

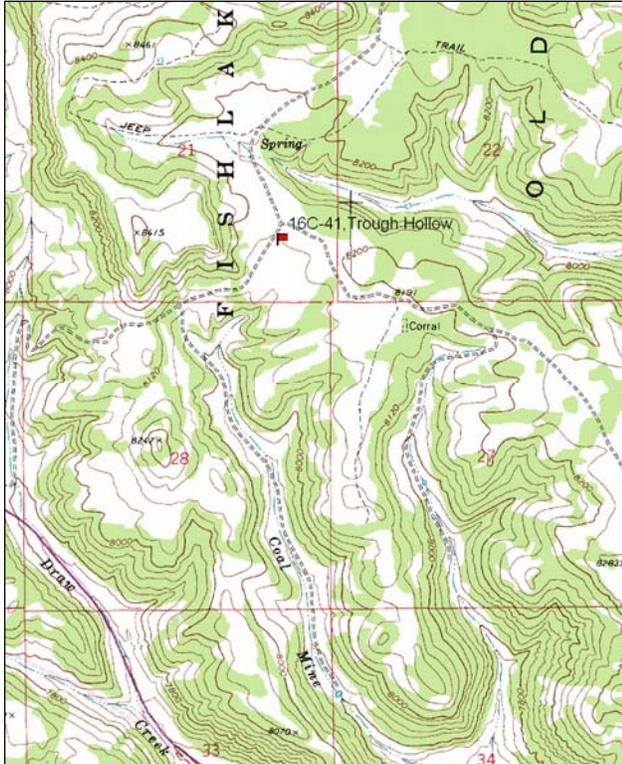
TROUGH HOLLOW - TREND STUDY NO. 16C-41-09

Vegetation Type: Mixed Mountain Brush  
Range Type: Crucial Deer Spring/Fall/Summer, Substantial Elk Winter  
NRCS Ecological Site Description: Not Available  
Land Ownership: USFS  
Elevation: 8,200 ft (2,499 m)  
Aspect: South  
Slope: 2%  
Transect bearing: 180 degrees magnetic  
Belt placement: line 1 (11 & 95), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:

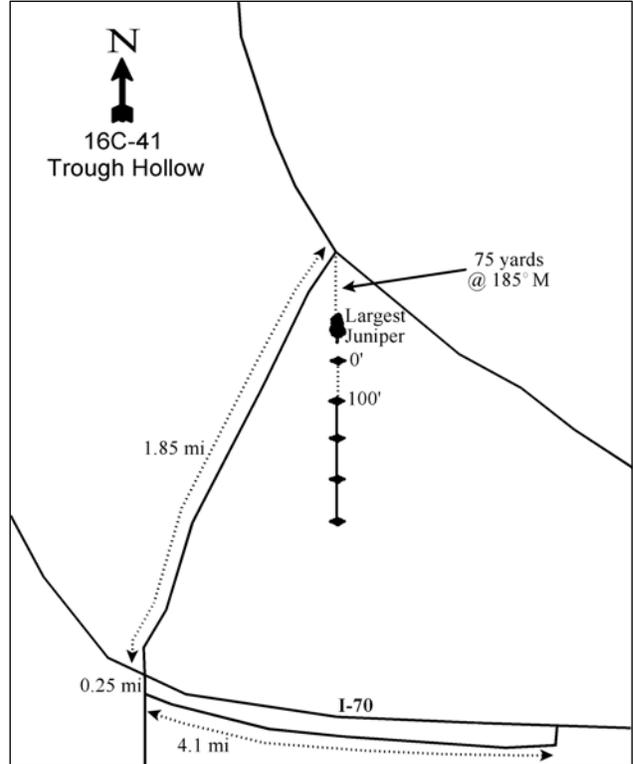
From Salina drive about 37.5 miles east on I-70 to a rest area exit. From the exit turn right and come back west on the frontage road paralleling the freeway for 4.1 miles to an intersection. Turn right on F.S. Road #011 and drive 0.25 miles to cross under the freeway. From the tunnel proceed 1.85 miles up and around a hill, then on to a major intersection. Stop here and look back at a bearing of 185 degrees magnetic to the largest juniper close to the road. It is about 75 yards from the intersection. Go back to this juniper to find the 0-foot baseline stake, 10 feet south of the tree out in the sagebrush flat. The stake is marked with browse tag #7192.

