

ECHO CANYON - TREND STUDY NO. 4-2-11

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: 6,800 ft (2,073 m)

Aspect: Southwest

Slope: 30%

Transect bearing: 92° magnetic

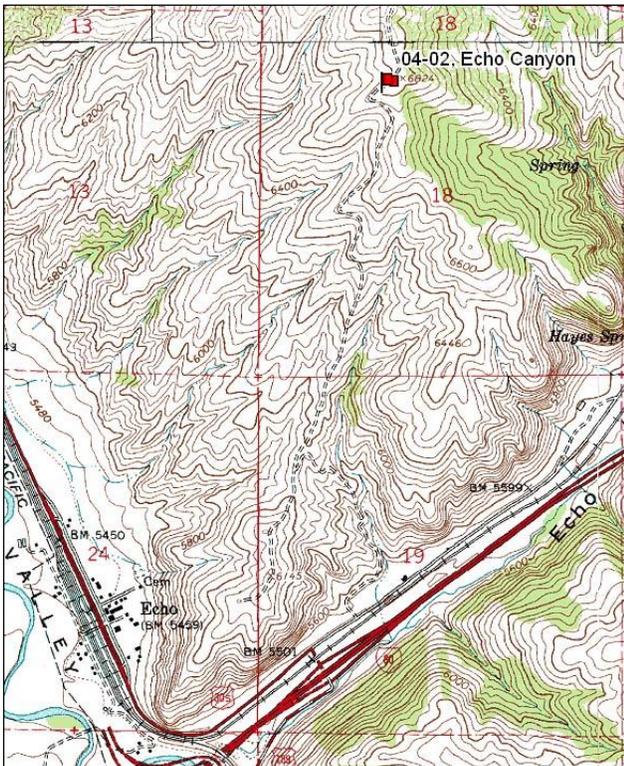
Belt placement: line 1 (11ft), line 2 (34ft), line 3 (95ft), line 4 (59ft), line 5 (71 ft)

Directions:

From I-80 exit 169, just east of the I-80/I-84 junction, travel northeast towards Emery 0.1 miles, and turn left onto a dirt road. Proceed up the mountain 0.2 miles to a gate. Proceed 0.6 miles to a fork, and turn right.

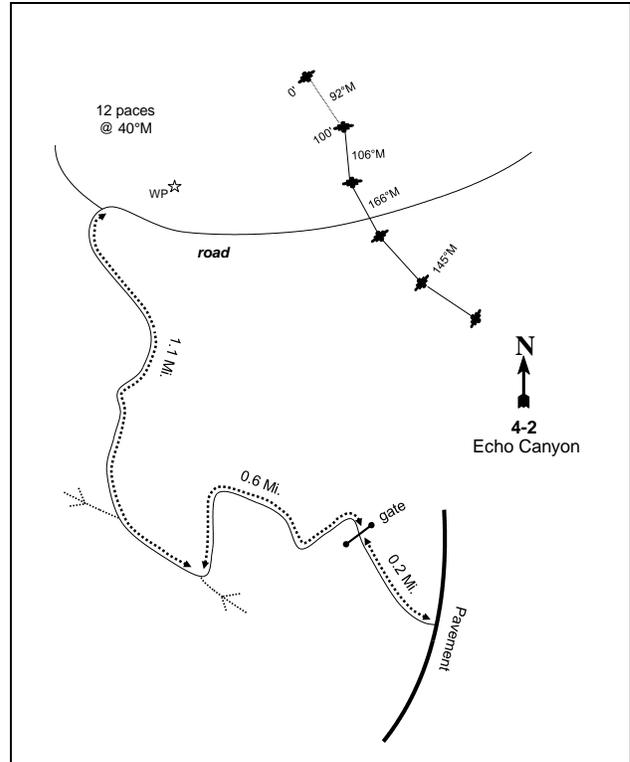
Proceed north 1.1 miles to a fork in the road and stop. From this point, walk 12 paces at 40 degrees magnetic to the witness post. The 0-foot baseline stake is 18 paces at 40 degrees magnetic from the witness post. The 0-foot baseline stake is marked by browse tag #7943. The baseline doglegs along the hillside. Line 1 runs 92 degrees magnetic. Line 2 runs 106 degrees magnetic. Line three runs 166 degrees magnetic. Lines 4 and 5 run 145 degrees magnetic.

