

Trend Study 6-2-06

Study site name: Echo Canyon Rest Area .

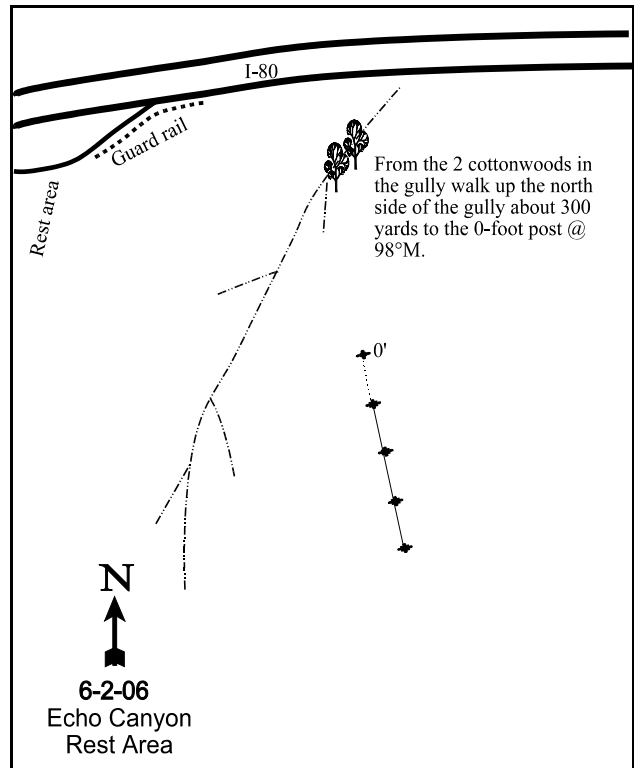
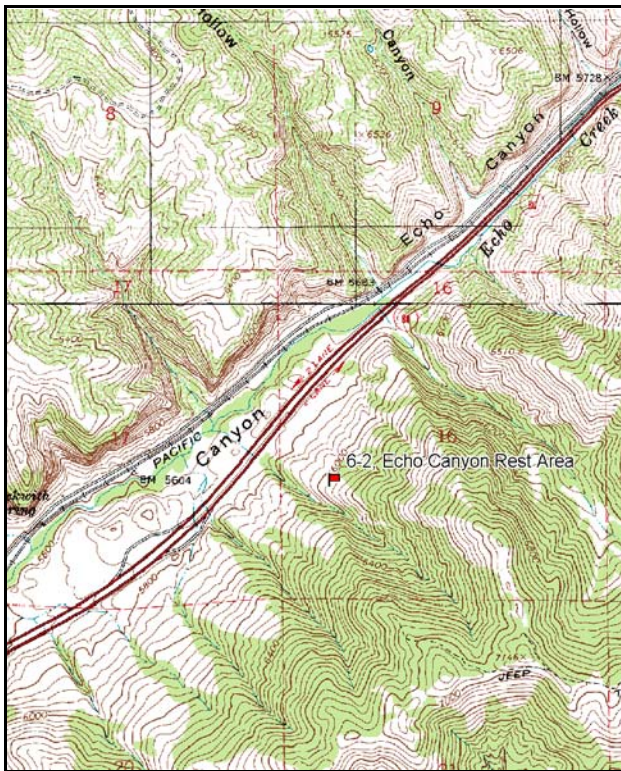
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 80 degrees magnetic.

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

LOCATION DESCRIPTION

Beginning at Echo Reservoir, travel northeast on Highway I-80 to the rest area (approximately 2 miles). From the rest area, follow the guard-rail on the right side of the freeway until it ends (approximately 100 yards). From the end of the guard-rail, proceed on an azimuth of 90 degrees magnetic for approximately 305 paces to a point on the left-hand or north side of the canyon. The 0-foot stake of the baseline consists of a green steel fencepost, 12"-18" high, and is marked with browse tag #7950.



