

MIDDLE MOUNTAIN - TREND STUDY NO. 16C-17-09

Vegetation Type: Chained, Seeded P-J

Range Type: Crucial Deer Winter, Substantial Elk Winter

NRCS Ecological Site Description: Not Available

Land Ownership: USFS

Elevation: 8,000 ft (2,438 m)

Aspect: Southwest

Slope: 4%

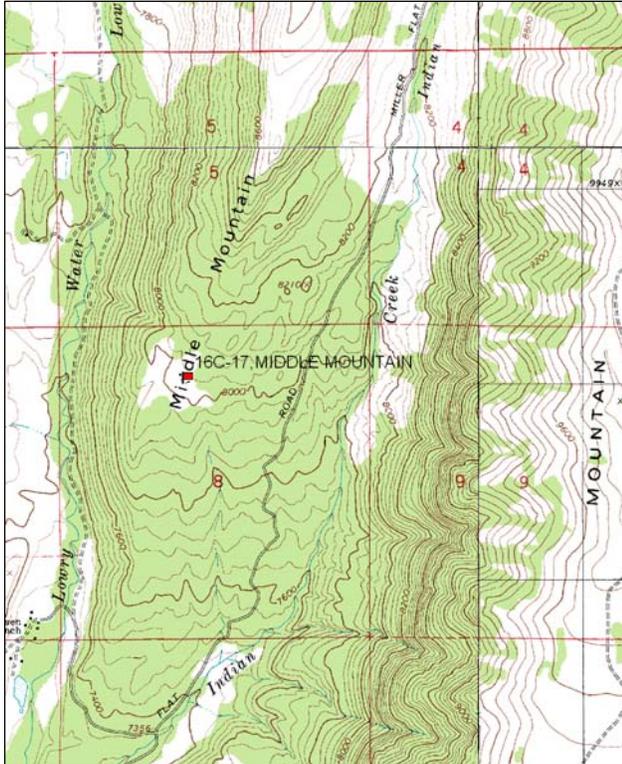
Transect bearing: 345 degrees magnetic.

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

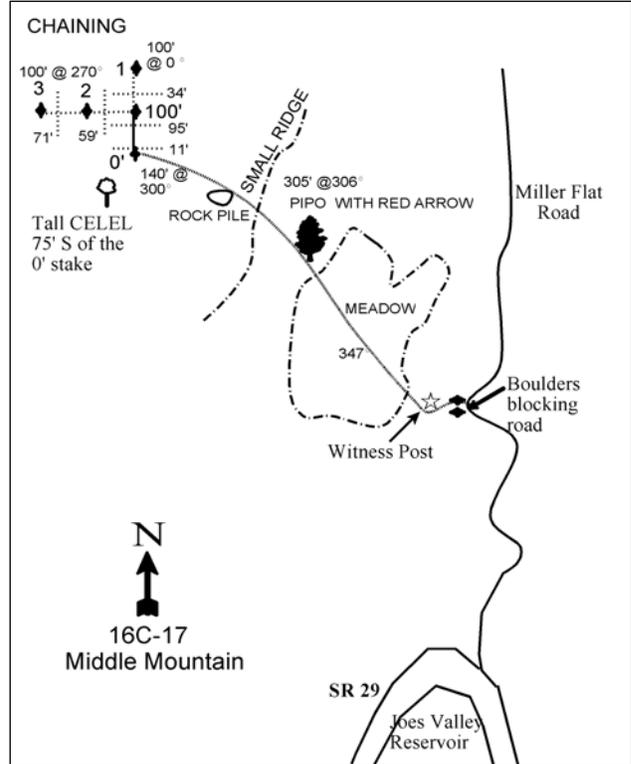
Directions:

From the paved highway at the north end of Joes Valley Reservoir, proceed north on the Upper Joes Valley road (Millers Flat road) for 1.2 miles. Stay right at the fork and continue 1.2 miles to another fork. Stay right (on the Indian Creek side) and go 1.1 miles to a faint turnoff to the left. Park by the witness post which is about 75 yards off the main road. From the witness post, walk NNW to the upper end of the meadow to the lighting-scarred Ponderosa with a red arrow painted on it. From the pine tree walk NW 100 yards to a pile of rocks painted red. From the rock pile, walk NW (300°) for 140 feet to the 0-foot baseline stake. The 1st stake has a red browse tag #9018 attached.