Map Name: Coalville



Township: 3N Range: 5E Section: 18

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 463944 E 4538613 N

ECHO CANYON - TREND STUDY NO. 4-2

Site Information

Site Description: This is located on the ridge approximately one mile to the northeast of Echo Junction. The area is managed by the Division of Wildlife Resources (DWR) as part of the Henefer-Echo Wildlife Management Area (WMA). At the outset of the study, the study area was dominated by a moderately dense population of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), but sagebrush has decreased in abundance and the weedy grass species bulbous bluegrass (*Poa bulbosa*) has become the dominant species on the site. Deer pellet groups were sampled in high abundance in 2001 and 2006, but in low abundance in 2011 following a hard winter. Elk pellet groups have been sampled in low to moderate abundance since 2001. Sampled cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: Mountain big sagebrush provides the majority of the browse cover (Table - Browse Trends). The sagebrush population has been declining since 1996. The population was moderately dense at the outset of the study, but has steadily decreased since 1996. Decadence and poor vigor of sagebrush have also steadily increased since 1996, and both parameters were very high in 2011. Recruitment of young sagebrush plants has been poor in most sample years. Utilization of sagebrush has been moderate to heavy over the course of the study. Other browse species are rare on the site (Table - Browse Characteristics). The decrease in sagebrush on this site is a major concern. Decreases in density and cover are likely primarily due to competition with the weedy exotic species bulbous bluegrass and cheatgrass (*Bromus tectorum*). Continued heavy utilization of browse by animals will likely exasperate the stress from competition and increase the rate of decline of browse on this site.

Herbaceous Understory: The grass component has increased, and provides the majority of the vegetation cover on the site. However, most of the increase is due to the weedy species bulbous bluegrass, which has steadily increased since 1996 and has become the dominant species. The competition from the increase in bulbous bluegrass is likely responsible for much of the decrease in the sagebrush population. The only other common perennial grass species are bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*). Bluebunch wheatgrass is the major forage producer. Photographs taken from 1984 show little cheatgrass; however, annuals were not included in the sample in 1984 and 1990. Cheatgrass cover was high in 1996, but has decreased to more moderate levels. Forbs are abundant and relatively diverse. Common perennial forb species include Louisiana sagebrush (*Artemisia ludoviciana*), three species of milkvetch (*Astragalus* spp.), and silvery lupine (*Lupinus argenteus*). Annual forb species are also prevalent on the site (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 sandy clay loam with a neutral soil reaction (pH 7.0) (Table - Soil Analysis Data). Bare ground cover is low, with a high amount of vegetation and litter cover (Table - Basic Cover). The soil erosion condition was classified as slight in 2001, but has been stable since 2006.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** Density of mountain big sagebrush decreased 51% from 5,998 plants/acre to 2,932 plants/acre. Decadence increased from 29% to 64%.
- **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 decreased to 19%, and recruitment of young plants increased from 0% to 16% of the population.

- **1996 to 2001 - slightly down (-1):** Mountain big sagebrush density decreased 16% from 3,300 plants/acre to 2,780 plants/acre, but cover increased slightly from 14% to 15%. Decadence increased to 31%, and recruitment of young plants decreased to 0%.
- **2001 to 2006 - down (-2):** Density of mountain big sagebrush decreased 32% to 1,880 plants/acre, and cover decreased to 10%. Decadence increased to 48%, and poor vigor increased from 9% to 30%.
- **2006 to 2011 - down (-2):** Mountain big sagebrush decreased 37% to 1,180 plants/acre, and cover decreased to 4%. Decadence increased to 68%, and poor vigor increased to 63%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased 43%, with a significant increase in the nested frequency of bluebunch wheatgrass.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 31%. However, bulbous bluegrass was sampled for the first time. Annual grasses were included in the sample for the first time, and the nested frequency and cover of cheatgrass were very high.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased 36%, and cover increased from 10% to 16%. There was a significant decrease in the nested frequency of cheatgrass, and cover decreased from 14% to 4%.
- **2001 to 2006 - stable (0):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, remained similar, but cover increased to 20% due to an increase in bluebunch wheatgrass. Bulbous bluegrass increased significantly in nested frequency, and cover increased from 3% to 5%.
- **2006 to 2011 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 13%, and cover decreased to 13%. Bulbous bluegrass increased significantly in nested frequency, and cover increased to 24%. Bulbous bluegrass dominated the site.

