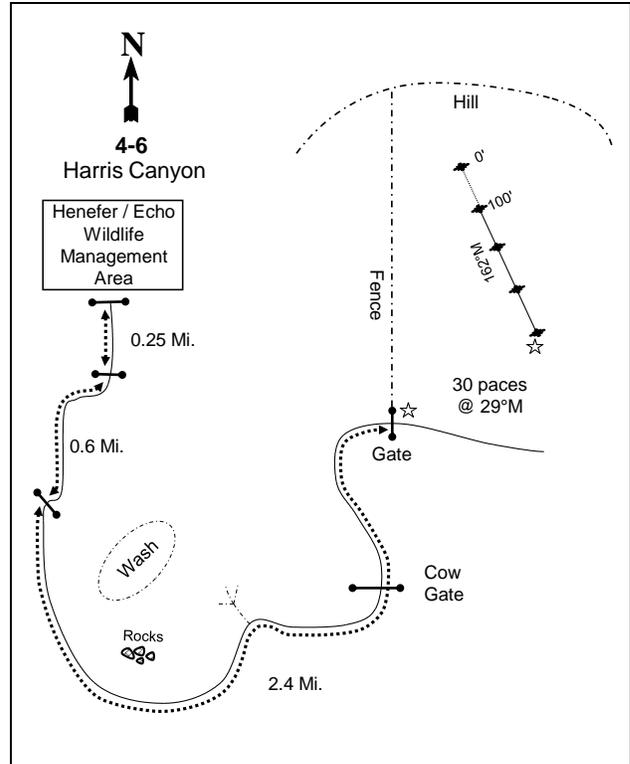
From exit 115 to Henefer, proceed northwest for 3.5 miles (towards Croyden) to the Croyden access road. At the DWR/R-Ranch property, turn right and travel 0.25 miles. Turn right at the DWR fence line and proceed 0.6 miles to another gate. Stay to the right, traveling around a wash for 2.4 to a fence with a gate. Stop here and park. From the gate walk 30 paces (at 29 degrees magnetic) to the 400-foot baseline stake. Walk 400 feet to the north at a bearing of 342 degrees magnetic to the 0-foot baseline stake. The 0-foot stake is marked by browse tag #7975.

Map Name: Henefer



Township: 4N Range: 4E Section: 27

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 459689 E 4545091 N

## HARRIS CANYON - TREND STUDY NO. 4-6

### Site Information

Site Description: The study is located in the hills to the north of Harris Canyon within the Division of Wildlife Resources (DWR) Henefer-Echo Wildlife Management Area (WMA). The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community. Cattle and sheep, owned by ranchers to the north and south of the property, graze the lower elevations of the WMA. Deer and elk pellet groups have been sampled in high abundance since 2001. There have been very little cattle sign sampled since 2001 (Table - Pellet Group Data).

Browse: The total browse density is well below optimum for this location. The key species are mountain big sagebrush and antelope bitterbrush (*Purshia tridentata*). Sagebrush density has remained relatively low throughout the course of the study. Health of the sagebrush population has fluctuated with years of low decadence and good vigor, and years of high decadence and poor vigor. In 2006, 40 plants/acre were identified with the sagebrush defoliator moth (*Aroga websteri*), but many individuals in the population appeared infested. Utilization of sagebrush was very heavy at the outset of the study, but use has been mostly light to moderate since 1996. Recruitment of young sagebrush plants has been mostly good over the course of the study. The bitterbrush population is comprised of a small population of very heavily used plants. Decadence and poor vigor were high in 2011. Recruitment of young bitterbrush plants has been mostly poor throughout the study years. Utah serviceberry (*Amelanchier utahensis*) is present in low densities, and a small population of white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*) provides additional forage, but has steadily decreased in density since 1996. The increaser species stickyleaf low rabbitbrush (*C. viscidiflorus* ssp. *viscidiflorus*) and broom snakeweed (*Gutierrezia sarothrae*) are both common (Table - Browse Characteristics), but provide limited cover (Table - Browse Trends).

Herbaceous Understory: The herbaceous understory is dominated by the native perennial grass bluebunch wheatgrass (*Agropyron spicatum*), and the annual grasses cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*). Other grass species are fairly rare. A fair number of forbs are also present, but few are abundant. The predominant perennial forbs are Louisiana sagebrush (*Artemisia ludoviciana*) and American vetch (*Vicia americana*). Weedy annual forbs are quite abundant with pale alyssum (*Alyssum alyssoides*) and storksbill (*Erodium cicutarium*) being some of the most prevalent annual forb species (Table - Herbaceous Trends).

