Trend Study 6-4-06

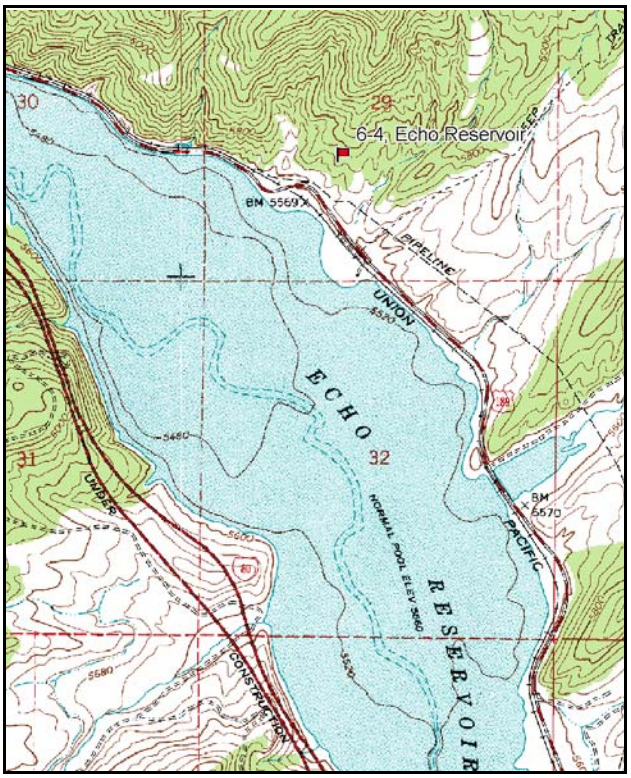
Study site name: Echo Reservoir . Vegetation type: Juniper .

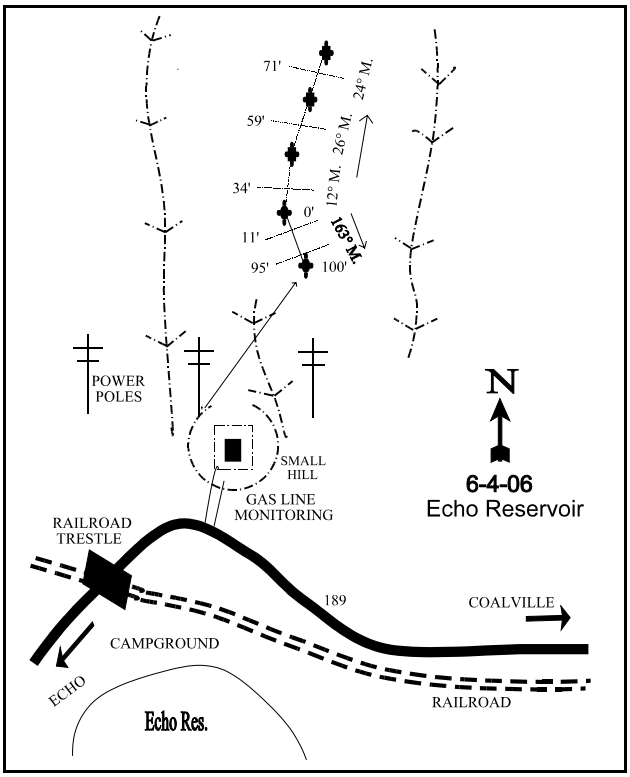
Compass bearing: frequency baseline 163 degrees magnetic.

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

LOCATION DESCRIPTION

From the east end of Echo Dam, proceed toward Coalville on Highway 189 to a point where the road passes over railroad tracks. Continue for approximately 150 yards to a spur road on the left that leads to a gas monitoring station on a small hill. From the power pole, approximately 25 yards north of the station, walk up the narrow ridge north of the power pole approximately 70 paces at 45 degrees true to the 100-foot stake of the baseline. The 0-foot stake is marked by browse tag #7970. The rest of the baseline runs off the 0-foot baseline stake. Line 2 runs in a direction of 34 degrees magnetic. Line 3 runs in a direction of 26 degrees magnetic. Line 4 runs in a direction of 24 degrees magnetic.