Forb:

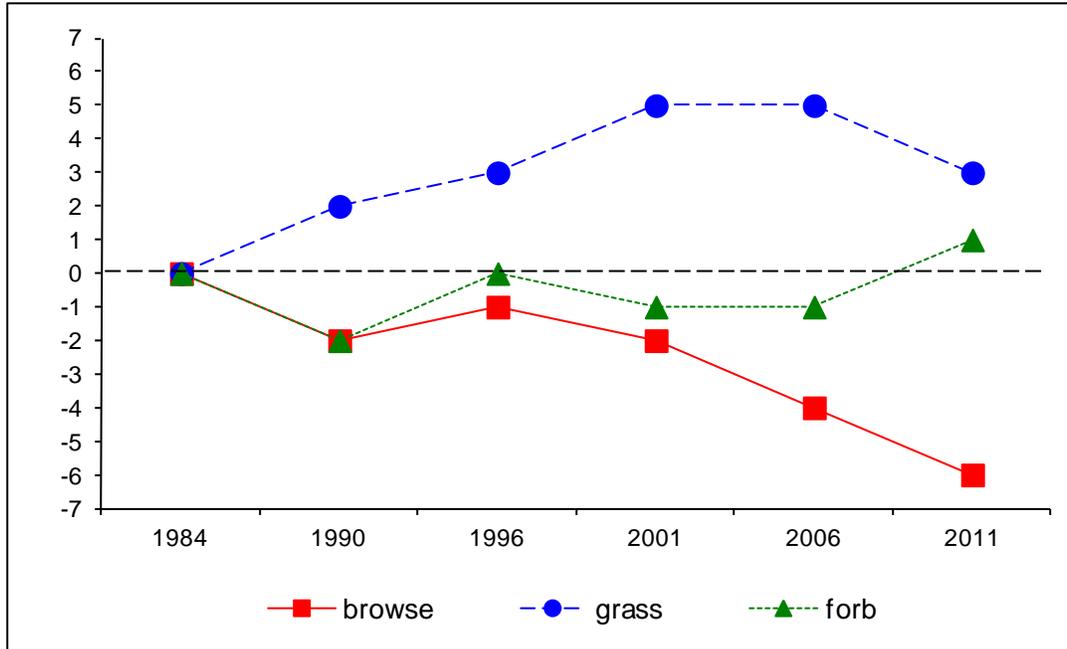
- **1984 to 1990 - down (-2):** The perennial forb sum of nested frequency decreased by 69%.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased more than two-fold. There was also a substantial increase in the sum of nested frequency of annual forbs.
- **1996 to 2001 - slightly down (-1):** There was a 19% decrease in the sum of nested frequency of perennial forbs, but cover increased slightly from 6% to 7%.
- **2001 to 2006 - stable (0):** There was little change in the sum of nested frequency or cover of perennial forbs.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased by 40%, and cover increased to 10%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 4, study no: 2