Map Name: Coalville

Diagrammatic Sketch

Township 3N, Range 5E, Section 16

UTM NAD 27, UTM 12T 4537730 N 466866 E

DISCUSSION

Echo Canyon Rest Area - Trend Study 6-2

Study Information

This study replaced a line-intercept transect established in 1977 which sampled a similar true mountain mahogany community. In 1984, a new study was established slightly up slope using the newer sampling methods, but was on a steep rocky south-facing slope (70%) with very little big game use. The current study was reestablished a second time in 1996, when the study methods were refined once again, on a ridge that is up slope and to the north of the 1984 study (elevation: 6,000 feet, slope: 32%, aspect: west). A fire burned the study area in 1999. In 1996 (pre-burn), the pellet group quadrat frequency showed moderately high use for deer, light use for elk, and occasional use by moose. Pellet group quadrat frequency for deer decreased from 38% in 1996 to 12% in 2001 and no elk or moose pellet groups were sampled. The pellet group transect data in 2001 estimated 26 deer days use/acre (64 ddu/ha) and 7 elk days use/acre (18 edu/ha). In 2006, the pellet group quadrat frequency was 28% for deer and 18% for elk. The 2006 pellet group transect data estimated 27 deer, 36 elk, and 1 moose days use/acre (68 ddu/ha, 89 edu/ha, and 1 mdu/ha). Most pellets were from winter, but some were from spring.

Soil

The soil is in the Horrocks-Cutoff series complex, which is moderately deep, well drained, moderately permeable and formed in glacial deposits, residuum, and colluvium derived from andesite, quartzite, sandstone, and conglomerate (USDA-NRCS 2006). The soil texture is a sandy clay loam with a neutral reaction (pH of 6.7). Soils have an effective rooting depth estimated at almost 15 inches. Surface rock and pavement are not particularly abundant, yet the soil profile is moderately stony throughout. Erosion is not excessive on this moderately steep ridge because of the abundant vegetation and litter cover and a fairly low percentage of bare ground cover. The relative bare ground cover was 6% in 1996, 12% in 2001, and 14% in 2006. The erosion condition class score was slight in 2001 and stable in 2006.

Browse

The browse community has been diverse, both before and after the burn. Prior to the fire, the key browse consisted mostly of mountain big sagebrush, true mountain mahogany, bitterbrush, and serviceberry. Two other species that are usually not considered key browse, snowberry and Gambel oak, were also present and had displayed some use. Mountain big sagebrush was the most abundant browse in 1996, with an estimated density of 2,440 plants/acre. Plants classified with poor vigor was also high in 1996. After the fire, the sagebrush density was 80 plants/acre in 2001 and 160 plants/acre in 2006, most of which were young in 2001 and mature in 2006.

Antelope bitterbrush, Saskatoon serviceberry, and true mountain mahogany shrubs were sampled at relatively low densities previous to the fire. In 1996, serviceberry density was 120 plants/acre, mahogany was 420 plants/acre, and bitterbrush was only 60 plants/acre. After the fire in 2001, it was noted that these key browse species were resprouting, primarily mountain mahogany and serviceberry. A lot of the mahogany and serviceberry were classified as decadent in 2001, but decadence may have been overestimated because of the burned growth form and many of the resprouting individuals appeared young. Serviceberry density was 200 plants/acre in 2001 and 440 plants/acre in 2006. Use on serviceberry was heavy in 1996, light in 2001, and light-moderate in 2006. Mahogany density was 300 plants/acre in 2001 and 180 plants/acre in 2006. Use on mahogany was light in 2001, but heavy in 2006. Bitterbrush density was only 40 plants/acre in 2001 and 2006. Use was moderate in 1996, light in 2001, and heavy in 2006.

Gambel oak density increased from 760 stems/acre in 1996 to 2,040 stems/acre in 2001 and 2,880 stems/acre in 2006. Oak cover remained unchanged after the fire, although stems were more abundant. This species is a vigorous sprouter following fire. Stickyleaf low rabbitbrush has maintained a stable population since 1996.

Herbaceous Understory

The herbaceous understory is an important component to this winter range; it provided 27% cover in 1996, 51% in 2001, and 36% in 2006. A composition change occurred between 1996 and 2001 due to the fire. In 1996, 88% of the herbaceous cover was made up of grasses. In 2001, grasses provided only 47% of the herbaceous cover and forbs provided 53% of the cover. The increase in forbs was due primarily to two perennial species, yarrow and American vetch, and several annual species (pale alyssum, littleflower collinsia, holosteum, and bur buttercup). In 2006, grasses made up 73% of the herbaceous cover, most of which were perennials. Sandberg bluegrass and bluebunch wheatgrass made up 85% of the grass cover in 1996, but both significantly decreased in nested frequency in 2001. Bluebunch increased significantly again in 2006, but Sandberg's bluegrass did not. Cheatgrass provided 3% cover in 1996, increased to 8% in 2001, then decreased to 5% in 2006. Annual forb nested frequency increased ten-fold in 2001 and remained high in 2006. Annual species often increase following disturbances.