Map Name: Coalville

Diagrammatic Sketch

Township 3N , Range 5E , Section 29

UTM NAD 27, UTM 12T 4534516 N 465647 E

DISCUSSION

Echo Reservoir - Trend Study No. 6-4

Study Information

The study samples a Utah juniper community located immediately east of Echo Reservoir near Coalville (elevation: 5,700 feet, slope: 15-25%, aspect: southwest). This area is critically important to wintering deer, and to a lesser extent elk. Much of the surrounding area, including the high ridge to the north and the bench lands adjacent to Grass Creek, were consumed by fire prior to 1977. The old line-intercept transect, as well as the range trend study, both lie entirely within unburned juniper. Big game use has been moderate to heavy. Deer use was heavy prior to 1977. Although deer were fed at two nearby locations during the winter of 1983-84, signs of long-term winter use was intense. The heavy use has resulted in the elimination of the already low abundance browse forage. The only browse species is Utah juniper, but it was intensely highlined in the past, and provides only limited forage. Further evidence of heavy deer use was the more than 50 winter-killed carcasses from the critical winter of 1983-84 observed near the old line-intercept transect. The pellet group transect data in 2001 estimated 63 deer days use/acre (155 ddu/ha), 8 elk days use/acre (20 edu/ha), and 4 cow days use/acre (9 cdu/ha). In 2001, 3 deer carcasses were also observed. In 2006, 46 deer and 19 elk days use/acre (112 ddu/ha and 48 edu/ha) were estimated. Most pellets were from winter.

Soil

The soil is in the Jana-Richsum-Rock outcrop series complex, which consists of shallow to very deep, well drained, moderately permeable soils that formed in slope alluvium, colluvium, and residuum on mountain slopes, valley sides, low mountains, and high tablelands. They were derived from conglomerate, sandstone, and shale (USDA-NRCS 2006). The effective rooting depth was estimated at just over 12 inches. The soil is clay loam in texture with a moderately alkaline soil reaction (7.9 pH). On the more gentle slopes, soil depth is moderate. On the steeper slopes, soil depth is more shallow and the erosion rate is more rapid. Relative bare ground cover in 1996 was 21%, 24% in 2001, and 36% in 2006. Most of the bare soil lies in the interspaces between juniper trees. On more gentle slopes, there is good litter cover under tree crowns and fair grass cover in the tree interspaces. The erosion condition class measurement was moderate in 2001and slight in 2006.

Browse

Browse composition consists of a variety of scattered shrubs, of which only mountain big sagebrush and Saskatoon serviceberry are palatable. The remaining species are less preferred and generally classifieded as increasers or invaders. The most abundant are stickyleaf low rabbitbrush and broom snakeweed. Big sagebrush and serviceberry have not been sampled since 1996 in neither density nor height/crown measurements. Utah juniper is highlined, but not as extensively as in the winters of 1982-84. It has shown significant recovery, yet is still a limited source of low quality browse. Point-centered quarter data taken in 2001 and 2006 estimated about 80 juniper trees/acre. Line intercept cover has averaged 16% since 2001.

Herbaceous Understory

Grasses are moderately abundant. Cheatgrass was the dominant grass in 1996 with 15%, but significantly declined in nested frequency and cover in 2001 due to the drought conditions of 2000 and 2001. Cheatgrass nested frequency changed little by 2006. Perennial grass cover nearly doubled in 2001. Indian ricegrass, Sandberg bluegrass, and needle-and-thread all significantly increased in nested frequency in 2001, while bluebunch wheatgrass significantly decreased in nested frequency. In 2006, the nested frequency of perennial grasses decreased, mainly due to significant decreases in the nested frequencies of Sandberg bluegrass and needle-and-thread. Forbs have been relatively insignificant during all years it has been sampled, having contributed only 2% cover in 2001 and about 5% in 1996 and 2006.