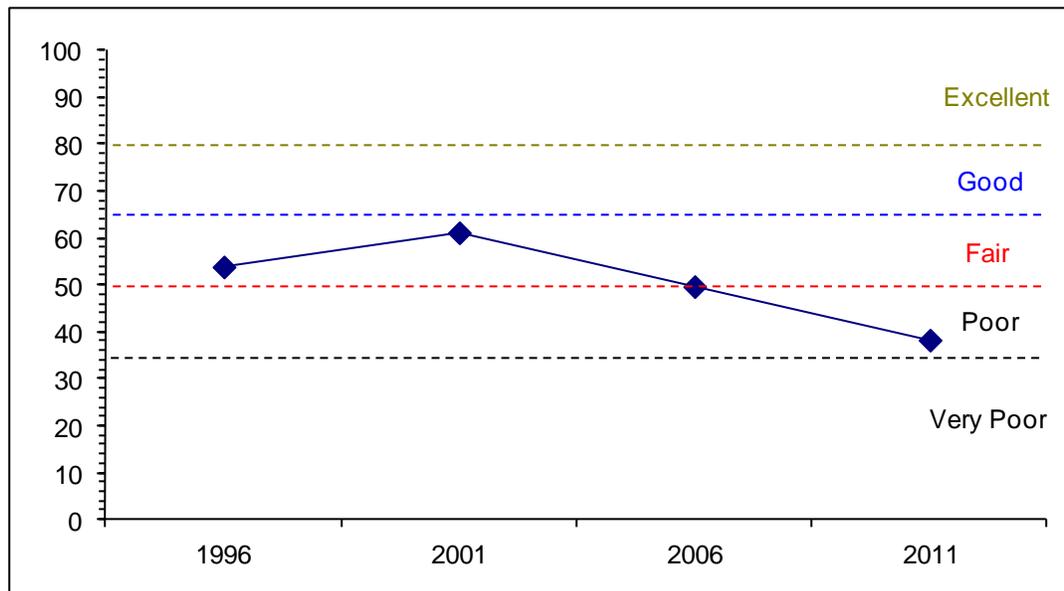
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	17.9	9.3	8.0	19.0	-10.3	10.0	0.0	53.9	Fair
01	18.8	5.7	0.0	30.0	-3.3	10.0	0.0	61.2	Fair
06	12.0	0.6	0.5	30.0	-3.4	10.0	0.0	49.7	Poor-Fair
11	5.3	0.0	0.0	26.5	-3.5	10.0	0.0	38.3	Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 4 Study no: 2



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 4, Study no: 2



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a125	bc179	b182	bc184	c226	bc232	7.53	7.38	15.21	10.14
G	Bromus japonicus (a)	-	-	a16	b33	a6	a4	.08	.36	.04	.00
G	Bromus tectorum (a)	-	-	c330	b169	b179	a128	13.71	4.04	4.49	4.67
G	Poa bulbosa	-	-	a58	a85	b160	c310	1.31	2.56	4.97	23.65
G	Poa fendleriana	-	-	6	3	16	1	.01	.03	.15	.03
G	Poa pratensis	7	17	10	17	4	6	.12	.66	.38	.03
G	Poa secunda	a20	a22	b83	c169	b121	b83	1.81	7.96	4.49	3.04
G	Sitanion hystrix	-	-	1	-	-	-	.00	-	-	-
G	Sporobolus cryptandrus	-	-	4	8	3	-	.03	.07	.15	-
G	Stipa lettermani	-	-	-	7	-	-	-	.06	-	-
Total for Annual Grasses		0	0	346	202	185	132	13.79	4.40	4.54	4.67
Total for Perennial Grasses		152	218	344	473	530	632	10.82	18.72	25.36	36.90
Total for Grasses		152	218	690	675	715	764	24.62	23.13	29.91	41.58
F	Achillea millefolium	-	2	4	4	3	3	.01	.01	.03	.03
F	Agoseris glauca	6	9	6	13	14	18	.01	.10	.14	.30
F	Allium acuminatum	b145	a6	a-	a21	a2	a23	-	.11	.00	.11
F	Alyssum alyssoides (a)	-	-	c199	bc167	a79	b122	5.09	1.06	.25	.62
F	Ambrosia psilostachya	-	-	-	-	-	-	-	.00	-	-
F	Antennaria rosea	-	-	-	3	1	-	-	.03	.00	-
F	Artemisia ludoviciana	bc45	c65	a19	ab26	ab25	ab33	1.32	1.85	.70	.79
F	Astragalus beckwithii	-	-	9	9	12	18	.07	.24	1.16	.87
F	Astragalus cibarius	b163	a-	a15	a22	a17	a2	.09	.34	.54	.03
F	Astragalus utahensis	a6	a5	c75	b39	a16	a12	1.76	1.37	.43	.53
F	Calochortus nuttallii	a1	a-	a1	ab6	a1	b22	.00	.02	.00	.07
F	Camelina microcarpa (a)	-	-	-	8	5	-	-	.07	.01	-
F	Castilleja linariaefolia	-	-	2	4	-	1	.00	.04	-	.03
F	Cirsium undulatum	6	17	13	5	2	3	.29	.18	.03	.18
F	Collinsia parviflora (a)	-	-	a22	b97	a50	a38	.07	.72	.10	.24
F	Collomia linearis (a)	-	-	b14	c39	a-	b12	.04	.18	-	.20
F	Crepis acuminata	-	-	1	2	-	3	.00	.00	-	.03
F	Cymopterus sp.	a-	a-	a-	b13	c69	c83	-	.06	.92	1.56
F	Descurainia pinnata (a)	-	-	-	3	-	1	-	.01	-	.00
F	Descurainia sp. (a)	-	-	-	-	-	7	-	-	-	.01
F	Draba sp. (a)	-	-	106	93	74	109	.31	.24	.34	.53
F	Epilobium brachycarpum (a)	-	-	-	10	4	-	-	.02	.01	-
F	Erigeron pumilus	-	-	-	3	-	-	-	.00	-	-
F	Eriogonum umbellatum	-	-	-	2	-	-	-	.00	-	-
F	Erodium cicutarium (a)	-	-	b97	a57	a37	c131	2.56	2.00	.35	5.48
F	Galium sp.	a-	a-	b14	a2	a-	a-	.08	.00	-	-
F	Grindelia squarrosa	a-	a-	b22	ab10	a1	a-	.10	.34	.03	-
F	Helianthus annuus (a)	-	-	-	-	5	-	-	-	.01	-
F	Heterotheca villosa	-	1	3	2	-	-	.00	.15	-	-
F	Holosteum umbellatum (a)	-	-	b239	a106	a80	a109	1.67	.66	.25	.97

