

ECHO RESERVOIR - TREND STUDY NO. 6-4-11

Vegetation Type: Juniper

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Upland Loam \(Basin Big Sagebrush\), R047XA305UT](#)

Land Ownership: Private

Elevation: 5,700 ft (1,737 m)

Aspect: South

Slope: 20%

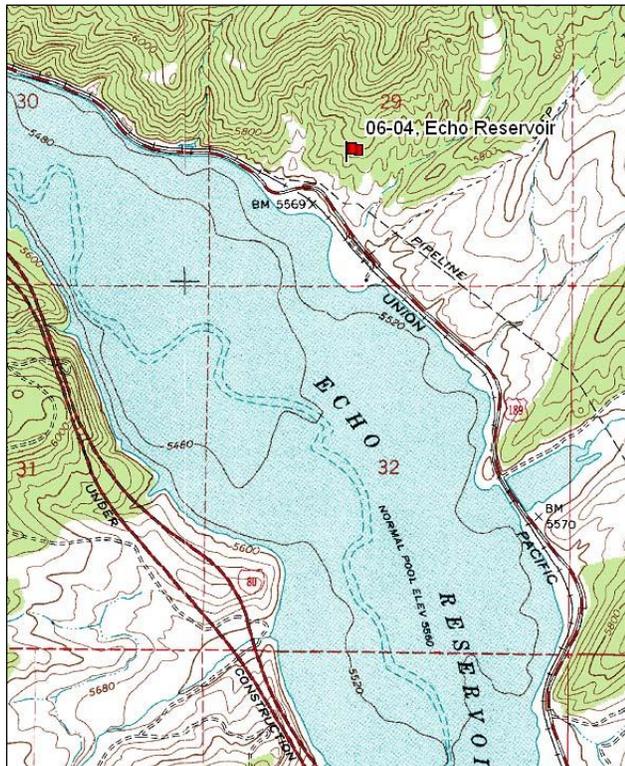
Transect bearing: 163° magnetic

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

Directions:

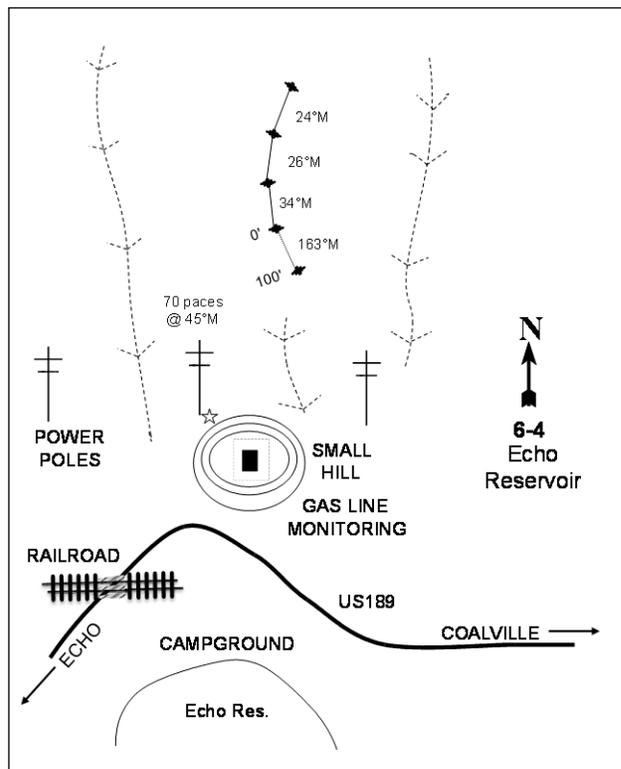
From the east end of Echo Dam, proceed toward Coalville on Highway 189 to a point where the road passes over railroad tracks. Continue for approximately 150 yards to a spur road on the left that leads to a gas monitoring station on a small hill. From the power pole, approximately 25 yards north of the 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



