Trend Study 17-41-07

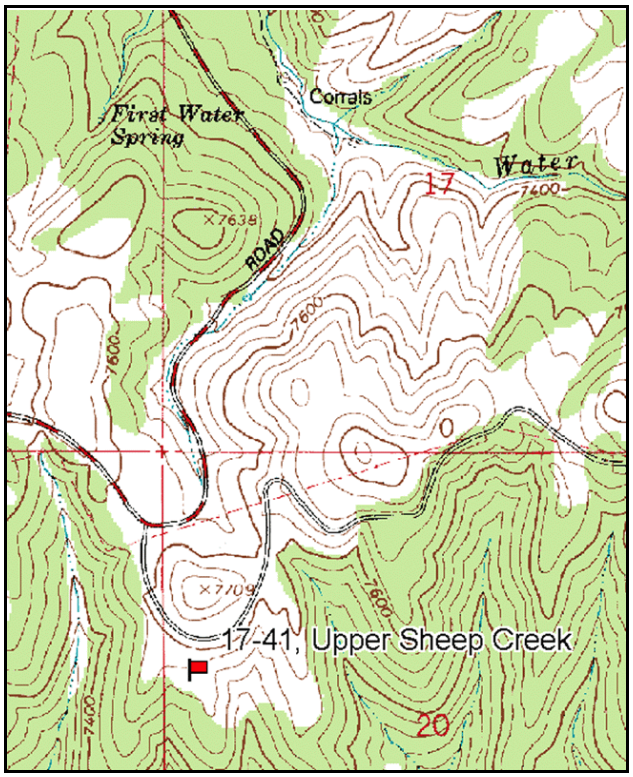
Study site name: Upper Sheep Creek . Vegetation type: Mountain Brush .

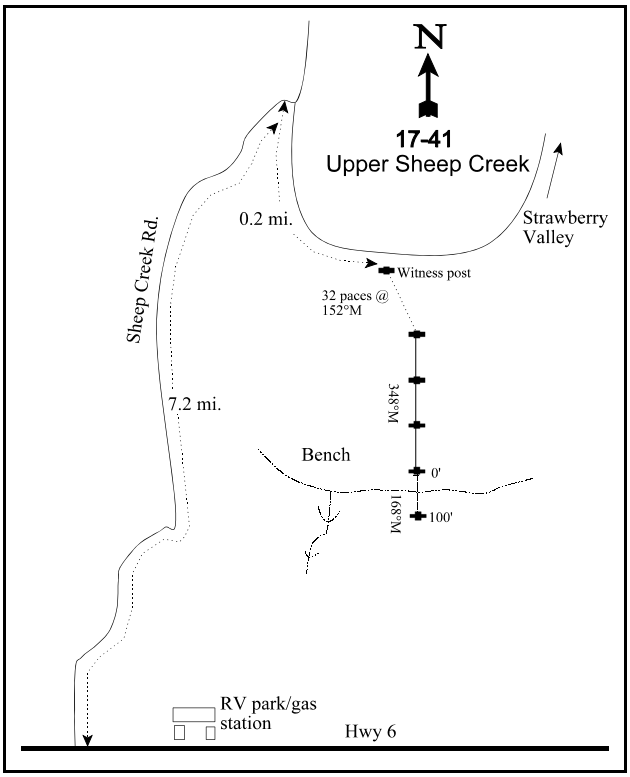
Compass bearing: frequency baseline 168 degrees magnetic.

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

LOCATION DESCRIPTION

Beginning at the intersection of Sheep Creek Road and Rays Valley, proceed northerly up Rays Valley Road for 7.2 miles to an intersection (0.20 miles past a cattle guard). Turn right at the intersection and proceed easterly for 0.60 miles to another intersection. Turn right at the intersection and proceed 0.10 miles to a "Y" in the road. Take the left side of the "Y" and proceed another 0.10 miles to a faint road to the right. Turn right on the faint road and proceed 0.10 miles to a green steel "T" fencepost to the left. From the stake, the 0-foot stake of the baseline is 32 paces away at an azimuth of 152 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.