1990 TREND ASSESSMENT

The browse trend is down. The estimated 101 juniper trees/acre are mostly mature, severely highlined trees. Saskatoon serviceberry density decreased from 866 to 0 plants/acre in 1990. Low rabbitbrush provides most

of the browse forage. Prickly pear cactus and broom snakeweed are the only browse species that increased in density. The perennial grass component has improved since 1984. There is a good stand of bluebunch wheatgrass, Indian ricegrass, and needle-and-thread. The nested frequency of Sandberg bluegrass increased significantly.

browse - down (-2) grass - up (+2) forb - down (-2)

1996 TREND ASSESSMENT

The browse trend is stable. The density of preferred browse species continues to be lacking. The grass trend is slightly down. The nested frequency of perennial grasses decreased 16%, due mainly to significant decreases in the nested frequencies of Indian ricegrass and Sandberg bluegrass. Cheatgrass cover is quite high. The forb trend is slightly up, due mainly to a significant increase in the nested frequency of Utah milkvetch. The Desirable Components Index score is very poor due to no browse cover, only moderate perennial grass cover, moderate cheatgrass cover, and only moderate perennial forb cover.

winter range condition (DC Index) - very poor (11) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - slightly up (+1)

2001 TREND ASSESSMENT

Trend for browse remains stable. Palatable browse remains in very low abundance. Juniper is the dominant browse. The less palatable species, low rabbitbrush, prickly pear, and snakeweed, are the most abundant shrubs. The grass trend is up. The nested frequency of perennial grasses increased 23%. The nested frequency of Indian ricegrass and Sandberg bluegrass increased significantly and cheatgrass decreased significantly. The forb trend is stable. The nested frequency and composition of perennial forbs changed little. The DCI score remained very poor, although the annual grass cover decreased and perennial grass cover increased.

winter range condition (DC Index) - very poor (31) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - stable (0)

2006 TREND ASSESSMENT

The browse trend is stable. Preferred browse species are still lacking. The grass trend is down. The nested frequency of perennial grasses decreased 21%. The nested frequencies of Sandberg bluegrass and needle-and-thread decreased significantly. Cheatgrass nested frequency is unchanged. The forb trend is slightly down. The nested frequency of perennial forbs decreased slightly. The DCI score remained very poor.

winter range condition (DC Index) - very poor (27) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 4

