

## SHELL HOLLOW - TREND STUDY NO. 4-8-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: [Mountain Gravelly Loam \(Mountain Big Sagebrush\), R047XA406UT](#)

Land Ownership: Private

Elevation: 5575 ft (1,699 m)

Aspect: Southwest

Slope: 18-32%

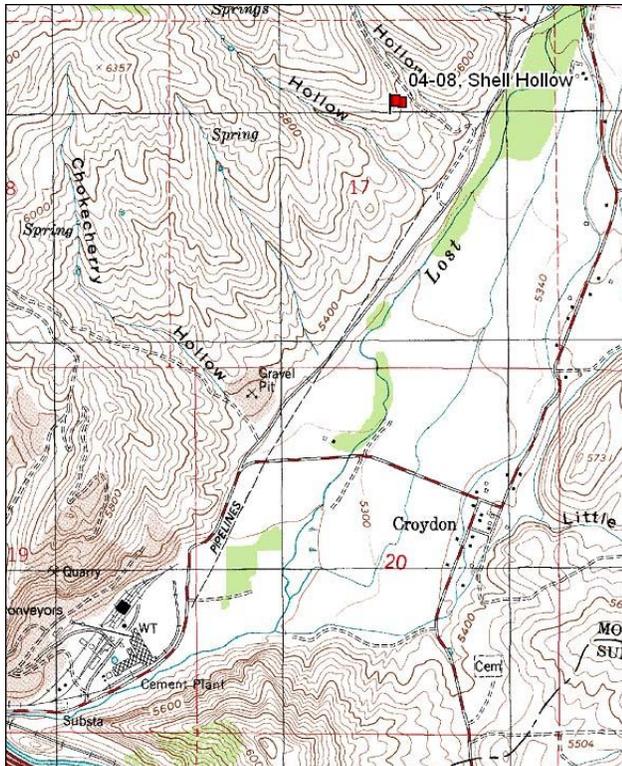
Transect bearing: 159° magnetic

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

### Directions:

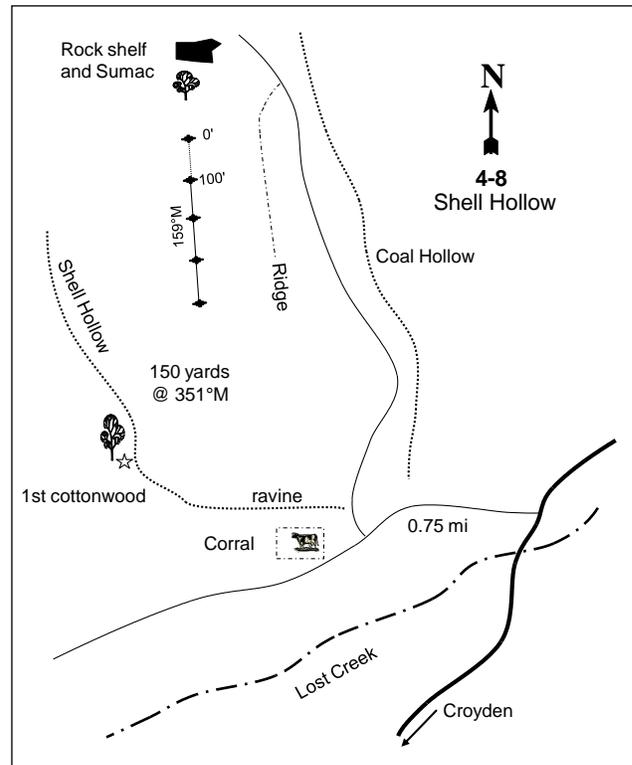
From 6900 East and 1900 South in Croyden, proceed east 1.55 miles to a road paralleling Lost Creek. Turn left here and travel 0.75 miles to Coal Hollow Road. Just east of the road is a corral. Northwest of the corral is the ravine, Shell Hollow. Walk up Shell Hollow to the first cottonwood tree over 25 feet tall. Nearby should be a small drainage up the slope to the right. From the tree, take a bearing of 351 degrees true and walk approximately 150 yards up-slope to the 0-foot stake of the baseline marked by browse tag #7947. Ten feet north of the 0-foot stake is a sumac and a rocky shelf behind. Just east of the 0-foot stake is a large rock with a perfect seat carved by the wind. Contact the land owner prior to accessing the site.