Type	Species	Nested Frequency					Average Cover %				
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Lactuca serriola</i> (a)	-	-	3	-	-	1	.01	-	-	.00
F	<i>Lithophragma</i> sp.	-	-	-	-	-	3	-	-	-	.04
F	<i>Lomatium</i> sp.	a ⁻	a ³	b ²⁸	ab ¹⁹	a ³	ab ²¹	.09	.14	.02	.31
F	<i>Lupinus argenteus</i>	a ¹	ab ³	bc ²⁵	c ³¹	c ²⁹	c ⁴²	.97	1.37	.76	1.85
F	<i>Machaeranthera</i> spp	a ⁻	a ⁻	b ⁴²	a ⁻	a ⁻	a ²	.10	-	-	.00
F	<i>Microsteris gracilis</i> (a)	-	-	-	22	26	8	-	.05	.05	.02
F	<i>Oenothera</i> sp.	-	-	-	-	9	-	-	-	.07	-
F	<i>Penstemon</i> sp.	b ¹⁹	a ⁻	-	-	-	-				
F	<i>Ranunculus testiculatus</i> (a)	-	-	24	53	50	25	.10	.53	.36	.22
F	<i>Schoenrambe linifolia</i>	-	-	-	-	-	7	-	-	-	.21
F	<i>Senecio integerrimus</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Sisymbrium altissimum</i> (a)	-	-	-	-	-	9	-	-	-	.23
F	<i>Sphaeralcea grossulariifolia</i>	-	-	4	-	-	1	.18	-	-	.03
F	<i>Taraxacum officinale</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Tragopogon dubius</i> (a)	a ⁻	bc ³⁵	c ⁶¹	bc ³¹	ab ¹³	a ²	.37	.49	.18	.03
F	<i>Verbascum thapsus</i>	-	-	-	4	-	-	-	.01	-	-
F	<i>Veronica biloba</i> (a)	-	-	-	1	-	-	-	.00	-	-
F	<i>Vicia americana</i>	a ⁻	a ¹⁰	c ⁶³	ab ³⁶	bc ⁶³	c ⁸¹	.57	.36	1.71	2.91
F	<i>Zigadenus paniculatus</i>	-	1	-	-	3	-	-	-	.00	-
Total for Annual Forbs		0	35	765	687	423	574	10.25	6.06	1.93	8.58
Total for Perennial Forbs		392	122	346	280	270	378	5.69	6.78	6.58	9.93
Total for Forbs		392	157	1111	967	693	952	15.94	12.85	8.51	18.52