Township: 3N Range: 5E Section: 29

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 465582 E 4534723 N

ECHO RESERVOIR - TREND STUDY NO. 6-4

Site Information

Site Description: The study samples a Utah juniper (*Juniperus osteosperma*) community located immediately east of Echo Reservoir, near an old line-intercept transect study. This area is important to wintering deer, and elk to a lesser extent. 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 an unburned juniper stand. Big game use has been moderate to heavy. Although deer were fed at two nearby locations during the winter of 1983-84, signs of long-term winter use were intense. This heavy utilization likely contributed in the elimination of the already low abundance of browse forage. Evidence of heavy deer presence includes the more than 50 winter-killed carcasses observed near the old line-intercept transect following the hard winter of 1983-84. Deer pellet groups have been sampled in high abundance since 2001. There were three deer carcasses observed on the site in 2001 and one deer carcass in 2011. Elk pellet groups were sampled in low abundance in 2001, but have steadily increased and were sampled in moderate abundance in 2011. Sampled cattle sign has been minimal (Table - Pellet Group Data).

Browse: Browse composition consists of a variety of scattered shrubs, of which only mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Saskatoon serviceberry (*Amelanchier alnifolia*) are palatable. The remaining species are less preferred and are generally classified as increasers or invaders. The most abundant are stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and broom snakeweed (*Gutierrezia sarothrae*). Big sagebrush and serviceberry have not been sampled since 1996 in either density or height/crown measurements. The only substantial browse species is Utah juniper, but provides only limited quality forage. It was noted that Utah juniper trees had been high-lined in the past, but utilization has been lower in more recent sample years (Table - Browse Characteristics). The juniper population is comprised of mostly mature trees, and density has remained similar since 2001 (Table - Point-Quarter Tree Data).

Herbaceous Understory: Grasses are moderately diverse and abundant. The annual species cheatgrass (*Bromus tectorum*) was the dominant grass in 1996, but decreased significantly in nested frequency and cover in 2001. Cheatgrass remains common on the site, but perennial grass species are also prevalent and provide good cover. Common perennial grass species include bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), and needle-and-thread (*Stipa comata*). The forb component is not particularly abundant, and is dominated by annual species (Table - Herbaceous Trends).

Soil: The soil is in the Jana-Richsum-Rock outcrop series complex, likely as part of the Jana component. This component occurs on mountain slopes, and parent material consists of colluviums derived from sandstone, conglomerate, and shale (Soil Survey Staff 2011). The soil is a clay loam in texture with a moderately alkaline soil reaction (pH 7.9) (Table - Soil Analysis Data). 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. Bare ground cover is moderately high with most of the bare soil occurring in the interspaces between juniper trees; however, there is a moderate amount of vegetation and litter providing protective ground cover on the site. Pavement cover is also high (Table - Basic Cover). The soil erosion condition was classified as moderate in 2001, slight in 2006, but stable in 2011.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density of serviceberry decreased from 865 plants/acre to no plants sampled on the site. Other browse species occur in low densities.
- **1990 to 1996 - stable (0):** Palatable browse species remain rare on the site.

- **1996 to 2001 - stable (0):** Palatable browse species remain rare on the site.
- **2001 to 2006 - stable (0):** Palatable browse species remain rare on the site.
- **2006 to 2011 - stable (0):** Palatable browse species remain rare on the site.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased two-fold. The sum of nested frequency of Sandberg bluegrass increased significantly.
- **1990 to 1996 - slightly down (-1):** There was a 16% decrease in the sum of nested frequency of perennial grasses.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial grasses increased by 23%, and cover increased from 9% to 16%. There was a significant decrease in the nested frequency of cheatgrass, and cover decreased from 15% to 1%.
- **2001 to 2006 - down (-2):** There was a 21% decrease in the sum of nested frequency of perennial grasses, and cover decreased to 13%. Much of the decline was due to a significant decrease in the nested frequency of needle-and-thread.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial grasses increased slightly by 10%, and cover increased to 14%. There was a significant increase in the nested frequency of needle-and-thread, but a significant decrease in the nested frequency of bluebunch wheatgrass. The nested frequency of cheatgrass remained similar, but cover increased from 2% to 5%.