### Map Name: Devil's Slide



Township: 4N Range: 4E Section: 17

### Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 456425 E 4548191 N

## SHELL HOLLOW - TREND STUDY NO. 4-8

### Site Information

Site Description: This study is located on a small privately owned ridge between Shell Hollow and Coal Hollow, on the west side of Lost Creek. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and basin big sagebrush (*A. tridentata* ssp. *tridentata*) hybrid community on a hillside 150 yards above Shell Hollow. A road near the site was improved just prior to the 2011 sample, and a bulldozer had crossed one of the sample belts. Deer pellet groups were sampled in moderate abundance in 2001 and 2006, but in low abundance in 2011 following a severe winter. Three deer carcasses were identified below the study area and a skeleton was identified in the study area in 2006. Elk pellet groups have been sampled in low abundance since 2001. Cattle were present along the creek during the 1996 reading and had already utilized the available understory forage. Sampled sheep and cattle sign has been minimal since 2001 (Table - Pellet Group Data).

Browse: The key browse species is classified as mountain big sagebrush. It appears to be a hybrid with basin big sagebrush, since many are tall and have the upright growth form of basin big sagebrush. Sagebrush has provided the majority of the shrub cover since 1996 (Table - Browse Trends). The sagebrush population has been moderately dense, with mostly light to moderate use over the course of the study. Density of sagebrush has steadily decreased since 1996. Decadence has been moderately high to high since the outset of the study. Part of the poor vigor of the sagebrush in 2006 might have been a product of the presence of the sagebrush defoliator moth (*Aroga websteri*), which was identified on the study, but not on any individuals sampled in density measurements. Small populations of Saskatoon serviceberry (*Amelanchier alnifolia*) and white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*) have also been sampled. The increaser species stickyleaf low rabbitbrush is the most abundant shrub in density (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses are rare. The annual grasses cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) are the most prevalent grasses. Perennial forbs are fairly diverse, but are not abundant. Weedy, annual forb species dominate the forb component (Table - Herbaceous Trends).

Soil: The soil is in the Kilfoil-Rock outcrop complex, which occurs on mountainsides. Parent material consists of colluvium over residuum derived from sandstone and shale. The soil is classified as moderately deep and well drained (Soil Survey Staff 2011). Soil texture is a sandy clay loam with a slightly alkaline soil reaction (pH 7.8) (Table - Soil Analysis Data). It is very gravelly, with some large, exposed boulders. Bare ground cover has increased since 1996, and was moderately high in 2011. Vegetation and litter cover has been high over the course of the study (Table - Basic Cover). The soil erosion condition was classified as stable in 2001 and 2006, but was slight in 2011.

### Trend Assessments

#### Browse:

- **1984 to 1990 - down (-2):** The density of sagebrush decreased 21% from 4,797 plants/acre to 3,798 plants/acre. Decadence increased from 33% to 54%, and poor vigor increased from 3% to 19%. Recruitment of young sagebrush decreased from 11% to 7%.
- **1990 to 1996 - stable (0):** 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 24%, but poor vigor increased to 28%. Recruitment of young sagebrush plants remained similar at 8% of the population.
- **1996 to 2001 - down (-2):** The density of sagebrush decreased 30% from 4,780 plants/acre to 3,340 plants/acre, but cover increased from 22% to 27%. Decadence decreased to 20%, and poor vigor decreased to 8%. Recruitment of young plants decreased to 3%.

- **2001 to 2006 - slightly down (-1):** The sagebrush density decreased 16% to 2,820 plants/acre, and cover decreased to 21%. Decadence increased to 39%, and poor vigor increased to 15%. Recruitment of young plants decreased to just 2% of the population.
- **2006 to 2011 - slightly down (-1):** Density of sagebrush decreased 17% to 2,340 plants/acre, and cover remained similar. Decadence decreased slightly to 32%, and poor vigor remained the same. There were no young plants sampled.