2001 TREND ASSESSMENT

Due to the change in the study location in 1996, the summaries for 1984 to 1996 have been omitted because they do not compare with the new location.

Trend for browse is down. The decline in trend is caused by the decline in sagebrush density and increased decadence of other browse species after the fire. Mountain big sagebrush density declined by 97% in 2001, with only 80 young plants/acre sampled. Mountain big sagebrush provided 44% of the browse cover in 1996 and 0% in 2001. True mountain mahogany density decreased as well, but many of the plants are sprouting. Serviceberry and bitterbrush were infrequent prior to the fire, and have remained so. Gambel oak density increased from an estimated 760 stems/acre to over 2,000 stems/acre in 2001, which should help prevent erosion. The grass trend is down. The nested frequency of perennial grasses decreased 35% which was due to significant decreases in bluebunch wheatgrass and Sandberg bluegrass. The nested frequency of annual forbs increased 35%, although the nested frequency of cheatgrass did not increase significantly. The forb trend is up. The nested frequency of perennial forbs increased more than two-fold and several species increased significantly. The nested frequency of annual forbs also increased, nearly ten-fold. The Desirable Components Index score in 1996 was good due to excellent browse cover, excellent perennial grass cover, moderate perennial forb cover, and moderate decadence. In 2001, the DCI had decreased to fair because of the loss of browse cover.

1996 winter range condition (DC Index) - good (78) High potential scale

2001 winter range condition (DC Index) - fair (64) High potential scale

browse - down (-2)

grass - down (-2)

forb - up (+2)

2006 TREND ASSESSMENT

The browse trend is stable. The density of serviceberry increased slightly; mahogany, sagebrush, and bitterbrush densities remained stable. The density of Gambel oak increased, but did not appear to have been utilized. The grass trend is up. The nested frequency of perennial grasses increased 37% (excluding bulbous bluegrass) due to a significant increase in bluebunch wheatgrass. The nested frequency of cheatgrass increased significantly, however. The forb trend is stable. The nested frequency of perennial forbs decreased, but most of the decreases were due to significant decreases in weedy or increaser species. The DCI score remained fair in 2006.

winter range condition (DC Index) - fair (63) High potential scale

browse - stable (0)

grass - up (+2)

forb - stable (0)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 2

T y p e	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	_b 176	_a 104	_b 186	6.88	6.83	11.74
G	Bromus brizaeformis (a)	-	-	1	-	-	.00
G	Bromus carinatus	-	2	2	-	.15	.03
G	Bromus japonicus (a)	-	-	1	-	-	.00
G	Bromus tectorum (a)	_a 166	_a 214	_b 310	3.30	7.93	4.98
G	Carex sp.	-	-	1	-	.00	.03
G	Festuca myuros (a)	-	2	-	-	.00	-
G	Festuca ovina	5	-	-	.03	-	-
G	Koeleria cristata	3	1	2	.03	.00	.03
G	Oryzopsis hymenoides	-	-	1	.00	-	.15
G	Poa bulbosa	-	-	4	-	-	.01
G	Poa fendleriana	_a 7	_{ab} 14	_b 28	.18	.57	1.11
G	Poa secunda	_b 318	_a 194	_a 224	13.49	8.03	8.32
G	Sitanion hystrix	-	-	3	-	-	.03
Total for Annual Grasses		166	216	312	3.30	7.94	4.99
Total for Perennial Grasses		509	315	451	20.62	15.60	21.48
Total for Grasses		675	531	763	23.93	23.54	26.47
F	Achillea millefolium	_c 117	_b 176	_a 48	1.82	10.21	1.58
F	Agoseris glauca	_a -	_a 2	_b 18	-	.00	.04
F	Alyssum alyssoides (a)	_a 28	_b 104	_c 200	.11	3.04	.83
F	Allium sp.	_a 4	_c 86	_b 63	.03	.51	.49
F	Ambrosia psilostachya	-	1	1	-	.15	.15
F	Antennaria rosea	1	1	3	.03	.03	.15
F	Arabis sp.	1	8	2	.00	.04	.01
F	Astragalus cibarius	_a -	_b 14	_{ab} 6	-	.37	.18
F	Astragalus convallarius	4	6	1	.03	.16	.00
F	Aster sp.	3	-	4	.03	.03	.06
F	Castilleja linariaefolia	3	1	-	.03	.03	-
F	Calochortus nuttallii	_a -	_{ab} 3	_b 18	-	.01	.06
F	Cirsium undulatum	_a 14	_b 36	_a 12	.11	.79	.23
F	Collomia linearis (a)	1	7	10	.00	.02	.02
F	Comandra pallida	3	-	-	.00	-	-
F	Collinsia parviflora (a)	_a 12	_c 188	_b 111	.03	3.34	.40
F	Crepis acuminata	3	9	14	.00	.10	.10
F	Descurainia pinnata (a)	_a -	_b 38	_a 1	-	.21	.00