Map Name: Old Woman Plateau, Utah



Township: 23S, Range: 4E, Section: 21

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 459750 E 4293535 N

## TROUGH HOLLOW - TREND STUDY NO. 16C-41

### Site Information

Site Description: The study is located on the south end of the Old Woman Plateau in an open area dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). The community is described as mixed mountain brush because of the great variety of desirable browse species present on the site. The area is quite popular for deer hunting and access is good on this part of the plateau. The area is managed by the Forest Service as part of the Beavers Dam allotment. The area provides good year long habitat for deer, especially in spring and fall. Pellet group data estimated moderate use by deer and elk in 1999 and 2009, but lighter use by both species in 2004. Estimated cattle use has been mostly moderate since 1999 (Table - Pellet Group Data).

Browse: Mountain big sagebrush and antelope bitterbrush (*Purshia tridentata*) are the key browse species on the site and account for most of the browse cover (Table - Browse Trends). The mountain big sagebrush population is somewhat dense with moderate decadence, good vigor, and good recruitment of young plants over the sample years. Mountain big sagebrush plants have displayed mostly light to moderate use over the length of the study. Bitterbrush has shown consistent moderate to heavy use since 1985. Most of the population was classified as decadent in 1991, but decadence was low and vigor was good in all other sample years (Table - Browse Characteristics). The bitterbrush plants display a spreading prostrate growth form, forming a secondary cover under the sagebrush. Additional browse species include small numbers of Utah serviceberry (*Amelanchier utahensis*), sticky leaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), Wood's rose (*Rosa woodsii*), snowberry (*Symphoricarpos oreophilus*), and gray horsebrush (*Tetradymia canescens*).

Herbaceous Understory: There are many species of perennial grasses growing under and between the sagebrush, creating a fairly dense ground cover that has averaged 17% since 1999. The most common grasses are mutton bluegrass and Kentucky bluegrass (*Poa fendleriana* and *P. pratensis*). Letterman needlegrass (*Stipa lettermani*) and western wheatgrass (*Agropyron smithii*) have also been common over the sample years. Sheep fescue (*Festuca ovina*) has increased substantially since 2004. Perennial forbs are diverse and have a moderate abundance, providing an average of 4% cover since 1999 (Table - Herbaceous Trends). Some provide highly palatable and preferred forage for deer and elk, such as redroot eriogonum (*Eriogonum racemosum*), penstemon's (*Penstemon spp.*), and fleabanes (*Erigeron spp.*).

Soil: The soil texture is a sandy clay loam with a neutral pH (Table - Soil Analysis Data). The ground is covered with a high percent of litter and vegetation with little bare ground cover exposed (Table - Basic Cover). The soil erosion condition was classified as stable in 2004 and 2009.

### Trend Assessments

#### Browse:

- **1985 to 1991 - stable (0):** There was little change the density of either of the key browse species, mountain big sagebrush and bitterbrush. Decadence of mountain big sagebrush decreased from 45% to 22%, and recruitment of young plants increased from 9% to 19% of the population. Decadence of bitterbrush increased from 3% to 62% and poor vigor increased from 0% to 23%.
- **1991 to 1999 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1999; therefore, trend was determined using other parameters. Decadence of bitterbrush decreased to 1% and poor vigor returned to 1985 levels. Recruitment of both mountain big sagebrush and bitterbrush increased slightly.
- **1999 to 2004 - stable (0):** Density of both mountain big sagebrush and bitterbrush decreased slightly, but the main decrease was in the density of the abundant young class. Recruitment of young plants was still good for both species.