Map Name: Joes Valley Reservoir



Diagrammatic Sketch:



Township: 17S, Range: 6E, Section: 8

GPS: NAD 83, UTM 12S 476889 E 4357214 N

MIDDLE MOUNTAIN - TREND STUDY NO. 16C-17

Site Information

Site Description: The study site is a diverse, productive area of high elevation range used by both deer and elk as winter-spring range. The study is located at the upper end of a small (approximately 200 acre) chaining on a slope where the pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees were never very dense. It is more of a mixed mountain brush site. The area was retreated by a bullhog treatment as part of the Middle Mountain Forest Service project and occurred just before the study was sampled in 2009. The methods of the treatment were similar to the Joes Valley PJ Retreatment ([WRI project # 1159](#)) done in the area, but was not conducted as part of the Watershed Restoration Initiative. The slope is open, but nearby stands of ponderosa pine (*Pinus ponderosa*), aspen (*Populus tremuloides*), and mature curlleaf mountain mahogany (*Cercocarpus ledifolius*) on the ridge provide excellent cover and additional foraging opportunities. Pellet group data estimated moderate use by elk in 1999 and 2004, but decreased to fairly light use in 2009. Estimated deer use has been light since 1999. Sheep sign has also been encountered, but is minimal (Table - Pellet Group Data).

Browse: The site supports a variety of desirable browse species at moderate abundances including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), black sagebrush (*Artemisia nova*), Utah serviceberry (*Amelanchier utahensis*), dwarf rabbitbrush (*Chrysothamnus depressus*), and true mountain mahogany (*Cercocarpus montanus*). All of these browse species have had fairly healthy populations with low decadence and good vigor, though serviceberry had a large increase in decadence and poor vigor in 2009 following the bullhog treatment. All the preferred browse species on the site has had mostly moderate use with some years of heavy use (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is diverse and abundant. Salina wildrye (*Elymus salina*) is the dominant grass species providing over 70% of grass cover since 1994. Other common grasses include bluebunch wheatgrass (*Agropyron spicatum*), prairie junegrass (*Koeleria cristata*) and mutton bluegrass (*Poa fendleriana*). Forbs are also diverse and abundant. Common species include rose pussy toes (*Antennaria rosea*), aster (*Aster* sp.), bastard toadflax (*Comandra pallida*), thistle (*Cirsium* sp.), and desert phlox (*Phlox austromontana*).

Soil: The soil is a clay to sandy clay loam with a neutral pH. Phosphorus has very limited availability for plant growth and development at just 2 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Bare ground cover has been moderately high over the study. The bullhog treatment increased the amount of litter cover in 2009 (Table - Basic Cover). The soil erosion condition was classified as stable in 2004 and 2009.

Trend Assessments

Browse:

- **1988 to 1994 - stable (0):** Differences in density may be related to the larger sample area used in 1994; therefore, trend was determined using other parameters. There was little change in the decadence or vigor of the preferred browse species. There was a large decrease in the recruitment of young serviceberry, dwarf rabbitbrush, and true mountain mahogany plants.
- **1994 to 1999 - slightly up (+1):** Density and cover increased in serviceberry, black sagebrush, and true mountain mahogany. Recruitment of young plants also increased in the serviceberry and true mountain mahogany populations. Density of mountain big sagebrush decreased by 29%, however, cover increased, and decadence and poor vigor both decreased substantially. Recruitment of young mountain big sagebrush plants increased.
- **1999 to 2004 - slightly up (+1):** The density of mountain big sagebrush and black sagebrush both increased substantially and cover increased slightly. However, density of serviceberry and true mountain mahogany decreased substantially, though cover of both species increased.