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

BROWSE TRENDS--

Management unit 04, Study no: 2

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	<i>Artemisia tridentata vaseyana</i>	75	77	60	42	14.32	15.01	9.60	4.08
B	<i>Chrysothamnus nauseosus albicaulis</i>	4	1	1	0	-	-	-	.15
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	4	2	5	2	.45	.53	.74	.00
B	<i>Gutierrezia sarothrae</i>	20	34	5	1	.29	.90	-	.00
B	<i>Opuntia</i> sp.	6	6	4	1	-	-	.15	-
B	<i>Symphoricarpos oreophilus</i>	4	5	4	6	.18	.04	.06	.68
Total for Browse		113	125	79	52	15.25	16.48	10.55	4.92

CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 2

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	11.75	5.88
Chrysothamnus viscidiflorus viscidiflorus	.08	.20
Gutierrezia sarothrae	.05	-
Opuntia sp.	.23	-
Symphoricarpos oreophilus	1.18	1.46

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 2

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.7	1.8	1.0

BASIC COVER--

Management unit 04, Study no: 2

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.50	10.50	49.46	50.97	47.50	60.85
Rock	23.00	13.50	9.88	11.98	8.98	9.15
Pavement	13.25	9.25	6.84	11.67	11.53	2.95
Litter	49.75	63.00	59.37	43.15	42.29	45.18
Cryptogams	0	0	.03	.10	.08	.07
Bare Ground	11.50	3.75	2.89	9.38	6.46	3.04

SOIL ANALYSIS DATA --

Management unit 04, Study no: 2, Study Name: Echo Canyon

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.5	7.0	46.7	27.0	26.3	3.1	25.9	192.0	0.7

PELLET GROUP DATA--

Management unit 04, Study no: 2

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	-	-	1	-	-	-	-
Rabbit	-	-	5	2	-	-	-
Elk	17	1	22	14	6 (15)	28 (69)	5 (13)
Deer	17	29	35	38	50 (124)	84 (208)	7 (18)
Cattle	2	1	1	1	5 (13)	-	-

BROWSE CHARACTERISTICS--

Management unit 04, Study no: 2

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Amelanchier alnifolia</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	32/29	
01	0	0	0	-	-	0	0	0	34/37	
06	0	0	0	-	-	0	0	0	50/52	
11	0	0	0	-	-	0	0	0	50/50	
<i>Artemisia tridentata vaseyana</i>										
84	5998	1	70	29	266	23	76	0	26/35	
90	2932	0	36	64	1933	66	23	7	26/35	
96	3300	16	64	19	20	44	4	1	18/37	
01	2780	0	69	31	80	53	12	9	23/44	
06	1880	1	51	48	280	40	37	30	24/39	
11	1180	2	31	68	20	56	14	63	22/38	
<i>Chrysothamnus nauseosus albicaulis</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	80	0	100	-	-	0	0	0	18/30	
01	20	0	100	-	-	0	0	0	29/41	
06	20	0	100	-	-	0	0	0	31/47	
11	0	0	0	-	-	0	0	0	26/44	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	66	0	100	-	-	0	0	0	7/9	
90	66	0	100	-	-	0	0	100	9/20	
96	80	0	100	-	-	0	0	0	12/22	
01	40	0	100	-	-	0	0	0	10/19	
06	100	0	100	-	-	0	0	0	13/24	
11	40	0	100	-	-	0	0	0	12/20	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	1340	39	61	0	980	0	0	0	8/11	
01	1540	3	91	6	-	0	0	3	7/9	
06	140	14	86	0	-	0	0	0	7/10	
11	20	0	100	0	20	0	0	0	5/4	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Opuntia sp.										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	240	8	92	-	-	0	0	0	6/12	
01	260	15	85	-	-	8	0	23	4/10	
06	80	0	100	-	-	0	0	0	5/17	
11	20	0	100	-	-	0	0	0	6/18	
Symphoricarpos oreophilus										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	80	75	25	-	-	0	0	0	25/25	
01	120	0	100	-	-	0	0	0	16/22	
06	80	0	100	-	-	0	0	0	24/43	
11	160	0	100	-	-	0	0	0	25/36	