Soil: The soil is in the Horrocks-Cutoff complex, likely as part of the Horrocks component. These soils occur on mountain slopes, with parent material consisting of colluvium derived from conglomerate, sandstone, and andesite. The soils are characterized as moderately deep, well drained, and moderately permeable (Soil Survey 2011). The soil texture is a clay loam with a neutral soil reaction (pH of 7.2). Organic matter content is relatively high at 4% (Table - Soil Analysis Data). The color of the surface soil is reddish, which indicates some iron oxide. The soil surface is moderately rocky, and most surface rocks are rounded and cobblestone-like. Bare ground cover is moderately low, with a high amount of vegetation, litter, and rock cover (Table - Basic Cover). The soil erosion condition was classified as slight in 2001 and 2006, but was stable in 2011.

### Trend Assessments

#### Browse:

- **1984 to 1990 - stable (0):** Mountain big sagebrush increased slightly from 631 plants/acre to 698 plants/acre. Decadence decreased from 63% to 52%, but remains very high. Poor vigor increased from 0% to 24%. Recruitment of young sagebrush plants remained similar at 24% of the population. Bitterbrush density increased 25% from 132 plants/acre to 165 plants/acre. However, decadence increased from 50% to 60%, and poor vigor increased from 0% to 60%. Recruitment of young bitterbrush plants increased from 0% to 20% of the population. White rubber rabbitbrush increased in

density four-fold from 232 plants/acre to 931 plants/acre. Most of the increase was due to an increase in the recruitment of young plants.

- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of sagebrush and bitterbrush decreased to 10% and 5%, respectively. Poor vigor of sagebrush decreased to 5%, and poor vigor of bitterbrush decreased to 0%.
- **1996 to 2001 - stable (0):** The density of mountain big sagebrush decreased 19% from 840 plants/acre to 680 plants/acre, but cover increased from 3% to 8%. Most of the decrease in density was due to a decrease in the recruitment of young sagebrush plants from 24% to 6% of the population. Decadence increased slightly to 21%, and poor vigor increased to 9%. Density of bitterbrush decreased 21% from 380 plants/acre to 300 plants/acre, and cover remained less than 1%. Decadence and poor vigor remained low. White rubber rabbitbrush density decreased 32% from 1,180 plants/acre to 800 plants/acre, but cover increased from 2% to 5%.
- **2001 to 2006 - down (-2):** Mountain big sagebrush density decreased 35% to 440 plants/acre, and cover decreased to 5%. Decadence remained similar at 18%, and poor vigor at 5%. Nearly 10% of the sagebrush population was identified as infested by the sagebrush defoliator moth. Bitterbrush density remained similar at 280 plants/acre, but cover increased to 1%. Decadence of bitterbrush increased to 21%. White rubber rabbitbrush density decreased 20% to 640 plants/acre, and cover decreased to 2%.
- **2006 to 2011 - slightly down (-1):** The density of mountain big sagebrush increased by 41% to 620 plants/acre, but cover decreased slightly to 4%. Decadence of sagebrush increased to 35%, and poor vigor increased to 23%. Bitterbrush density decreased by 36% to 180 plants/acre, and cover decreased to near 0%. Decadence of bitterbrush increased to 44%, and poor vigor increased to 22%. White rubber rabbitbrush density decreased by 44% to 360 plants/acre, and cover decreased to less than 1%.

#### Grass:

- **1984 to 1990 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 16%.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial grasses decreased by 27%, with a significant decrease in the nested frequency of bluebunch wheatgrass. Annual species were included in the sample for the first time and were moderately abundant on the site.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses increased 24%, and cover increased from 12% to 14%. The sum of nested frequency of annual grasses and cover remained similar.
- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover increased slightly to 15%. The sum of nested frequency of annual grasses remained similar, but cover increased from 9% to 19%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial grasses increased 20%, though cover decreased slightly to 13%. There was a significant increase in the nested frequency of intermediate wheatgrass (*Agropyron intermedium*), which had cover of 1%.

#### Forb:

- **1984 to 1990 - down (-2):** The perennial forb sum of nested frequency decreased 40%.
- **1990 to 1996 - up (+2):** There was a 79% increase in the sum of nested frequency of perennial forbs. The annual forb sum of nested frequency also increased substantially.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, though cover increased slightly from 2% to 4%. The annual forb sum of nested frequency increased markedly, and cover increased from 3% to 10%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial forbs increased 13%, and cover increased to 5%. The annual forb sum of nested frequency decreased, and cover decreased to 4%.