- **2004 to 2009 - slightly up (+1):** There was a slight decrease in the density of mountain big sagebrush, but bitterbrush density increased by 22%. Cover remained similar for bitterbrush, but decreased slightly for mountain big sagebrush.

Grass:

- **1985 to 1991 - slightly up (+1):** Perennial grass sum of nested frequency increased by 12%.
- **1991 to 1999 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 13%.
- **1999 to 2004 - slightly down (-1):** There was a 13% decrease in the sum of nested frequency of perennial grasses and cover decreased from 19% to 14%.
- **2004 to 2009 - slightly down (-1):** Perennial grass sum of nested frequency decreased by 10%, though cover increased to 18%.

Forb:

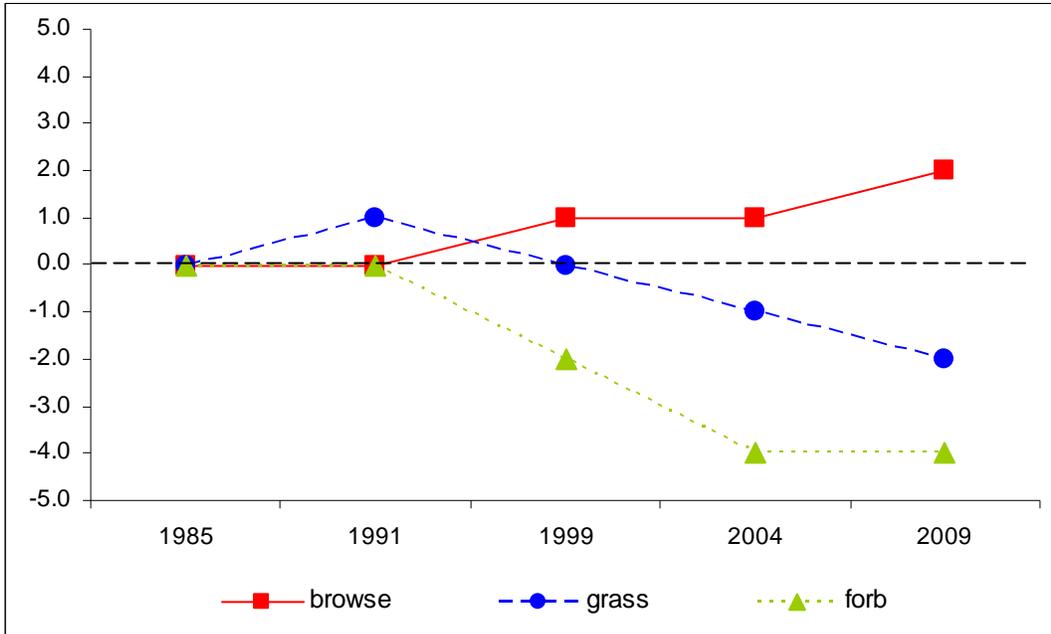
- **1985 to 1991 - stable (0):** There was little change in the perennial forb sum of nested frequency.
- **1991 to 1999 - down (-2):** Perennial forb sum of nested frequency decreased by 56%.
- **1999 to 2004 - down (-2):** The sum of nested frequency of perennial forbs decreased by 23% and cover decreased from 5% to 4%.
- **2004 to 2009 - stable (0):** There was little change in the perennial forb sum of nested frequency or cover.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --  
Management unit 16C, study no: 41