Forb:

- **1984 to 1990 - down (-2):** The sum of nested frequency of perennial forbs decreased 42%.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 32%, but perennial forbs remained moderately rare on the site.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial forbs, but cover decreased slightly from 2% to 1%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 33%, but cover increased slightly to 2%. Annual forb sum of nested frequency increased substantially, and cover increased from 1% to 4%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 70%, but cover remained similar at 2%. Perennial forbs remained rare on the site. Annual forb sum of nested frequency remained similar, but cover increased to 10%.

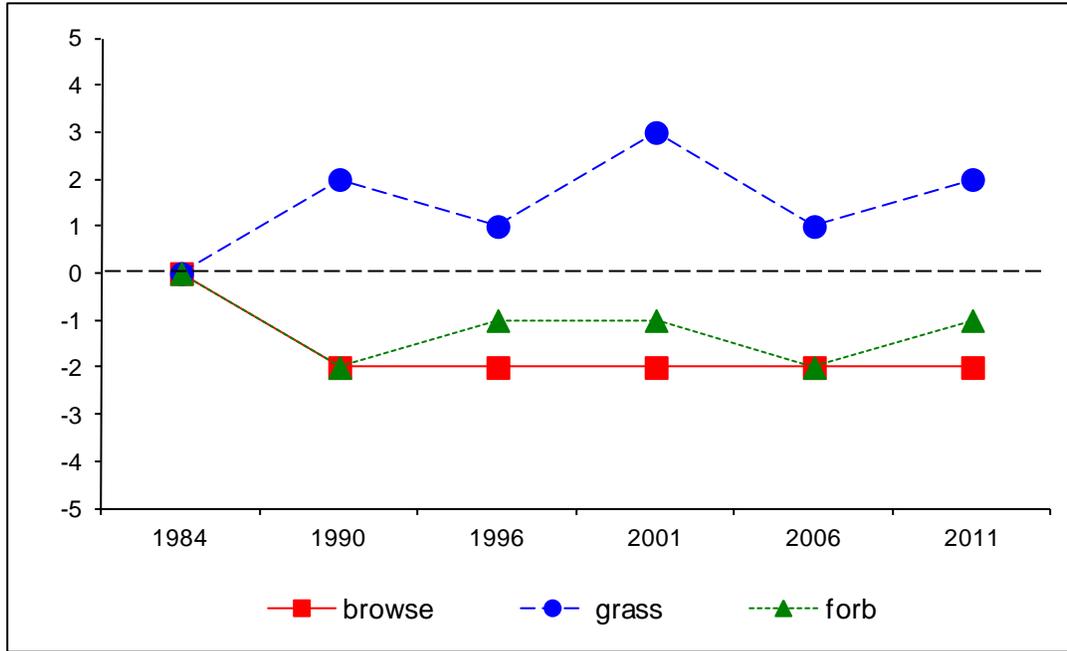
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 6, study no: 4

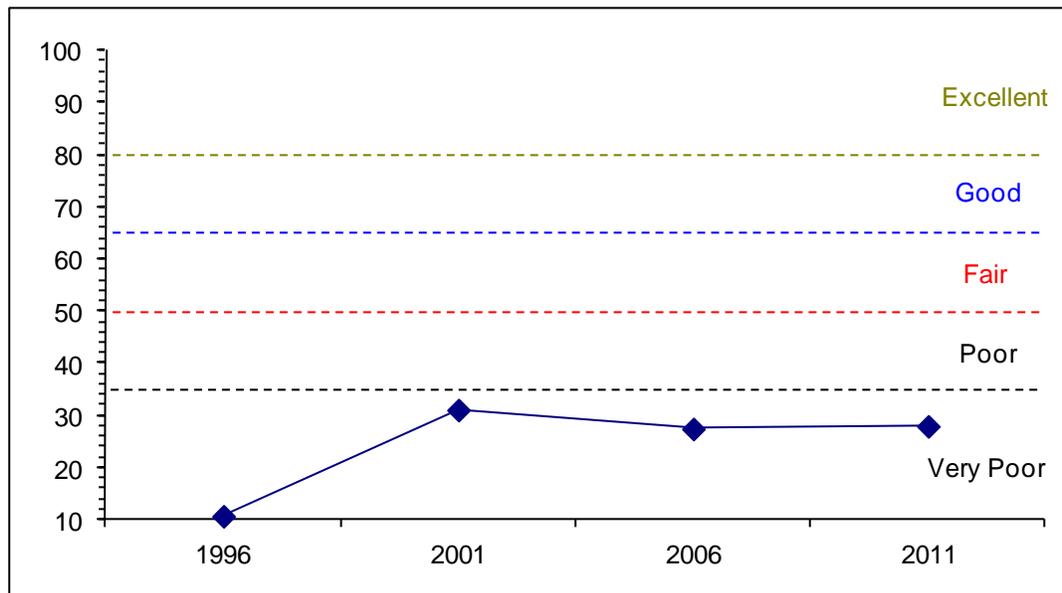
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	0.0	0.0	0.0	17.6	-11.5	4.6	0.0	10.7	Very Poor
01	0.0	0.0	0.0	30.0	-1.0	2.0	0.0	31.0	Very Poor
06	0.0	0.0	0.0	25.7	-1.4	3.1	0.0	27.4	Very Poor
11	0.0	0.0	0.0	27.0	-3.6	4.5	0.0	27.9	Very Poor