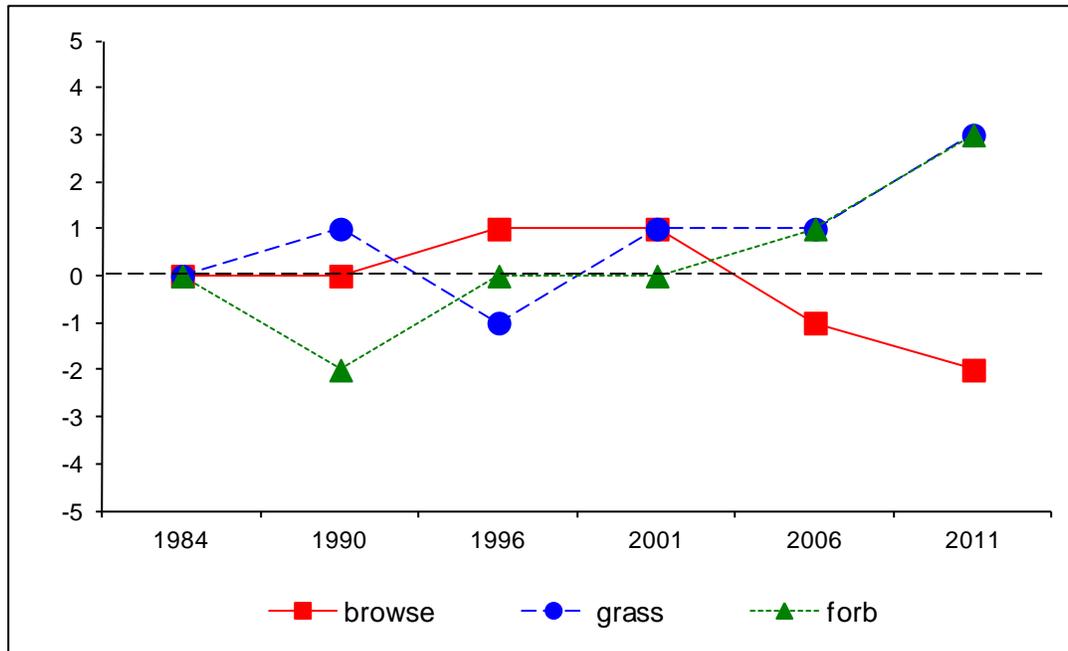
- **2006 to 2011 - up (+2):** The perennial forb sum of nested frequency increased two-fold, and cover increased to 8%. Annual forb sum of nested frequency increased substantially, and cover increased to 13%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --  
Management unit 4, study no: 6

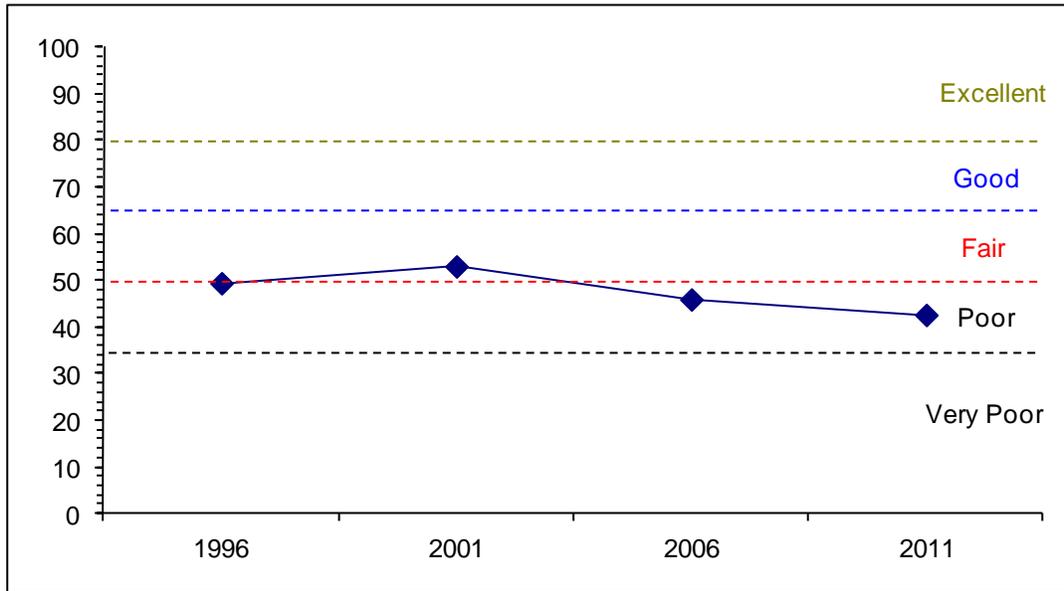
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	8.5	11.9	9.5	24.6	-7.2	4.2	-2.0	<b>49.4</b>	Poor-Fair
01	16.9	7.1	3.3	27.2	-6.6	7.0	-2.0	<b>53.0</b>	Fair
06	11.0	8.2	3.2	29.4	-13.9	10.0	-2.0	<b>45.9</b>	Poor
11	6.8	4.9	4.4	25.2	-8.6	10.0	0.0	<b>42.6</b>	Poor