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	$_{ab}$13	$_{ab}$21	$_{a}$7	$_{a}$6	$_{b}$27	.18	.15	.56
G	Agropyron spicatum	$_{a}$81	$_{bc}$130	$_{d}$177	$_{ab}$109	$_{cd}$166	5.22	4.59	8.24
G	Bromus brizaeformis (a)	-	-	7	-	-	.02	-	-
G	Bromus japonicus (a)	-	-	-	2	-	-	.00	-
G	Bromus tectorum (a)	-	-	$_{b}$323	$_{a}$152	$_{a}$138	15.37	1.27	1.90
G	Oryzopsis hymenoides	$_{b}$71	$_{b}$79	$_{a}$26	$_{b}$70	$_{b}$60	.43	3.11	2.12
G	Poa fendleriana	$_{a}$-	$_{a}$-	$_{b}$18	$_{a}$-	$_{a}$1	.13	-	.03
G	Poa pratensis	-	-	2	5	3	.00	.30	.03
G	Poa secunda	$_{a}$10	$_{c}$143	$_{b}$63	$_{c}$150	$_{b}$71	.93	2.65	1.13
G	Sitanion hystrix	-	-	1	3	-	.03	.00	.00
G	Sporobolus cryptandrus	2	1	-	-	-	-	-	-
G	Stipa comata	$_{ab}$32	$_{b}$47	$_{b}$61	$_{b}$92	$_{a}$15	1.87	5.07	.73
Total for Annual Grasses		0	0	330	154	138	15.39	1.28	1.90
Total for Perennial Grasses		209	421	355	435	343	8.81	15.89	12.86
Total for Grasses		209	421	685	589	481	24.20	17.17	14.77
F	Agoseris glauca	-	1	-	-	-	-	-	-
F	Alyssum alyssoides (a)	-	-	$_{b}$291	$_{a}$264	$_{b}$307	2.98	1.28	3.78
F	Allium sp.	-	-	-	4	4	-	.01	.01
F	Antennaria rosea	$_{b}$24	$_{b}$20	$_{a}$-	$_{a}$3	$_{ab}$7	-	.00	.09
F	Artemisia ludoviciana	-	-	-	-	3	-	-	.15
F	Astragalus cibarius	-	-	-	3	1	-	.00	.03
F	Astragalus utahensis	$_{b}$79	$_{a}$17	$_{b}$68	$_{a}$38	$_{a}$23	1.45	.29	.23
F	Camelina microcarpa (a)	-	-	-	1	4	-	.00	.02
F	Calochortus nuttallii	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$10	$_{a}$1	-	.01	.00
F	Cirsium undulatum	8	2	3	-	-	.03	-	-
F	Collomia linearis (a)	-	-	-	3	-	-	.00	-
F	Collinsia parviflora (a)	-	-	-	8	19	-	.04	.06
F	Cordylanthus ramosus (a)	-	-	-	1	-	-	.00	-
F	Crepis acuminata	-	-	1	-	-	.00	-	-
F	Cryptantha sp.	-	-	10	-	5	.06	-	.06
F	Cymopterus sp.	-	-	2	9	5	.01	.02	.06
F	Descurainia pinnata (a)	-	-	$_{a}$-	$_{a}$1	$_{b}$17	-	.00	.03
F	Draba sp. (a)	-	-	$_{a}$-	$_{a}$2	$_{b}$33	-	.00	.08
F	Epilobium brachycarpum (a)	-	-	-	4	-	-	.03	-
F	Eriogonum brevicaule	6	2	5	-	-	.09	-	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Erigeron pumilus	$_{a}$-	$_{ab}$5	$_{a}$-	$_{b}$12	$_{ab}$9	-	.08	.33
F	Galium aparine (a)	-	-	-	2	-	-	.00	-
F	Hackelia patens	-	-	4	-	-	.01	-	-
F	Holosteum umbellatum (a)	-	-	$_{a}$1	$_{ab}$6	$_{b}$14	.00	.02	.17
F	Lactuca serriola	-	-	-	-	2	-	-	.00
F	Lesquerella sp.	-	-	-	3	-	-	.00	-
F	Machaeranthera grindelioides	-	-	-	5	-	-	.03	-
F	Penstemon humilis	1	-	-	-	-	-	-	-
F	Phlox austromontana	22	21	12	8	7	.12	.19	.24
F	Phlox hoodii	-	-	-	-	1	-	-	.03
F	Phlox longifolia	-	1	-	-	-	-	-	-
F	Ranunculus testiculatus (a)	-	-	$_{a}$-	$_{a}$5	$_{b}$17	-	.01	.07
F	Sphaeralcea coccinea	30	29	24	19	16	.49	.31	.30
F	Townsendia sp.	-	-	-	5	-	-	.01	-
F	Tragopogon dubius	$_{b}$15	$_{a}$1	$_{a}$1	$_{a}$-	$_{a}$-	.00	-	-
F	Vicia americana	-	-	-	3	-	-	.01	-
Total for Annual Forbs		0	0	292	297	411	2.98	1.43	4.22
Total for Perennial Forbs		185	99	130	122	84	2.30	1.00	1.56
Total for Forbs		185	99	422	419	495	5.29	2.43	5.79

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

BROWSE TRENDS --
Management unit 06 , Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Chrysothamnus nauseosus albicaulis	2	1	1	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	36	27	18	1.18	.72	.18
B	Gutierrezia sarothrae	36	33	7	1.12	.90	.49
B	Juniperus osteosperma	3	2	1	7.92	5.48	1.89
B	Opuntia sp.	36	41	39	1.15	.90	1.62
B	Pinus edulis	0	0	1	-	-	-
B	Tetradymia canescens	1	3	2	-	.03	-
Total for Browse		114	107	69	11.39	8.03	4.19

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 4

Species	Percent Cover	
	'01	'06
Chrysothamnus viscidiflorus viscidiflorus	-	.01
Gutierrezia sarothrae	-	.30
Juniperus osteosperma	17.60	15.28
Opuntia sp.	-	1.35