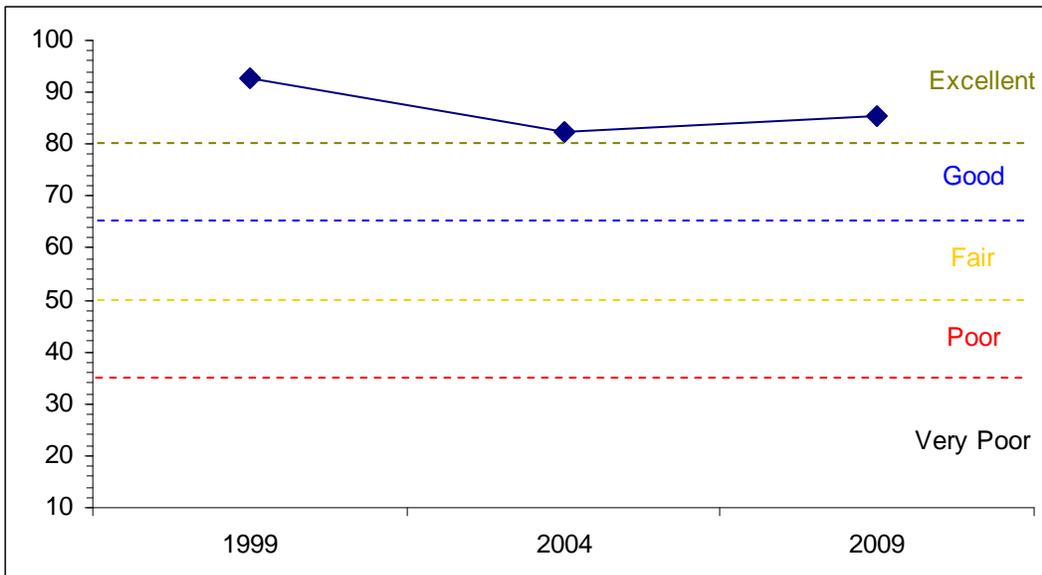
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
99	30.0	11.3	11.6	30.0	0.0	9.7	0.0	<b>92.7</b>	Excellent
04	30.0	10.0	5.7	28.8	0.0	7.9	0.0	<b>82.4</b>	Excellent
09	30.0	11.2	5.4	30.0	0.0	9.0	0.0	<b>85.6</b>	Excellent

## Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--  
 Management unit 16C Study no: 41



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL  
 Management unit 16C, Study no: 41