Grass:

- **1984 to 1990 - stable (0):** Perennial grass species are rare on the site.
- **1990 to 1996 - stable (0):** There was an increase in the sum of nested frequency of perennial grasses, but this is likely due to the increased sample area. Perennial grass species remain relatively rare on the site. Annual species were included in the sample for the first time, and were abundant on the site, namely Japanese chess.
- **1996 to 2001 - slightly up (+1):** There was little change in the sum of nested frequency of perennial grasses, but Japanese chess decreased significantly in nested frequency. Cover of annual grasses decreased from 26% to 2%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial grass increased 10%, and cover increased from 3% to 5%. However, there was a significant increase in the nested frequencies of Japanese chess and cheatgrass, and cover of annual grasses increased to 26%.
- **2006 to 2011 - stable (0):** There was a slight decrease in the sum of nested frequency of perennial grasses, and cover decreased to 3%. The sum of nested frequency of annual grasses decreased 22%, and annual grass cover decreased to 10%.

Forb:

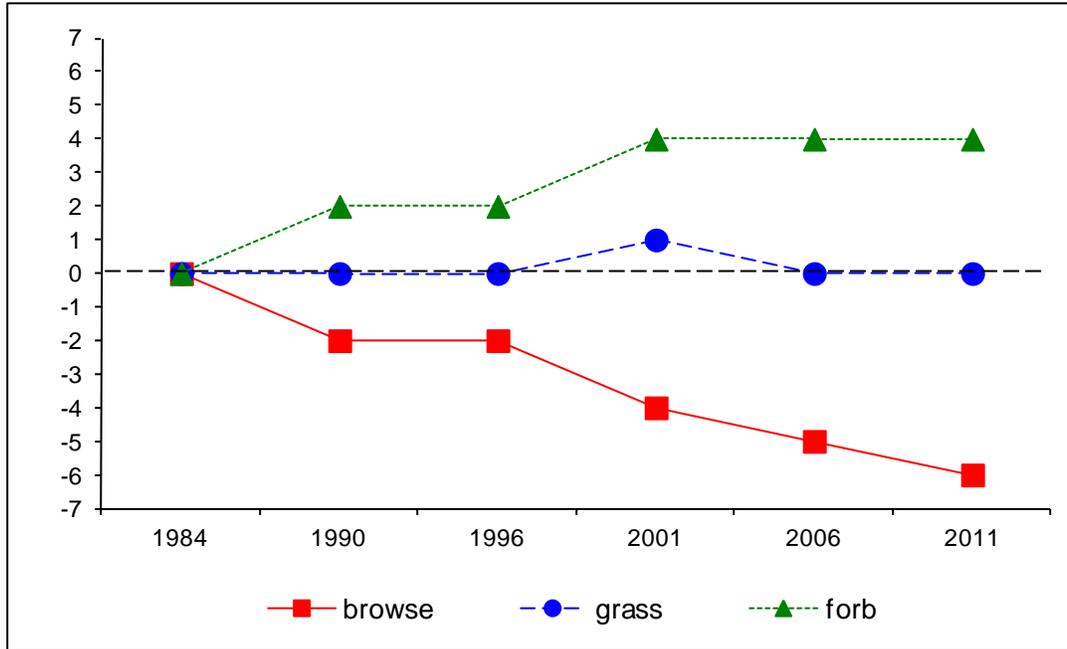
- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial forbs increased substantially.
- **1990 to 1996 - stable (0):** There was a slight increase in the sum of nested frequency of perennial forbs, but again this is likely due to the increased sample area.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial forbs increased 50%, and cover increased from 2% to 3%. The forb composition remained poor for big game.
- **2001 to 2006 - stable (0):** The perennial forb sum of nested frequency decreased 17%, but cover increased to 7%. There was a significant increase in the desirable forb species American vetch (*Vicia americana*). Annual forb sum of nested frequency decreased substantially, and cover decreased from 13% to 3%.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial forbs increased 29%, but cover decreased to 3%. Annual forb sum of nested frequency increased substantially, and cover increased to 16%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --  
Management unit 4, study no: 8