POINT-QUARTER TREE DATA --
Management unit 06 , Study no: 4

Species	Trees per Acre	
	'01	'06
Juniperus osteosperma	80	79

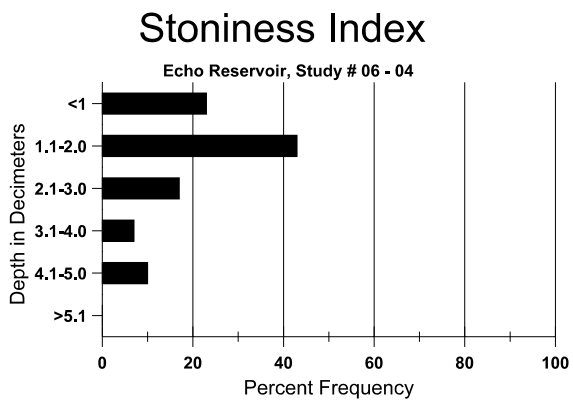
Average diameter (in)	
'01	'06
12.6	8.7

BASIC COVER --
Management unit 06 , Study no: 4

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	6.50	7.25	37.54	31.35	25.73
Rock	1.25	1.50	2.04	1.21	2.53
Pavement	2.25	4.50	6.47	6.97	10.48
Litter	61.00	46.50	37.07	31.57	22.95
Cryptogams	.75	7.75	6.51	16.85	11.54
Bare Ground	28.25	32.50	23.30	27.64	40.34

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

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
12.3	75.6 (12.1)	7.9	44.7	24.0	31.3	2.1	4.3	38.4	0.5



PELLET GROUP DATA --
Management unit 06 , Study no: 4

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	2	19	35
Elk	5	2	16
Deer	31	36	43
Cattle	1	3	-

Days use per acre (ha)	
'01	'06
-	-
8 (20)	19 (48)
63 (155)	46 (112)
-	-

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 4

		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												
84	**866**	-	66	400	400	-	8	92	46	-	0	42/14
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Artemisia tridentata vaseyana												
84	**66**	-	-	-	66	-	50	50	100	-	50	-/-
90	**33**	-	-	-	33	-	100	0	100	61	100	-/-
96	**0**	-	-	-	-	260	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	20	0	0	0	-	0	-/-
Chrysothamnus nauseosus albicaulis												
84	**33**	-	-	33	-	-	0	100	0	-	0	19/18
90	**33**	-	-	-	33	-	0	100	100	-	100	-/-
96	**40**	-	-	-	40	-	0	50	100	50	50	27/40
01	**20**	-	-	-	20	-	0	0	100	-	0	21/20
06	**20**	-	-	-	20	-	0	0	100	100	100	26/27
Chrysothamnus viscidiflorus viscidiflorus												
84	**5132**	-	66	2066	3000	-	14	0	58	-	0	12/18
90	**2332**	-	66	1733	533	-	9	11	23	2	69	10/14
96	**1940**	20	560	1340	40	-	1	0	2	-	0	8/14
01	**1200**	-	100	840	260	-	2	0	22	3	3	6/10
06	**580**	-	180	360	40	-	14	0	7	3	3	7/9

		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)
Gutierrezia sarothrae												
84	**1432**	-	66	1333	33	-	0	0	2	-	0	13/14
90	**2366**	566	1200	1033	133	-	0	0	6	.84	10	8/7
96	**1900**	700	580	1280	40	-	0	0	2	2	2	8/10
01	**2380**	-	40	2140	200	-	0	0	8	3	4	6/8
06	**280**	-	100	140	40	-	0	0	14	14	14	6/7
Juniperus osteosperma												
84	**66**	-	33	33	-	-	0	50	-	-	50	69/47
90	**33**	33	33	-	-	-	100	0	-	-	0	-/-
96	**60**	-	-	60	-	-	0	0	-	-	0	-/-
01	**40**	-	-	40	-	-	50	0	-	-	0	-/-
06	**20**	20	-	20	-	-	0	0	-	-	0	-/-
Opuntia sp.												
84	**999**	-	366	633	-	-	0	0	0	-	0	6/16
90	**1199**	-	333	833	33	-	0	0	3	-	22	4/16
96	**1300**	40	260	980	60	120	0	0	5	3	6	5/18
01	**1680**	40	120	1520	40	120	1	0	2	1	2	5/10
06	**1800**	40	120	1260	420	-	0	1	23	6	7	5/13
Pinus edulis												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
84	**1266**	-	333	800	133	-	32	0	11	-	0	27/25
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**0**	-	-	-	-	-	0	0	0	-	0	-/-
01	**0**	-	-	-	-	-	0	0	0	-	0	-/-
06	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Tetradymia canescens												
84	**66**	-	-	-	66	-	100	0	100	-	0	-/-
90	**66**	-	-	-	66	-	100	0	100	-	50	-/-
96	**40**	-	-	40	-	-	0	0	0	-	0	8/16
01	**100**	-	-	20	80	-	20	0	80	-	0	12/24
06	**40**	-	-	40	-	-	50	0	0	-	0	8/14