HERBACEOUS TRENDS--

Management unit 16C, Study no: 41

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'99	'04	'09	'99	'04	'09
G	Agropyron smithii	a99	b215	a91	a70	a78	1.06	.94	.73
G	Agropyron spicatum	-	-	-	1	-	-	.00	-
G	Agropyron trachycaulum	a-	b34	ab25	a5	a-	.92	.06	-
G	Bouteloua gracilis	ab12	b14	a-	a-	a-	-	-	-
G	Bromus ciliatus	b16	a-	c66	b12	a-	.71	.10	-
G	Bromus inermis	5	-	8	-	-	.04	-	-
G	Carex sp.	5	12	14	3	6	.24	.00	.04
G	Festuca ovina	ab13	a-	a-	a1	b25	-	.03	1.01
G	Poa fendleriana	227	214	175	202	204	7.59	6.55	8.02
G	Poa pratensis	a13	b116	c166	d234	b120	6.27	6.21	4.07
G	Poa secunda	a-	ab4	a-	ab3	b14	-	.15	.48
G	Sitanion hystrix	c162	b38	a13	a2	a5	.20	.02	.01
G	Stipa columbiana	2	3	6	-	-	.18	-	-
G	Stipa lettermani	c119	c105	bc95	a38	ab60	2.16	.30	3.52
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		673	755	659	571	512	19.41	14.39	17.91
Total for Grasses		673	755	659	571	512	19.41	14.39	17.91
F	Agoseris glauca	a-	b76	a-	a1	a-	-	.00	-
F	Androsace septentrionalis (a)	-	-	c64	b29	a4	.41	.18	.00
F	Antennaria rosea	a14	ab29	a12	ab26	b39	.62	1.35	1.38
F	Arabis sp.	-	4	13	-	2	.05	-	.03
F	Aster sp.	4	-	-	-	2	-	-	.03
F	Astragalus convallarius	b113	a35	a18	a10	a16	.16	.05	.03
F	Astragalus sp.	4	8	12	1	3	.22	.00	.00
F	Calochortus nuttallii	b90	c148	a-	a2	a-	-	.01	-
F	Castilleja chromosa	5	10	3	-	-	.06	-	-
F	Chaenactis douglasii	-	-	2	-	-	.00	-	-
F	Cirsium wheeleri	3	4	2	3	-	.03	.03	-
F	Collinsia parviflora (a)	-	-	a3	c144	b60	.01	.61	.12
F	Crepis acuminata	12	6	-	-	9	-	-	.06
F	Erigeron caespitosus	10	-	-	-	-	-	-	-
F	Erigeron eatonii	b105	b96	a23	a25	a17	.31	.15	.14
F	Erigeron flagellaris	ab16	ab7	ab16	a7	b21	.13	.01	.13
F	Erigeron pumilus	a5	ab14	ab18	b20	a-	.50	.08	-
F	Eriogonum racemosum	112	122	88	99	74	1.36	1.33	.82
F	Eriogonum umbellatum	9	6	19	13	16	.24	.80	.88
F	Ipomopsis aggregata	5	-	1	-	-	.00	-	-
F	Lithospermum ruderales	-	3	-	-	-	-	-	-
F	Lupinus argenteus	8	2	8	1	9	.54	.03	.16
F	Lychnis drummondii	-	-	3	-	-	.00	-	-
F	Machaeranthera canescens	-	-	2	-	2	.03	-	.03
F	Microsteris gracilis (a)	-	-	a-	a7	b37	-	.02	.07
F	Oxybaphus linearis	b12	a-	a-	a-	a-	-	-	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'99	'04	'09	'99	'04	'09
F	<i>Penstemon pachyphyllus</i>	5	11	1	-	1	.15	.00	.00
F	<i>Penstemon palmeri</i>	2	-	-	-	-	-	-	-
F	<i>Penstemon watsonii</i>	<sub>a</sub> 5	<sub>b</sub> 29	<sub>ab</sub> 21	<sub>a</sub> 4	<sub>ab</sub> 17	.31	.04	.75
F	<i>Petroradia pumila</i>	-	-	2	-	-	.00	-	-
F	<i>Polygonum douglasii</i> (a)	-	-	<sub>a</sub> 18	<sub>b</sub> 44	<sub>a</sub> 14	.04	.11	.03
F	<i>Senecio multilobatus</i>	-	-	1	-	-	.00	-	-
F	<i>Taraxacum officinale</i>	<sub>b</sub> 23	<sub>ab</sub> 15	<sub>ab</sub> 26	<sub>ab</sub> 11	<sub>a</sub> 6	.08	.03	.01
F	<i>Tragopogon dubius</i>	-	3	-	-	-	-	-	-
F	<i>Trifolium</i> sp.	6	5	-	-	-	-	-	-
F	Unknown forb-perennial	<sub>b</sub> 34	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	-	-	-
F	<i>Vicia americana</i>	<sub>b</sub> 18	<sub>ab</sub> 11	<sub>a</sub> -	<sub>a</sub> 2	<sub>a</sub> -	-	.00	-
F	<i>Zigadenus paniculatus</i>	<sub>ab</sub> 6	<sub>b</sub> 12	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	-	-	-
Total for Annual Forbs		0	0	85	224	115	0.46	0.92	0.22
Total for Perennial Forbs		626	656	291	225	234	4.86	3.97	4.49
Total for Forbs		626	656	376	449	349	5.32	4.89	4.72