T y p e	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	<i>Draba verna</i> (a)	a-	b ⁶⁴	b ⁴⁴	-	.20	.15
F	<i>Epilobium brachycarpum</i> (a)	a-	b ⁹⁶	c ¹⁰⁹	-	.46	.89
F	<i>Erodium cicutarium</i> (a)	-	-	5	-	-	.03
F	<i>Erigeron pumilus</i>	b ³⁰	b ²⁸	a ⁷	.65	.32	.04
F	<i>Gayophytum ramosissimum</i> (a)	3	3	2	.00	.00	.01
F	<i>Hackelia patens</i>	3	-	-	.03	.15	.03
F	<i>Hedysarum boreale</i>	-	-	2	-	-	.00
F	<i>Helianthella uniflora</i>	-	-	-	-	.00	-
F	<i>Holosteum umbellatum</i> (a)	a ⁶	b ⁹⁵	b ⁸⁵	.01	1.18	.27
F	<i>Lactuca serriola</i>	-	1	-	-	.00	-
F	<i>Lomatium triternatum</i>	a-	ab ⁴	b ¹³	-	.01	.10
F	<i>Microsteris gracilis</i> (a)	a-	b ¹⁵	c ⁵⁷	-	.08	.78
F	<i>Penstemon</i> sp.	1	-	4	.00	-	.00
F	<i>Phlox longifolia</i>	6	3	-	.02	.03	-
F	<i>Polygonum douglasii</i> (a)	a ⁶	a ²	b ³⁹	.01	.00	.11
F	<i>Ranunculus testiculatus</i> (a)	a ⁹	b ⁸³	c ¹³⁹	.02	1.31	1.19
F	<i>Schoenocrambe linifolia</i>	a-	b ²²	a ⁴	-	.53	.04
F	<i>Senecio integerrimus</i>	-	2	-	-	.00	-
F	<i>Sisymbrium altissimum</i> (a)	a-	b ¹³	a-	-	.22	-
F	<i>Sphaeralcea coccinea</i>	-	-	1	-	-	.15
F	<i>Tragopogon dubius</i>	-	-	3	-	-	.03
F	<i>Verbascum thapsus</i>	a-	b ¹⁸	a ¹	-	.11	.03
F	<i>Vicia americana</i>	a ³⁷	b ¹⁴⁰	b ¹²⁹	.28	2.97	1.40
F	<i>Zigadenus paniculatus</i>	-	1	2	-	.03	.03
Total for Annual Forbs		65	708	802	0.21	10.13	4.72
Total for Perennial Forbs		230	562	356	3.11	16.64	4.96
Total for Forbs		295	1270	1158	3.33	26.77	9.68

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

BROWSE TRENDS --

Management unit 06 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	<i>Amelanchier alnifolia</i>	6	10	10	.07	.63	.93
B	<i>Artemisia tridentata vaseyana</i>	75	3	7	12.75	-	.38
B	<i>Cercocarpus montanus</i>	18	11	8	3.73	.97	.71
B	<i>Chrysothamnus nauseosus albicaulis</i>	0	2	1	-	-	.15
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	55	52	56	3.87	5.69	6.55
B	<i>Gutierrezia sarothrae</i>	4	3	7	.06	.18	-
B	<i>Opuntia sp.</i>	1	1	1	-	-	-
B	<i>Purshia tridentata</i>	2	2	2	1.00	1.25	1.70
B	<i>Quercus gambelii</i>	6	9	9	2.57	2.22	2.13
B	<i>Symphoricarpos oreophilus</i>	32	32	33	4.96	4.35	5.69
Total for Browse		199	125	134	29.04	15.31	18.27

CANOPY COVER, LINE INTERCEPT --

Management unit 06 , Study no: 2

Species	Percent Cover
	'06
<i>Amelanchier alnifolia</i>	.36
<i>Artemisia tridentata vaseyana</i>	.33
<i>Cercocarpus montanus</i>	1.13
<i>Chrysothamnus nauseosus albicaulis</i>	.23
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	11.14
<i>Gutierrezia sarothrae</i>	.10
<i>Purshia tridentata</i>	1.14
<i>Quercus gambelii</i>	4.23
<i>Symphoricarpos oreophilus</i>	9.61