Trend Summary

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



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



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

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	ab13	ab21	a7	a6	b27	ab26	.18	.15	.56	.70
G	Agropyron spicatum	a81	bc130	d177	ab109	cd166	ab110	5.22	4.59	8.24	4.65
G	Bromus brizaeformis (a)	-	-	7	-	-	-	.02	-	-	-
G	Bromus japonicus (a)	-	-	-	2	-	-	-	.00	-	-
G	Bromus tectorum (a)	-	-	b323	a152	a138	a152	15.37	1.27	1.90	4.85
G	Oryzopsis hymenoides	b71	b79	a26	b70	b60	a22	.43	3.11	2.12	.67
G	Poa bulbosa	-	-	-	-	-	6	-	-	-	.06
G	Poa fendleriana	a-	a-	b18	a-	a1	a-	.13	-	.03	-
G	Poa pratensis	-	-	2	5	3	3	.00	.30	.03	.03
G	Poa secunda	a10	c143	b63	c150	b71	b98	.93	2.65	1.13	2.47
G	Sitanion hystrix	-	-	1	3	-	-	.03	.00	.00	.00
G	Sporobolus cryptandrus	2	1	-	-	-	-	-	-	-	-
G	Stipa comata	ab32	b47	bc61	cd92	a15	d111	1.87	5.07	.73	4.98
Total for Annual Grasses		0	0	330	154	138	152	15.39	1.28	1.90	4.85
Total for Perennial Grasses		209	421	355	435	343	376	8.81	15.89	12.86	13.58
Total for Grasses		209	421	685	589	481	528	24.20	17.17	14.77	18.44
F	Agoseris glauca	-	1	-	-	-	4	-	-	-	.01
F	Allium sp.	a-	a-	a-	a4	a4	b18	-	.01	.01	.06
F	Alyssum alyssoides (a)	-	-	b291	a264	b307	b293	2.98	1.28	3.78	8.72
F	Antennaria rosea	b24	ab20	a-	a3	ab7	ab22	-	.00	.09	.69
F	Artemisia ludoviciana	-	-	-	-	3	-	-	-	.15	-
F	Astragalus cibarius	-	-	-	3	1	3	-	.00	.03	.03
F	Astragalus utahensis	b79	a17	b68	a38	a23	a30	1.45	.29	.23	.50
F	Calochortus nuttallii	-	-	-	10	1	11	-	.01	.00	.03
F	Camelina microcarpa (a)	-	-	-	1	4	5	-	.00	.02	.03
F	Chenopodium album (a)	-	-	-	-	-	3	-	-	-	.00
F	Cirsium undulatum	8	2	3	-	-	1	.03	-	-	.00
F	Collinsia parviflora (a)	-	-	-	8	19	-	-	.04	.06	-
F	Collomia linearis (a)	-	-	-	3	-	-	-	.00	-	-
F	Cordylanthus ramosus (a)	-	-	-	1	-	-	-	.00	-	-
F	Crepis acuminata	-	-	1	-	-	6	.00	-	-	.07
F	Cryptantha sp.	-	-	10	-	5	7	.06	-	.06	.01
F	Cymopterus sp.	-	-	2	9	5	6	.01	.02	.06	.05
F	Descurainia pinnata (a)	-	-	a-	a1	ab17	b25	-	.00	.03	.76
F	Draba sp. (a)	-	-	a-	a2	b33	a5	-	.00	.08	.06
F	Epilobium brachycarpum (a)	-	-	-	4	-	-	-	.03	-	-
F	Erigeron pumilus	-	5	-	12	9	3	-	.08	.33	.00
F	Eriogonum brevicaulis	6	2	5	-	-	-	.09	-	-	-
F	Galium aparine (a)	-	-	-	2	-	-	-	.00	-	-
F	Hackelia patens	-	-	4	-	-	2	.01	-	-	.03
F	Holosteum umbellatum (a)	-	-	a1	ab6	ab14	b17	.00	.02	.17	.23
F	Lactuca serriola (a)	-	-	-	-	2	3	-	-	.00	.01
F	Lesquerella sp.	-	-	-	3	-	-	-	.00	-	-