**Trend Summary**

CUMULATIVE RANGE TREND ASSESSMENT--  
Management unit 4 Study no: 6



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--  
 Management unit 4, Study no: 6



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron cristatum</i>	-	-	-	-	3	-	-	-	.03	-
G	<i>Agropyron intermedium</i>	a3	a2	ab5	ab7	b20	c44	.03	.33	.97	1.35
G	<i>Agropyron spicatum</i>	ab218	b231	a182	a189	ab219	b234	11.84	11.55	12.99	10.35
G	<i>Bromus brizaeformis</i> (a)	-	-	4	3	3	1	.01	.03	.00	.00
G	<i>Bromus japonicus</i> (a)	-	-	b205	b227	a151	a117	2.62	3.64	1.90	.55
G	<i>Bromus tectorum</i> (a)	-	-	b267	a239	b310	b299	6.97	5.10	16.68	10.97
G	<i>Elymus cinereus</i>	-	-	-	4	-	4	-	.38	.38	.38
G	<i>Elymus junceus</i>	-	-	-	-	2	-	-	-	.00	-
G	<i>Festuca ovina</i>	-	-	-	2	-	-	-	.03	-	-
G	<i>Oryzopsis hymenoides</i>	4	16	11	20	5	-	.36	.50	.29	-
G	<i>Poa pratensis</i>	17	5	-	2	-	6	-	.03	-	.03
G	<i>Poa secunda</i>	a-	b26	a6	b28	a7	ab20	.06	.77	.04	.48
Total for Annual Grasses		0	0	476	469	464	417	9.60	8.77	18.59	11.53
Total for Perennial Grasses		242	280	204	252	256	308	12.31	13.61	14.72	12.59
Total for Grasses		242	280	680	721	720	725	21.92	22.39	33.32	24.12
F	<i>Achillea millefolium</i>	7	-	6	2	2	5	.01	.15	.15	.01
F	<i>Agoseris glauca</i>	a-	a1	a-	a5	a1	b21	-	.01	.00	.33
F	<i>Allium</i> sp.	a-	a-	a4	a11	a4	b29	-	.03	.01	.18
F	<i>Alyssum alyssoides</i> (a)	-	-	a245	bc304	ab291	c306	1.12	6.27	2.84	9.80
F	<i>Arabis drummondii</i>	-	-	-	-	-	3	-	-	.03	.00
F	<i>Arenaria</i> sp.	-	-	-	-	3	-	-	-	.03	-
F	<i>Artemisia ludoviciana</i>	a24	a23	a30	c68	ab45	bc71	.53	2.45	1.49	2.40
F	<i>Aster chilensis</i>	b15	a2	a1	a1	a-	a3	.00	.00	-	.03