- **2004 to 2009 - slightly up (+1):** There was a large increase in the density of black sagebrush due to an increase in the recruitment of young plants. Mountain big sagebrush also had a 17% increase in density. Serviceberry density remained similar, but decadence increased from 5% to 22% and poor vigor increased from 0% to 56%.

Grass:

- **1988 to 1994 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though there was a significant increase in the nested frequency of mutton bluegrass.
- **1994 to 1999 - stable (0):** Perennial grass sum of nested frequency increased slightly, but cover remained similar. Prairie junegrass increased significantly in nested frequency and mutton bluegrass decreased significantly.
- **1999 to 2004 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 18% though cover remained similar. There was a significant decrease in the nested frequency of prairie junegrass.
- **2004 to 2009 - stable (0):** Perennial grass sum of nested frequency changed little, though cover decreased from 15% to 12%. Prairie junegrass decreased significantly in nested frequency and is now rare. Sandberg bluegrass (*Poa secunda*) increased significantly in nested frequency.

Forb:

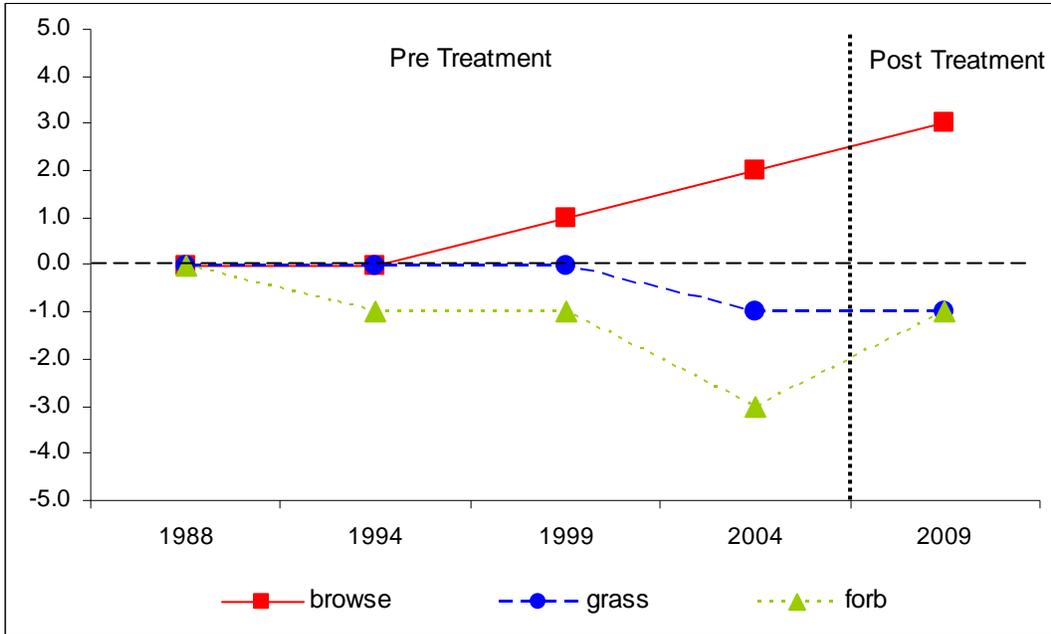
- **1988 to 1994 - slightly down (-1):** There was an 18% decrease in the sum of nested frequency of perennial forbs with significant decreases in many of the perennial forb species.
- **1994 to 1999 - stable (0):** The sum of nested frequency of perennial forbs decreased by 7%, but cover increased from 4% to 11%. Much of the increase cover came from a large increase in cover of bastard toadflax and thistle.
- **1999 to 2004 - down (-2):** There was a 30% decrease in the sum of nested frequency of perennial forbs and cover decreased to 7%. There was a significant decrease in the nested frequency of pussy toes and thistle.
- **2004 to 2009 - up (+2):** Perennial forb sum of nested frequency increased by 28%, though cover remained similar. Pussy toes increased significantly in nested frequency.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 16C, study no: 17