T y p e	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Machaeranthera grindelioides</i>	-	-	-	5	-	-	-	.03	-	.03
F	<i>Penstemon humilis</i>	1	-	-	-	-	-	-	-	-	-
F	<i>Phlox austromontana</i>	22	21	12	8	7	10	.12	.19	.24	.19
F	<i>Phlox hoodii</i>	-	-	-	-	1	-	-	-	.03	-
F	<i>Phlox longifolia</i>	-	1	-	-	-	-	-	-	-	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	a-	a5	b17	b33	-	.01	.07	.26
F	<i>Sphaeralcea coccinea</i>	30	29	24	19	16	11	.49	.31	.30	.49
F	<i>Taraxacum officinale</i>	-	-	-	-	-	5	-	-	-	.04
F	<i>Townsendia</i> sp.	-	-	-	5	-	-	-	.01	-	-
F	<i>Tragopogon dubius</i> (a)	b15	a1	a1	a-	a-	b20	.00	-	-	.06
F	<i>Vicia americana</i>	-	-	-	3	-	-	-	.01	-	-
Total for Annual Forbs		15	1	293	297	413	404	2.99	1.43	4.22	10.16
Total for Perennial Forbs		170	98	129	122	82	139	2.30	1.00	1.56	2.25
Total for Forbs		185	99	422	419	495	543	5.29	2.43	5.79	12.42

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

BROWSE TRENDS--

Management unit 06, Study no: 4

T y p e	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	<i>Chrysothamnus nauseosus albicaulis</i>	2	1	1	1	-	-	-	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	36	27	18	17	1.18	.72	.18	.01
B	<i>Gutierrezia sarothrae</i>	36	33	7	3	1.12	.90	.49	.03
B	<i>Juniperus osteosperma</i>	3	2	1	3	7.92	5.48	1.89	1.85
B	<i>Opuntia</i> sp.	36	41	39	32	1.15	.90	1.62	.77
B	<i>Pinus edulis</i>	0	0	1	0	-	-	-	-
B	<i>Tetradymia canescens</i>	1	3	2	3	-	.03	-	.00
Total for Browse		114	107	69	59	11.39	8.03	4.19	2.67

CANOPY COVER, LINE INTERCEPT--

Management unit 06, Study no: 4

Species	Percent Cover		
	'01	'06	'11
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	-	.01	.86
<i>Gutierrezia sarothrae</i>	-	.30	-
<i>Juniperus osteosperma</i>	17.60	15.28	19.53
<i>Opuntia</i> sp.	-	1.35	.95
<i>Tetradymia canescens</i>	-	-	.01

POINT-QUARTER TREE DATA--

Management unit 06, Study no: 4

Species	Trees per Acre			Average diameter (in)		
	'01	'06	'11	'01	'06	'11
Juniperus osteosperma	80	79	69	12.6	8.7	9.3

BASIC COVER--

Management unit 06, Study no: 4

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	6.50	7.25	37.54	31.35	25.73	32.56
Rock	1.25	1.50	2.04	1.21	2.53	1.38
Pavement	2.25	4.50	6.47	6.97	10.48	10.46
Litter	61.00	46.50	37.07	31.57	22.95	20.62
Cryptogams	.75	7.75	6.51	16.85	11.54	9.90
Bare Ground	28.25	32.50	23.30	27.64	40.34	43.84