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 06 , Study no: 2

Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	1.8	3.5
Artemisia tridentata vaseyana	-	3.6
Cercocarpus montanus	2.4	3.3

BASIC COVER --

Management unit 06 , Study no: 2

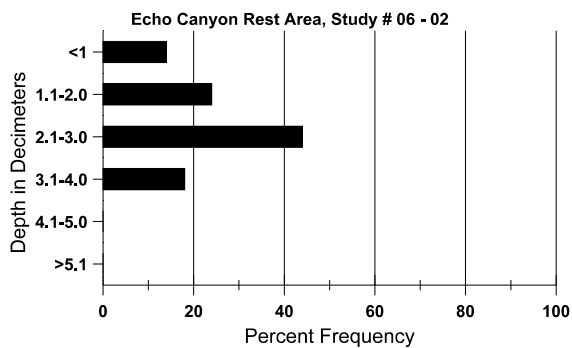
Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	51.15	61.48	50.06
Rock	1.75	2.42	3.21
Pavement	2.69	3.64	5.06
Litter	55.56	36.42	38.07
Cryptogams	6.57	1.93	2.82
Bare Ground	7.26	14.42	16.09

SOIL ANALYSIS DATA --

Herd Unit 06, Study no: 02, Echo Canyon Rest Area

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
14.9	65.2 (19.7)	6.7	44.7	22.0	33.3	2.9	14.4	92.8	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 06 , Study no: 2

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	3	4	28
Moose	1	-	-
Elk	6	-	18
Deer	38	12	28

Days use per acre (ha)	
'01	'06
-	-
-	1 (1)
7 (18)	36 (89)
26 (64)	27 (68)

BROWSE CHARACTERISTICS --

Management unit 06 , Study no: 2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia												
96	120	20	60	60	-	-	0	67	0	-	17	34/36
01	200	-	80	60	60	20	10	0	30	-	0	24/31
06	440	120	160	260	20	20	9	36	5	-	0	24/33
Artemisia tridentata vaseyana												
96	2440	-	120	1360	960	740	61	26	39	3	37	22/37
01	80	-	80	-	-	860	0	0	0	-	0	21/35
06	160	-	20	140	-	340	25	13	0	-	0	21/23
Cercocarpus montanus												
96	420	-	60	360	-	-	52	33	0	-	0	49/47
01	300	-	40	100	160	60	0	0	53	-	0	25/31
06	180	-	-	100	80	-	11	89	44	33	33	23/27
Chrysothamnus nauseosus albicaulis												
96	0	-	-	-	-	-	0	0	-	-	0	-/-
01	40	-	40	-	-	-	0	0	-	-	0	-/-
06	20	-	-	20	-	-	0	0	-	-	0	21/34
Chrysothamnus viscidiflorus viscidiflorus												
96	2400	-	80	2260	60	-	0	0	3	-	4	15/21
01	2320	-	180	2140	-	-	0	0	0	-	0	14/22
06	2460	60	220	1980	260	60	0	0	11	2	2	17/27
Gutierrezia sarothrae												
96	120	-	-	120	-	-	0	0	0	-	0	7/8
01	80	-	20	60	-	-	0	0	0	-	0	8/16
06	160	-	20	120	20	-	0	0	13	-	0	8/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
96	40	-	-	40	-	-	0	0	-	-	0	6/26
01	20	-	-	20	-	-	0	0	-	-	0	4/9
06	20	-	-	20	-	-	0	0	-	-	0	6/12
Purshia tridentata												
96	60	-	-	60	-	-	0	33	0	-	0	34/64
01	40	-	-	20	20	40	0	0	50	-	0	12/37
06	40	-	-	40	-	-	0	100	0	-	0	16/51
Quercus gambelii												
96	760	80	460	260	40	-	8	0	5	-	0	16/29
01	2040	-	2040	-	-	120	0	0	0	-	0	33/18
06	2880	-	240	2560	80	-	0	0	3	-	0	36/27
Symphoricarpos oreophilus												
96	1280	-	340	920	20	-	34	13	2	-	5	22/43
01	680	-	60	600	20	-	0	0	3	-	0	20/47
06	1240	-	140	1100	-	20	3	0	0	-	0	22/46