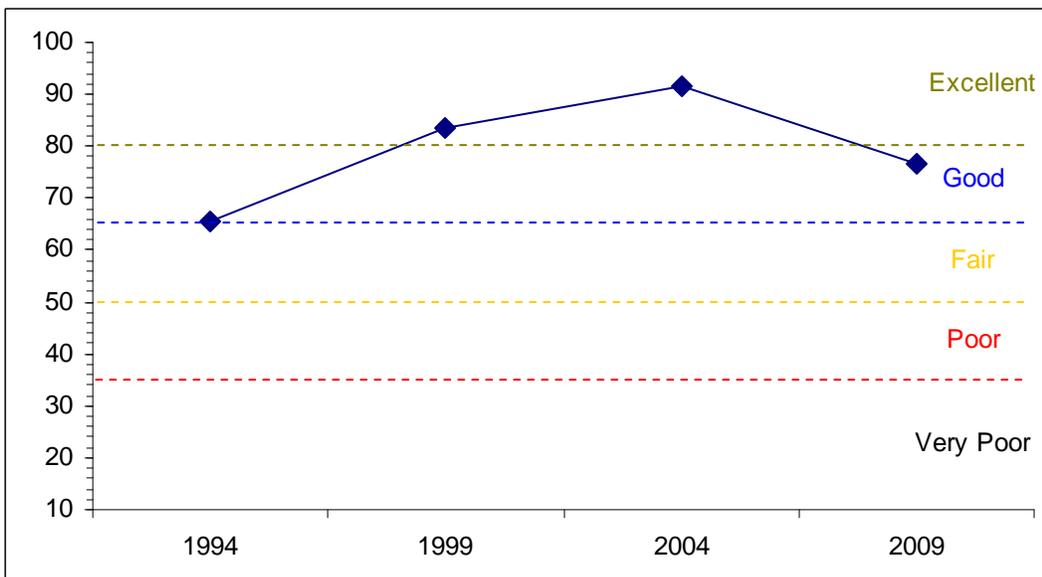
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
94	12.1	10.3	6.2	28.9	0.0	8.2	0.0	65.6	Fair-Good
99	23.2	12.6	8.3	29.6	0.0	10.0	0.0	83.7	Excellent
04	30.0	12.6	8.9	29.8	0.0	10.0	0.0	91.4	Excellent
09	21.9	11.8	8.9	23.9	0.0	10.0	0.0	76.5	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 16C Study no: 17



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL
Management unit 16C, Study no: 17