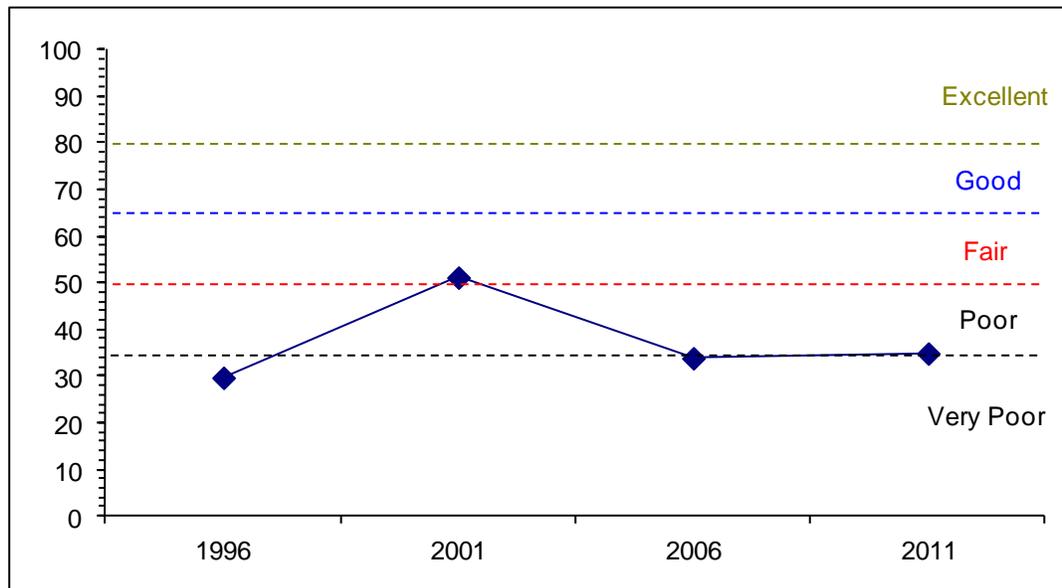
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	30.0	8.0	4.0	3.8	-19.5	3.4	0.0	<b>29.7</b>	Very Poor
01	30.0	9.2	1.7	6.0	-1.6	5.8	0.0	<b>51.2</b>	Poor-Fair
06	27.9	4.2	1.9	9.2	-19.4	10.0	0.0	<b>33.9</b>	Very Poor-Poor
11	26.5	5.6	0.0	5.0	-7.5	5.2	0.0	<b>34.9</b>	Very Poor-Poor

## Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--  
Management unit 4 Study no: 8



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--  
Management unit 4, Study no: 8