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Astragalus beckwithii</i>	-	-	-	-	6	10	-	-	.36	.33
F	<i>Astragalus</i> sp.	b31	a-	a7	a-	a-	a-	.21	-	-	-
F	<i>Astragalus utahensis</i>	2	1	3	2	-	-	.03	.03	.00	-
F	<i>Camelina microcarpa</i> (a)	-	-	a2	b17	a5	ab8	.00	.04	.01	.01
F	<i>Castilleja linariaefolia</i>	-	-	4	-	3	-	.18	-	.15	-
F	<i>Cirsium undulatum</i>	c23	bc27	abc16	ab5	abc7	a2	.21	.24	.37	.01
F	<i>Collinsia parviflora</i> (a)	-	-	10	7	10	2	.02	.07	.05	.00
F	<i>Collomia linearis</i> (a)	-	-	-	2	-	2	-	.01	-	.00
F	<i>Crepis acuminata</i>	-	-	-	-	4	9	-	-	.09	.12
F	<i>Cryptantha</i> sp.	b10	a-	a-	a-	a-	a-	-	-	-	-
F	<i>Cymopterus</i> sp.	a-	a8	a3	a2	a2	b47	.03	.03	.03	.33
F	<i>Cynoglossum officinale</i>	-	-	2	2	2	-	.00	.03	.15	-
F	<i>Descurainia pinnata</i> (a)	-	-	-	9	1	14	-	.04	.00	.08
F	<i>Draba</i> sp. (a)	-	-	-	-	14	7	-	-	.03	.01
F	<i>Erodium cicutarium</i> (a)	-	-	a24	b77	a38	c125	.10	1.62	.22	1.14
F	<i>Gilia</i> sp. (a)	-	-	-	-	-	8	-	-	-	.01
F	<i>Hackelia patens</i>	-	-	7	-	-	-	.04	-	-	-
F	<i>Hedysarum boreale</i>	-	7	2	6	1	4	.15	.04	.03	.03
F	<i>Helianthus annuus</i> (a)	-	1	-	-	-	-	-	-	-	-
F	<i>Holosteum umbellatum</i> (a)	-	-	a32	b130	c181	c195	.09	.60	.66	1.69
F	<i>Lactuca serriola</i> (a)	-	-	6	16	-	16	.01	.08	-	.07
F	<i>Lappula occidentalis</i> (a)	-	-	-	-	-	3	-	-	-	.00
F	<i>Lithospermum ruderales</i>	6	6	-	-	-	-	-	-	.03	-
F	<i>Microsteris gracilis</i> (a)	-	-	a-	b35	ab21	a9	-	.20	.09	.01
F	<i>Oenothera caespitosa</i>	6	-	1	-	2	-	.03	-	.03	-
F	<i>Penstemon</i> sp.	5	-	-	-	-	-	-	-	-	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	3	2	5	-	.00	.01	.03
F	<i>Sisymbrium altissimum</i> (a)	-	-	a-	a-	a-	b15	-	-	-	.42
F	<i>Streptanthus cordatus</i>	-	2	-	-	-	-	-	-	-	-
F	<i>Taraxacum officinale</i>	-	-	-	2	3	5	-	.03	.03	.04
F	<i>Tragopogon dubius</i> (a)	c134	ab37	c96	b66	a11	a8	1.27	.48	.09	.08
F	<i>Veronica biloba</i> (a)	-	-	-	-	-	3	-	-	-	.03
F	<i>Vicia americana</i>	-	-	ab52	a29	b67	c108	.65	.42	2.18	3.92
Total for Annual Forbs		134	38	415	666	574	726	2.63	9.45	4.03	13.44
Total for Perennial Forbs		129	77	138	135	152	317	2.10	3.49	5.19	7.77
Total for Forbs		263	115	553	801	726	1043	4.74	12.94	9.22	21.21

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

BROWSE TRENDS--

Management unit 04, Study no: 6

T y p e	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	<i>Amelanchier utahensis</i>	4	1	1	1	.41	.15	.63	.38
B	<i>Artemisia tridentata vaseyana</i>	30	30	16	24	3.45	7.90	4.65	4.26
B	<i>Chrysothamnus nauseosus albicaulis</i>	37	31	25	15	1.99	5.21	2.04	.63
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	32	28	24	21	1.61	.95	1.42	.87
B	<i>Gutierrezia sarothrae</i>	41	35	3	4	1.43	.75	.15	.15
B	<i>Leptodactylon pungens</i>	-	-	-	-	-	.15	-	-
B	<i>Mahonia repens</i>	4	5	6	6	.06	.27	.63	.48
B	<i>Purshia tridentata</i>	10	8	10	5	.69	.22	1.14	.06
Total for Browse		14	13	16	11	9.66	15.61	10.67	6.85

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 6

Species	Percent Cover	
	'06	'11
<i>Artemisia tridentata vaseyana</i>	7.68	5.50
<i>Chrysothamnus nauseosus albicaulis</i>	3.54	.93
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	1.76	2.04
<i>Gutierrezia sarothrae</i>	-	.15
<i>Mahonia repens</i>	.11	.96
<i>Purshia tridentata</i>	.93	-