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

#### BROWSE TRENDS--

Management unit 16C, Study no: 41

Type	Species	Strip Frequency			Average Cover %		
		'99	'04	'09	'99	'04	'09
B	<i>Amelanchier utahensis</i>	25	19	18	.66	.66	.24
B	<i>Artemisia tridentata vaseyana</i>	96	92	90	19.40	18.44	16.27
B	<i>Chrysothamnus nauseosus hololeucus</i>	0	4	14	-	.03	.45
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	37	50	40	1.11	1.74	.97
B	<i>Gutierrezia sarothrae</i>	0	2	0	-	.18	.33
B	<i>Juniperus osteosperma</i>	2	2	2	.38	.38	.63
B	<i>Mahonia repens</i>	13	14	14	.18	.31	.52
B	<i>Purshia tridentata</i>	71	72	80	10.40	11.54	11.49
B	<i>Rosa woodsii</i>	7	6	8	.49	.52	.39
B	<i>Symphoricarpos oreophilus</i>	11	15	17	.45	.52	.69
B	<i>Tetradymia canescens</i>	5	12	14	.06	.36	.19
Total for Browse		267	288	297	33.16	34.69	32.19

CANOPY COVER, LINE INTERCEPT--

Management unit 16C, Study no: 41

Species	Percent Cover		
	'99	'04	'09
<i>Amelanchier utahensis</i>	-	.36	.73
<i>Artemisia tridentata vaseyana</i>	-	24.01	17.11
<i>Chrysothamnus nauseosus hololeucus</i>	-	.23	.21
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	-	2.88	1.56
<i>Gutierrezia sarothrae</i>	-	-	.10
<i>Juniperus osteosperma</i>	1.00	1.83	2.01
<i>Mahonia repens</i>	-	.40	.75
<i>Purshia tridentata</i>	-	19.28	20.04
<i>Rosa woodsii</i>	-	.30	.03
<i>Symphoricarpos oreophilus</i>	-	1.06	1.60
<i>Tetradymia canescens</i>	-	.35	.05

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 16C, Study no: 41

Species	Average leader growth (in)	
	'04	'09
<i>Amelanchier utahensis</i>	3.9	1.6
<i>Artemisia tridentata vaseyana</i>	2.4	1.4
<i>Purshia tridentata</i>	5.0	2.2

BASIC COVER--

Management unit 16C, Study no: 41

Cover Type	Average Cover %				
	'85	'91	'99	'04	'09
Vegetation	13.25	21.25	56.79	51.33	47.65
Rock	0	.50	0	.01	.01
Pavement	0	.25	.21	.14	.02
Litter	73.00	63.25	59.30	61.34	63.54
Cryptogams	.75	.25	.21	0	.06
Bare Ground	13.00	14.50	13.29	11.04	15.16

SOIL ANALYSIS DATA --

Management unit 16C, Study no: 41, Study Name: Trough Hollow

Effective rooting depth (in)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
16.9	n/a	48	25.4	26.6	2.3	8.5	163.2	0.6

PELLET GROUP DATA--

Management unit 16C, Study no: 41

Type	Quadrat Frequency			Days use per acre (ha)		
	'99	'04	'09	'99	'04	'09
Rabbit	5	24	22	-	-	-
Elk	11	10	14	53 (131)	9 (23)	27 (66)
Deer	13	32	18	31 (77)	19 (48)	24 (60)
Cattle	7	10	10	38 (94)	27 (66)	32 (79)