HERBACEOUS TRENDS--  
Management unit 04, Study no: 8

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	<i>Agropyron dasystachyum</i>	a-	a-	b18	b18	b27	b20	1.52	1.67	1.50	1.95
G	<i>Agropyron spicatum</i>	-	4	10	7	9	15	.18	.18	.51	.28
G	<i>Bromus brizaeformis</i> (a)	-	-	4	12	4	-	.01	.10	.01	-
G	<i>Bromus japonicus</i> (a)	-	-	c382	a198	b239	b242	26.01	1.53	7.88	7.10
G	<i>Bromus tectorum</i> (a)	-	-	a6	a25	c246	b137	.03	.51	17.92	2.87
G	<i>Elymus cinereus</i>	3	1	7	7	10	6	.06	.83	2.21	.24
G	<i>Oryzopsis hymenoides</i>	-	-	1	6	4	3	.03	.18	.33	.03
G	<i>Poa pratensis</i>	-	-	-	-	1	-	-	-	.00	-
G	<i>Poa secunda</i>	-	-	13	12	4	2	.08	.13	.03	.00
Total for Annual Grasses		0	0	392	235	489	379	26.05	2.15	25.81	9.97
Total for Perennial Grasses		3	5	49	50	55	46	1.89	3.00	4.60	2.51
Total for Grasses		3	5	441	285	544	425	27.95	5.15	30.42	12.49
F	<i>Achillea millefolium</i>	-	5	3	3	2	-	.03	.15	.03	.00
F	<i>Allium acuminatum</i>	a1	ab4	b25	d123	ab20	c80	.07	.55	.08	.42
F	<i>Alyssum alyssoides</i> (a)	-	-	b212	a78	b180	c321	.96	.21	.76	7.34
F	<i>Aster chilensis</i>	-	3	-	-	1	-	-	-	.03	-
F	<i>Astragalus beckwithii</i>	3	-	-	10	7	14	-	.15	.17	.10
F	<i>Astragalus convallarius</i>	-	-	6	-	-	-	.06	-	-	-
F	<i>Astragalus utahensis</i>	-	-	2	1	-	-	.01	.00	-	-
F	<i>Calochortus nuttallii</i>	-	-	-	2	-	-	-	.00	-	-
F	<i>Camelina microcarpa</i> (a)	-	-	15	13	13	16	.03	.04	.08	.09
F	<i>Cirsium undulatum</i>	8	4	15	6	4	7	.12	.10	.01	.21
F	<i>Collinsia parviflora</i> (a)	-	-	a-	b34	b38	a4	-	.18	.13	.00
F	<i>Collomia grandiflora</i> (a)	-	-	-	-	10	-	-	-	.02	-
F	<i>Collomia linearis</i> (a)	-	-	a8	b30	a2	ab16	.01	.12	.00	.03
F	<i>Comandra pallida</i>	-	-	10	11	3	7	.07	.10	.15	.01
F	<i>Descurainia pinnata</i> (a)	-	-	-	2	2	2	-	.01	.00	.00
F	<i>Draba sp.</i> (a)	-	-	-	-	19	-	-	-	.04	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	a-	a4	b22	a5	-	.01	.05	.04
F	<i>Erodium cicutarium</i> (a)	-	-	a16	a7	a26	b57	.10	.03	.44	.96
F	<i>Galium aparine</i> (a)	-	-	a3	a1	a6	b31	.00	.03	.02	.92
F	<i>Gayophytum ramosissimum</i> (a)	-	-	11	-	-	-	.02	-	-	-
F	<i>Hackelia patens</i>	-	15	14	12	7	10	.16	.25	.13	.22
F	<i>Helianthus annuus</i> (a)	a-	a1	a-	a1	a3	b29	-	.00	.03	.22
F	<i>Holosteum umbellatum</i> (a)	-	-	a-	b18	b26	c73	-	.08	.12	.16
F	<i>Lactuca serriola</i> (a)	-	-	b9	a-	a-	a-	.02	.00	-	-
F	<i>Machaeranthera canescens</i>	-	-	1	-	-	-	.00	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	a-	b55	b54	c107	-	.32	.11	.62
F	<i>Phlox longifolia</i>	a-	c117	a4	b38	b43	b40	.01	.13	.28	.59
F	<i>Ranunculus testiculatus</i> (a)	-	-	a53	c220	b103	c207	.13	4.38	.43	1.70
F	<i>Taraxacum officinale</i>	-	-	-	-	-	2	-	-	-	.00
F	<i>Tragopogon dubius</i> (a)	a1	a3	ab9	a3	ab8	b16	.02	.00	.07	.09
F	<i>Verbascum thapsus</i>	a-	a-	b31	a-	a-	a5	.09	-	-	.01

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Veronica biloba</i> (a)	-	-	<sub>a</sub> 7	<sub>d</sub> 341	<sub>b</sub> 72	<sub>c</sub> 252	.04	7.48	.42	3.82
F	<i>Vicia americana</i>	<sub>a</sub> -	<sub>b</sub> 31	<sub>c</sub> 92	<sub>c</sub> 98	<sub>d</sub> 158	<sub>c</sub> 120	1.06	1.46	6.17	.73
F	<i>Viola</i> sp.	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> 7	<sub>b</sub> 39	-	-	.21	.28
Total for Annual Forbs		1	4	343	807	584	1136	1.35	12.93	2.76	16.04
Total for Perennial Forbs		12	179	203	304	252	324	1.70	2.91	7.26	2.62
Total for Forbs		13	183	546	1111	836	1460	3.06	15.84	10.03	18.67

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

#### BROWSE TRENDS--

Management unit 04, Study no: 8

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	<i>Amelanchier alnifolia</i>	1	1	0	0	-	-	-	.00
B	<i>Artemisia tridentata vaseyana</i>	97	88	78	75	22.27	26.68	20.50	20.50
B	<i>Chrysothamnus nauseosus albicaulis</i>	8	10	11	9	1.83	1.88	1.79	.68
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	76	65	69	63	6.00	2.82	6.31	2.99
B	<i>Gutierrezia sarothrae</i>	3	9	1	1	-	.36	.03	-
Total for Browse		185	173	159	148	30.11	31.75	28.64	24.18

#### CANOPY COVER, LINE INTERCEPT--

Management unit 04, Study no: 8

Species	Percent Cover	
	'06	'11
<i>Artemisia tridentata vaseyana</i>	19.21	30.66
<i>Chrysothamnus nauseosus albicaulis</i>	.83	1.53
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	5.38	3.88

#### KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 04, Study no: 8

Species	Average leader growth (in)		
	'01	'06	'11
<i>Artemisia tridentata vaseyana</i>	1.8	2.3	4.2

**BASIC COVER--**

Management unit 04, Study no: 8

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	1.50	5.75	55.91	52.17	54.70	49.15
Rock	2.50	1.50	1.75	1.55	1.64	1.69
Pavement	10.75	13.50	1.62	5.81	4.17	6.32
Litter	58.00	47.75	51.50	46.72	47.29	32.40
Cryptogams	0	0	.06	.03	.00	.38
Bare Ground	27.25	31.50	8.15	18.02	16.39	23.84

**SOIL ANALYSIS DATA --**

Management unit 04, Study no: 8, Study Name: Shell Hollow

Effective rooting depth (in)	pH	Sandy-Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
10.6	7.8	49.6	23.4	27.0	2.5	18.1	217.6	0.7

**PELLET GROUP DATA--**

Management unit 04, Study no: 8

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Sheep	-	-	1	1	-	8 (20)	19 (48)
Rabbit	-	6	8	2	-	-	-
Elk	-	-	2	2	-	6 (15)	1 (3)
Deer	10	6	8	2	21 (51)	35 (86)	7 (18)
Cattle	-	1	-	-	2 (5)	2 (5)	-

**BROWSE CHARACTERISTICS--**

Management unit 04, Study no: 8

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<b>Amelanchier alnifolia</b>									
84	0	0	0	-	-	0	0	0	-/-
90	0	0	0	-	-	0	0	0	-/-
96	20	0	100	-	-	0	100	0	23/40
01	20	100	0	-	-	0	0	0	25/43
06	0	0	0	-	-	0	0	0	25/29
11	0	0	0	-	20	0	0	0	37/51
<b>Artemisia tridentata vaseyana</b>									
84	4797	8	58	33	-	74	24	3	30/34
90	3798	7	39	54	533	60	2	19	29/37
96	4780	8	68	24	20	43	8	28	29/48
01	3340	3	77	20	-	20	2	8	35/47
06	2820	2	59	39	40	28	4	15	33/45
11	2340	0	68	32	-	29	2	15	34/54

		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>Chrysothamnus nauseosus albicaulis</i>										
84	132	50	50	0	-	50	0	0	21/27	
90	266	0	0	100	-	50	0	50	-/-	
96	220	9	73	18	-	0	0	9	29/38	
01	200	10	40	50	-	10	0	10	32/44	
06	240	25	58	17	-	25	0	17	23/28	
11	200	0	100	0	-	0	0	0	29/43	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
84	1798	4	89	7	-	56	0	0	14/17	
90	3531	6	57	38	-	21	2	30	10/12	
96	5360	12	85	3	-	2	0	5	13/16	
01	4560	4	93	3	-	4	0	2	9/13	
06	4080	3	96	1	-	2	0	3	13/18	
11	4120	3	97	0	-	10	0	0	9/10	
<i>Gutierrezia sarothrae</i>										
84	0	0	0	0	-	0	0	0	-/-	
90	0	0	0	0	-	0	0	0	-/-	
96	140	0	100	0	60	0	0	0	11/9	
01	280	0	79	21	-	0	0	7	8/10	
06	20	0	100	0	-	0	0	0	8/7	
11	20	0	100	0	-	0	0	0	11/13	
<i>Mahonia repens</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	0	0	0	-	-	0	0	0	-/-	
11	0	0	0	-	-	0	0	0	3/5	
<i>Opuntia sp.</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	3/6	
01	0	0	0	-	-	0	0	0	4/14	
06	0	0	0	-	-	0	0	0	8/20	
11	0	0	0	-	-	0	0	0	6/23	
<i>Rhus trilobata</i>										
84	0	0	0	-	-	0	0	0	-/-	
90	0	0	0	-	-	0	0	0	-/-	
96	0	0	0	-	-	0	0	0	72/128	
01	0	0	0	-	-	0	0	0	-/-	
06	0	0	0	-	-	0	0	0	62/115	
11	0	0	0	-	-	0	0	0	64/93	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Symphoricarpos oreophilus										
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	0	0	0	-	-	0	0	0	23/41	
11	0	0	0	-	-	0	0	0	27/53	