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 6

Species	Average leader growth (in)		
	'06	'11	
<i>Artemisia tridentata vaseyana</i>	2.6	2.0	1.8
<i>Purshia tridentata</i>	-	2.7	0.6

BASIC COVER--

Management unit 04, Study no: 6

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.25	10.00	40.52	52.22	47.18	50.22
Rock	19.00	16.50	13.25	18.04	20.68	19.32
Pavement	5.25	5.00	.59	.80	.70	.86
Litter	55.00	38.50	48.43	33.40	33.34	22.61
Cryptogams	0	0	.33	.14	.51	.85
Bare Ground	18.50	30.00	4.82	14.94	14.47	14.57

SOIL ANALYSIS DATA --

Management unit 04, Study no: 6, Study Name: Harris Canyon

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.4	7.2	43.3	26.7	30.0	4.0	6.9	163.2	0.8

PELLET GROUP DATA--

Management unit 04, Study no: 6

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	-	-	9	1	-	-	-
Elk	4	20	31	9	22 (55)	29 (71)	32 (78)
Deer	25	22	25	14	79 (195)	46 (112)	48 (119)
Cattle	-	1	-	-	-	-	-

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 6

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<b>Amelanchier utahensis</b>									
84	<b>33</b>	0	0	100	-	0	100	100	-/-
90	<b>33</b>	0	0	100	-	0	100	100	-/-
96	<b>80</b>	0	50	50	-	50	25	0	27/28
01	<b>20</b>	0	0	100	-	0	0	0	48/29
06	<b>20</b>	0	100	0	-	100	0	0	40/37
11	<b>20</b>	0	100	0	-	0	100	0	32/32
<b>Artemisia tridentata vaseyana</b>									
84	<b>631</b>	26	10	63	-	11	63	0	6/6
90	<b>698</b>	24	24	52	133	10	81	24	26/31
96	<b>840</b>	24	67	10	-	17	2	5	25/44
01	<b>680</b>	6	74	21	-	26	3	9	28/46
06	<b>440</b>	9	73	18	20	32	5	5	30/44
11	<b>620</b>	10	55	35	-	45	19	23	25/43
<b>Chrysothamnus nauseosus albicaulis</b>									
84	<b>232</b>	14	57	28	-	0	100	0	36/27
90	<b>931</b>	82	7	11	-	4	0	0	40/52
96	<b>1180</b>	19	76	5	20	20	0	0	22/35
01	<b>800</b>	8	60	33	-	30	18	13	25/34
06	<b>640</b>	6	53	41	-	13	0	16	25/33
11	<b>360</b>	6	50	44	20	44	0	44	20/25

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<b>Chrysothamnus viscidiflorus viscidiflorus</b>										
84	33	0	0	100	-	100	0	100	-/-	
90	765	22	30	48	-	13	65	35	6/8	
96	1380	17	83	0	20	4	3	0	11/17	
01	1020	6	92	2	-	2	0	0	9/14	
06	900	2	98	0	20	0	0	0	15/18	
11	760	11	82	8	960	8	0	5	9/16	
<b>Gutierrezia sarothrae</b>										
84	0	0	0	0	-	0	0	0	-/-	
90	1132	12	85	3	-	0	0	0	7/12	
96	2600	53	44	3	4100	0	0	3	10/13	
01	2140	7	90	4	-	0	0	3	8/9	
06	80	0	100	0	-	0	0	0	10/12	
11	120	17	83	0	-	0	0	0	7/11	
<b>Mahonia repens</b>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	660	100	0	-	-	0	0	0	-/-	
01	3300	7	93	-	-	0	0	0	3/4	
06	2540	0	100	-	-	0	0	0	2/4	
11	1700	0	100	-	-	0	0	0	2/4	
<b>Purshia tridentata</b>										
84	132	0	50	50	-	0	100	0	15/15	
90	165	20	20	60	-	20	80	60	11/28	
96	380	5	89	5	-	42	47	0	16/29	
01	300	0	100	0	-	0	100	0	15/30	
06	280	0	79	21	40	14	86	0	19/35	
11	180	11	44	44	-	11	89	22	21/33	
<b>Symphoricarpos oreophilus</b>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	15/22	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	17/24	
11	0	0	0	-	-	0	0	0	23/40	
<b>Tetradymia canescens</b>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	-/-	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	8/13	
11	0	0	0	-	-	0	0	0	12/37	