SOIL ANALYSIS DATA --

Management unit 06, Study no: 4, Study Name: Echo Reservoir

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
12.3	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				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	2	19	35	4	-	-	-
Elk	5	2	16	14	8 (20)	19 (48)	31 (76)
Deer	31	36	43	48	63 (155)	46 (112)	59 (146)
Cattle	1	3	-	-	4 (9)	-	-

BROWSE CHARACTERISTICS--

Management unit 06, Study no: 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)
Amelanchier alnifolia									
84	864	8	46	46	-	8	92	0	42/14
90	0	0	0	0	-	0	0	0	-/-
96	0	0	0	0	-	0	0	0	-/-
01	0	0	0	0	-	0	0	0	-/-
06	0	0	0	0	-	0	0	0	-/-
11	0	0	0	0	-	0	0	0	-/-

		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>Artemisia tridentata vaseyana</i>										
84	66	0	0	100	-	50	50	50	-/-	
90	33	0	0	100	-	100	0	100	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	0	0	0	0	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	-/-	
11	0	0	0	0	-	0	0	0	-/-	
<i>Chrysothamnus nauseosus albicaulis</i>										
84	33	0	100	0	-	0	100	0	19/18	
90	33	0	0	100	-	0	100	100	-/-	
96	40	0	0	100	-	0	50	50	27/40	
01	20	0	0	100	-	0	0	0	21/20	
06	20	0	0	100	-	0	0	100	26/27	
11	20	0	100	0	-	100	0	0	17/31	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	5131	1	40	58	-	14	0	0	12/18	
90	2332	3	74	23	-	9	11	69	10/14	
96	1940	29	69	2	20	1	0	0	8/14	
01	1200	8	70	22	-	2	0	3	6/10	
06	580	31	62	7	-	14	0	3	7/9	
11	440	27	73	0	-	0	0	0	8/12	
<i>Gutierrezia sarothrae</i>										
84	1432	5	93	2	-	0	0	0	13/14	
90	2365	51	44	6	566	0	0	10	8/7	
96	1900	31	67	2	700	0	0	2	8/9	
01	2380	2	90	8	-	0	0	4	6/8	
06	280	36	50	14	-	0	0	14	6/7	
11	60	67	33	0	-	0	0	0	9/10	
<i>Juniperus osteosperma</i>										
84	66	50	50	0	-	0	50	50	69/47	
90	33	100	0	0	33	100	0	0	-/-	
96	60	0	100	0	-	0	0	0	-/-	
01	40	0	100	0	-	50	0	0	-/-	
06	20	0	100	0	20	0	0	0	-/-	
11	60	0	67	33	-	0	0	0	-/-	
<i>Opuntia sp.</i>										
84	999	37	63	0	-	0	0	0	6/16	
90	1199	28	69	3	-	0	0	22	4/16	
96	1300	20	75	5	40	0	0	6	5/18	
01	1680	7	90	2	40	1	0	2	5/10	
06	1800	7	70	23	40	0	1	7	5/13	
11	1040	6	90	4	100	0	0	4	4/12	

		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>Pinus edulis</i>										
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	20	0	100	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	-/-	
<i>Symphoricarpos oreophilus</i>										
84	1265	26	63	11	-	32	0	0	27/25	
90	0	0	0	0	-	0	0	0	-/-	
96	0	0	0	0	-	0	0	0	-/-	
01	0	0	0	0	-	0	0	0	-/-	
06	0	0	0	0	-	0	0	0	-/-	
11	0	0	0	0	-	0	0	0	-/-	
<i>Tetradymia canescens</i>										
84	66	0	0	100	-	100	0	0	-/-	
90	66	0	0	100	-	100	0	50	-/-	
96	40	0	100	0	-	0	0	0	8/16	
01	100	0	20	80	-	20	0	0	12/24	
06	40	0	100	0	-	50	0	0	8/14	
11	60	33	33	33	-	33	0	33	7/14	