HERBACEOUS TRENDS--

Management unit 16C, Study no: 17

Type	Species	Nested Frequency					Average Cover %			
		'88	'94	'99	'04	'09	'94	'99	'04	'09
G	Agropyron spicatum	44	50	33	39	40	1.40	.54	.79	.88
G	Carex sp.	9	-	-	-	-	-	-	-	-
G	Elymus salina	ab244	b258	b264	ab237	a207	11.48	11.38	11.82	8.34
G	Koeleria cristata	bc52	ab27	d110	c77	a9	.26	2.42	1.95	.04
G	Poa fendleriana	bc56	d76	ab24	a10	cd68	.86	.26	.10	1.53
G	Poa secunda	a-	ab12	ab22	a7	b46	.24	.14	.18	.22
G	Sitanion hystrix	-	-	2	-	-	-	.03	-	-
G	Stipa lettermani	a-	a7	a-	a5	b25	.21	-	.06	.93
Total for Annual Grasses		0	0	0	0	0	0	0	0	0
Total for Perennial Grasses		405	430	455	375	395	14.47	14.80	14.92	11.95
Total for Grasses		405	430	455	375	395	14.47	14.80	14.92	11.95
F	Achillea millefolium	-	-	-	-	3	-	-	-	.00
F	Allium sp.	b54	a-	a-	a-	a1	-	-	-	.01
F	Androsace septentrionalis (a)	-	a-	b13	ab6	a2	-	.13	.04	.00
F	Antennaria rosea	18	23	92	17	50	.35	1.83	.33	.43
F	Arabis sp.	-	3	-	-	-	.00	-	-	-
F	Aster sp.	a54	c102	a38	bc83	ab53	.56	.28	.92	.88
F	Astragalus convallarius	-	2	-	1	3	.00	-	.00	.03
F	Astragalus sp.	2	5	7	-	6	.02	.19	-	.21
F	Calochortus nuttallii	-	-	3	1	-	-	.00	.00	-
F	Castilleja linariaefolia	5	-	4	-	9	-	.01	-	.13
F	Chaenactis douglasii	-	-	-	1	-	-	-	.00	-
F	Cirsium sp.	b105	b94	b98	a53	a49	.68	4.07	1.85	1.36
F	Collinsia parviflora (a)	-	a-	a-	a3	b32	-	-	.00	.08
F	Comandra pallida	b60	a35	c108	bc70	bc73	.13	2.89	1.23	1.03
F	Crepis acuminata	5	1	-	-	-	.00	-	-	-
F	Cryptantha sp.	2	4	-	-	-	.01	-	-	-
F	Cymopterus sp.	a-	ab5	a-	a1	b13	.01	-	.00	.08
F	Erigeron eatonii	c159	b79	b54	a3	a8	.42	.30	.09	.01
F	Erigeron flagellaris	-	-	-	4	9	-	-	.03	.02
F	Eriogonum racemosum	a-	a-	a-	a-	b16	-	-	-	.37
F	Eriogonum umbellatum	2	7	-	-	2	.03	-	-	.03
F	Gayophytum ramosissimum(a)	-	-	-	2	-	-	-	.00	-
F	Hymenopappus filifolius	a6	ab20	b24	ab17	a-	.30	.52	.38	-
F	Hymenoxys acaulis	-	-	-	-	3	-	-	-	.18
F	Lesquerella sp.	-	-	2	-	8	-	.03	-	.06
F	Lomatium grayi	b38	a2	a-	a-	a3	.00	-	-	.00
F	Machaeranthera canescens	a-	a-	a-	a4	b18	-	-	.04	.23
F	Microsteris gracilis (a)	-	a-	a-	a1	b7	-	-	.00	.01
F	Orthocarpus sp. (a)	-	a-	b21	c136	b25	-	.18	4.03	.45
F	Penstemon caespitosus	d76	cd66	a-	b25	bc40	.66	-	.46	.46
F	Penstemon lentus	4	-	-	5	4	-	-	.09	.06
F	Phlox austromontana	a14	ab34	ab28	ab35	b43	.77	.82	.99	.92

T y P e	Species	Nested Frequency					Average Cover %			
		'88	'94	'99	'04	'09	'94	'99	'04	'09
F	Phlox longifolia	-	-	-	1	3	-	-	.00	.03
F	Polygonum douglasii (a)	-	a ³	a ⁻	b ³⁶	ab ¹⁷	.00	-	.10	.04
F	Ranunculus testiculatus (a)	-	-	-	-	4	-	-	-	.01
F	Senecio multilobatus	3	-	-	-	-	-	-	-	-
F	Sphaeralcea coccinea	10	24	20	13	12	.10	.11	.11	.10
F	Taraxacum officinale	b ⁸	a ⁻	a ⁻	a ⁻	a ⁻	-	.03	-	-
Total for Annual Forbs		0	3	34	184	87	0.00	0.31	4.19	0.60
Total for Perennial Forbs		625	506	478	334	429	4.08	11.12	6.57	6.68
Total for Forbs		625	509	512	518	516	4.09	11.43	10.77	7.29