BROWSE CHARACTERISTICS--

Management unit 16C, Study no: 41

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Amelanchier utahensis</i>									
85	<b>599</b>	89	11	0	66	33	0	0	10/15
91	<b>598</b>	67	11	22	-	33	11	0	21/13
99	<b>600</b>	47	53	0	-	27	33	3	20/18
04	<b>480</b>	8	58	33	-	17	50	8	16/17
09	<b>480</b>	25	75	0	80	42	8	38	17/17
<i>Artemisia tridentata vaseyana</i>									
85	<b>4331</b>	9	46	45	666	40	0	14	26/25
91	<b>4198</b>	19	59	22	133	14	0	5	26/32
99	<b>5260</b>	21	60	19	520	4	1	3	35/42
04	<b>4540</b>	8	68	24	240	16	.44	8	29/32
09	<b>4280</b>	11	70	20	120	32	5	14	32/34
<i>Cercocarpus ledifolius</i>									
85	<b>0</b>	0	0	-	-	0	0	0	-/-
91	<b>0</b>	0	0	-	-	0	0	0	-/-
99	<b>0</b>	0	0	-	-	0	0	0	-/-
04	<b>0</b>	0	0	-	-	0	0	0	33/27
09	<b>0</b>	0	0	-	-	0	0	0	-/-
<i>Chrysothamnus nauseosus hololeucus</i>									
85	<b>0</b>	0	0	0	-	0	0	0	-/-
91	<b>0</b>	0	0	0	-	0	0	0	-/-
99	<b>0</b>	0	0	0	-	0	0	0	-/-
04	<b>220</b>	18	82	0	20	0	0	0	14/25
09	<b>340</b>	6	88	6	-	12	0	6	12/16
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
85	<b>1798</b>	33	67	0	-	0	0	0	5/8
91	<b>2265</b>	79	21	0	-	21	0	3	4/9
99	<b>2120</b>	6	94	0	-	0	0	0	8/11
04	<b>2280</b>	1	98	1	20	0	0	0	9/13
09	<b>2520</b>	7	93	0	-	0	0	0	10/12

		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>Gutierrezia sarothrae</i>										
85	0	0	0	-	-	0	0	0	-/-	
91	0	0	0	-	-	0	0	0	-/-	
99	0	0	0	-	-	0	0	0	-/-	
04	60	0	100	-	-	0	0	0	7/9	
09	0	0	0	-	-	0	0	0	10/13	
<i>Juniperus osteosperma</i>										
85	0	0	0	-	-	0	0	0	-/-	
91	0	0	0	-	-	0	0	0	-/-	
99	40	100	0	-	-	0	0	0	-/-	
04	40	50	50	-	-	0	0	0	-/-	
09	40	50	50	-	-	0	0	0	-/-	
<i>Mahonia repens</i>										
85	1665	16	84	-	-	0	0	0	3/3	
91	333	100	0	-	533	0	0	0	-/-	
99	2080	25	75	-	-	0	0	0	2/4	
04	1420	14	86	-	20	0	0	0	2/4	
09	2180	11	89	-	-	0	0	0	4/6	
<i>Purshia tridentata</i>										
85	1931	21	76	3	199	45	21	0	19/28	
91	1731	23	15	62	-	23	23	23	9/19	
99	2680	25	74	1	80	14	68	0	21/38	
04	2560	15	80	5	120	13	66	.78	19/40	
09	3140	10	87	3	20	31	43	4	20/38	
<i>Rosa woodsii</i>										
85	0	0	0	-	-	0	0	0	-/-	
91	0	0	0	-	-	0	0	0	-/-	
99	620	45	55	-	-	0	0	0	11/8	
04	580	52	48	-	-	0	0	0	8/8	
09	760	16	84	-	-	0	0	0	12/15	
<i>Symphoricarpos oreophilus</i>										
85	732	73	27	0	199	0	0	0	9/10	
91	931	43	50	7	-	36	0	0	9/14	
99	580	48	52	0	20	3	0	0	18/22	
04	520	15	69	15	-	0	0	4	14/18	
09	760	39	61	0	-	42	0	3	16/20	
<i>Tetradymia canescens</i>										
85	0	0	0	0	-	0	0	0	-/-	
91	0	0	0	0	-	0	0	0	-/-	
99	120	0	83	17	-	0	0	0	8/7	
04	280	29	64	7	-	0	7	7	8/12	
09	320	19	81	0	-	13	0	0	13/11	