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

BROWSE TRENDS--

Management unit 16C, Study no: 17

T y P e	Species	Strip Frequency				Average Cover %			
		'94	'99	'04	'09	'94	'99	'04	'09
B	Amelanchier utahensis	20	14	17	13	.64	.86	1.28	1.12
B	Artemisia nova	41	61	55	51	2.90	4.92	5.35	4.53
B	Artemisia tridentata vaseyana	50	47	50	54	1.99	4.48	6.42	4.51
B	Cercocarpus ledifolius	2	1	2	2	.00	.00	.00	.00
B	Cercocarpus montanus	16	25	21	18	1.57	3.73	4.58	2.73
B	Chrysothamnus depressus	68	72	76	58	2.13	3.63	5.44	3.85
B	Chrysothamnus viscidiflorus viscidiflorus	5	4	25	25	.18	.03	.46	.69
B	Gutierrezia sarothrae	53	26	41	55	1.48	.39	.93	1.57
B	Opuntia sp.	3	5	4	2	.01	.00	.03	.03
B	Pinus edulis	0	3	1	0	-	.38	1.03	-
B	Purshia tridentata	2	2	2	2	.00	.00	.00	.00
B	Symphoricarpos oreophilus	13	10	16	19	.84	.82	1.32	.52
Total for Browse		273	270	310	299	11.76	19.25	26.88	19.57

CANOPY COVER, LINE INTERCEPT--

Management unit 16C, Study no: 17

Species	Percent Cover	
	'04	'09
Amelanchier utahensis	1.73	.85
Artemisia nova	7.36	5.30
Artemisia tridentata vaseyana	5.48	5.01
Cercocarpus ledifolius	.51	.13
Cercocarpus montanus	3.53	4.53
Chrysothamnus depressus	4.03	3.56
Chrysothamnus viscidiflorus viscidiflorus	.60	.26
Gutierrezia sarothrae	2.06	1.81
Opuntia sp.	.03	-
Pinus edulis	2.51	-
Purshia tridentata	.13	.11
Symphoricarpos oreophilus	1.41	1.25

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 16C, Study no: 17

Species	Average leader growth (in)	
	'04	'09
Amelanchier utahensis	3.6	2.5
Artemisia nova	1.1	0.8
Artemisia tridentata vaseyana	2.4	1.3
Cercocarpus montanus	4.2	3.7

BASIC COVER--

Management unit 16C, Study no: 17

Cover Type	Average Cover %				
	'88	'94	'99	'04	'09
Vegetation	5.75	29.73	39.15	43.42	38.47
Rock	6.50	2.62	2.79	2.26	1.16
Pavement	0	.03	.09	.09	.03
Litter	74.25	19.81	27.38	24.07	37.84
Cryptogams	0	.60	.55	2.79	.05
Bare Ground	13.50	44.09	38.95	44.63	35.55

SOIL ANALYSIS DATA --

Management unit 16C, Study no: 17, Study Name: Middle Mountain

Effective rooting depth (in)	pH	clay			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.2	7.2	44.4	13.8	41.8	1.4	2	76.8	0.6

PELLET GROUP DATA--

Management unit 16C, Study no: 17

Type	Quadrat Frequency				Days use per acre (ha)		
	'94	'99	'04	'09	'99	'04	'09
Sheep	-	2	-	-	-	-	2 (5)
Rabbit	9	30	30	29	-	-	-
Elk	43	21	23	18	35 (87)	39 (96)	19 (46)
Deer	18	9	20	12	26 (64)	16 (40)	13 (33)
Cattle	1	-	-	-	-	-	-

BROWSE CHARACTERISTICS--

Management unit 16C, Study no: 17

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier utahensis									
88	1199	100	0	0	33	3	67	11	-/-
94	440	9	82	9	-	27	32	5	11/15
99	620	74	26	0	-	26	6	0	35/30
04	380	32	63	5	-	32	26	0	14/20
09	360	11	67	22	-	28	22	56	15/19
Artemisia nova									
88	599	56	22	22	-	28	6	6	7/8
94	1880	29	56	15	-	11	1	5	8/19
99	2480	11	77	12	120	37	21	4	11/20
04	3000	19	65	16	9820	28	14	7	8/18
09	5480	27	63	9	1380	9	9	3	8/19
Artemisia tridentata vaseyana									
88	1931	21	41	38	633	28	45	7	17/23
94	2180	5	62	33	40	28	5	13	14/25
99	1540	17	68	16	40	29	18	6	19/30
04	2720	33	54	13	9440	22	21	6	14/27
09	3120	29	47	24	3140	6	29	24	14/23
Cercocarpus ledifolius									
88	0	0	0	-	-	0	0	0	-/-
94	40	0	100	-	-	50	0	0	14/18
99	20	0	100	-	-	0	0	0	38/32
04	40	0	100	-	-	0	100	0	35/34
09	40	0	100	-	-	0	50	0	38/38
Cercocarpus montanus									
88	365	82	18	0	-	9	82	0	28/37
94	580	3	86	10	-	21	66	10	19/37
99	760	16	84	0	20	50	26	0	28/36
04	580	10	90	0	760	3	90	0	23/32
09	520	4	96	0	180	46	50	8	32/43

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Chrysothamnus depressus										
88	3198	57	41	2	-	26	18	1	4/10	
94	5240	5	88	7	-	3	0	3	3/8	
99	4760	11	86	3	60	17	6	.42	4/11	
04	7020	2	97	1	280	16	13	0	4/10	
09	7120	6	92	2	-	9	.56	9	4/9	
Chrysothamnus nauseosus										
88	33	0	100	-	-	0	0	100	20/19	
94	0	0	0	-	-	0	0	0	-/-	
99	0	0	0	-	-	0	0	0	-/-	
04	0	0	0	-	-	0	0	0	-/-	
09	0	0	0	-	-	0	0	0	-/-	
Chrysothamnus viscidiflorus viscidiflorus										
88	365	36	45	18	-	18	9	0	9/12	
94	100	0	80	20	-	0	0	20	7/8	
99	120	0	100	0	-	0	0	0	11/17	
04	1360	0	100	0	60	0	0	0	9/13	
09	2880	17	81	2	20	0	0	.69	7/11	
Gutierrezia sarothrae										
88	898	22	74	4	-	4	0	4	5/4	
94	3220	6	94	0	-	0	0	0	6/7	
99	1500	19	81	0	120	0	0	0	6/7	
04	3640	9	91	0	-	0	0	0	7/10	
09	7820	0	97	3	-	0	0	3	6/6	
Mahonia repens										
88	0	0	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	0	0	0	-	-	0	0	0	-/-	
04	0	0	0	-	-	0	0	0	-/-	
09	0	0	0	-	-	0	0	0	3/4	
Opuntia sp.										
88	33	0	0	100	-	0	0	100	-/-	
94	80	50	50	0	-	0	0	0	2/12	
99	100	40	40	20	-	0	0	20	2/8	
04	140	14	86	0	-	0	0	0	3/3	
09	60	33	67	0	-	0	0	0	-/-	
Pinus edulis										
88	33	100	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	60	33	67	-	-	0	0	0	-/-	
04	20	0	100	-	60	0	0	0	-/-	
09	0	0	0	-	-	0	0	0	-/-	

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
<i>Purshia tridentata</i>									
88	0	0	0	0	-	0	0	0	-/-
94	140	14	57	29	-	71	14	29	13/30
99	60	0	100	0	-	0	100	0	18/76
04	40	0	50	50	-	50	50	0	13/47
09	60	0	100	0	-	0	100	0	14/40
<i>Quercus gambelii</i>									
88	33	100	0	-	-	0	0	0	-/-
94	0	0	0	-	-	0	0	0	-/-
99	0	0	0	-	-	0	0	0	-/-
04	0	0	0	-	-	0	0	0	-/-
09	0	0	0	-	-	0	0	0	32/37
<i>Symphoricarpos oreophilus</i>									
88	698	71	19	9	66	24	57	0	11/19
94	440	5	95	0	-	59	0	0	8/16
99	240	17	83	0	-	17	0	0	12/25
04	520	12	85	4	-	0	0	0	11/22
09	1240	10	87	3	-	0	0	3	8/14
<i>Tetradymia canescens</i>									
88	33	0	100	-	-	100	0	0	9/10
94	0	0	0	-	-	0	0	0	-/-
99	0	0	0	-	-	0	0	0	-/-
04	0	0	0	-	-	0	0	0	-/-
09	0	0	0	-	-	0	0	0	-/-