Map Name: Ray's Valley

Diagrammatic Sketch

Township 9S , Range 5E , Section 20

GPS: NAD 83, UTM 12T 476139 E 4430595 N

DISCUSSION

Upper Sheep Creek - Trend Study No. 17-41

Study Information

This study is located near the upper limit of deer and elk winter range above US-6 in Spanish Fork Canyon [elevation: 7,500 feet (2,285 m), slope: 12-40%, aspect: south]. The elevation makes it unlikely in most winters that any big game are using this area after mid-November. Some early spring use probably occurs as the snow melts. Wildlife are likely more concentrated near the edge of the ridge where the sun and wind can help keep the snow at a more shallow depth. The study area drains into Sheep Creek, but is near the divide with First Water Creek. Both creeks are located within 1.1 miles (1.8 km) of the study. From the pellet group transect, there were 46 deer days use/acre (114 ddu//ha) in 2002 and 66 deer days use/acre (162 ddu/ha) in 2007. Elk use was estimated at 3 days use/acre (7 edu/ha) in 2002 and 11 days use/acre (28 edu/ha) in 2007. Cattle use was estimated at 13 days use/acre (32 cdu/ha) in 2002 and 12 days use/acre (29 cdu/ha) in 2007. Deer and elk pellet groups appeared to be from fall and spring use, while all cattle pats were from the summer.

Soil

The soil has a clay texture and a neutral soil reaction (pH of 7.2). The parent material appears to be limestone or shale. Since 1997, relative bare ground cover has averaged 11%. Vegetation and litter cover have been the dominant cover types and have comprised approximately 80% of the relative ground cover since 1997. Because of the disparity in slope and the evidences of erosion that exist along the baseline, the erosion condition was classified in two parts in 2007. For the steeper portion of the baseline, the erosion condition was classified as slight in 2007 , due to evidence of surface litter and rock movement, pedestalling, and flow patterns. For the remainder of the baseline, the erosion condition was classified as stable in 2002 and 2007.

Browse

The browse component has dominated this mountain brush community. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) canopy cover was 17% in 2002 and 11% in 2007. The density of sagebrush increased from 1,133 plants/acre (2,804 plants/ha) in1983 to 2,160 plants/acre (5,347 plants/ha) in 1997. Most of this increase was the result of the increased area sampled in beginning in 1997. In 2002, the density was estimated at 2,200 plants/acre (5,445 plants/ha), and it decreased to 1,940 plants/acre (4,802 plants/ha) in 2007. Few or no seedling plants have been sampled, and young plants have comprised 10% or less of the population. Decadence has increased from12% of the population in 1983 to 32% in 2007. Dead plants were first sampled in 1997, and the density of dead plants has been fairly stable, ranging from 160-200 plants/acre (396-495 plants/ha). The proportion of plants exhibiting poor vigor has ranged from 7% to 41% of the population. No dying plants were sampled in 1983, and in subsequent years dying plants have comprised 7%-19% of the population. The average annual leader growth was 1.6 inches (4.1 cm) in 2002 and 1.9 inches (4.7 cm) in 2007. Browse use on sagebrush has been light to light-moderate.

Antelope bitterbrush (*Purshia tridentata*) canopy cover was 19% in 2002 and 7% in 2007. Bitterbrush density has steadily increased from 1,066 plants/acre (2,640 plants/ha) in 1983 to 1,700 plants/acre (4,210 plants/ha) in 2007. Few or no seedlings have been sampled, and the young age class has accounted for 0%-11% of the population. Decadence has been low and has ranged from 0% to 8% of the population. Until 2007, no plants classified as dying or having poor vigor were. In 2007, 5% of the population had poor vigor. The average annual leader growth on bitterbrush was 0.9 inches (2.3 cm) in 2002 and 2.2 inches (5.5 cm) in 2007.

Serviceberry (*Amelanchier alnifolia*) cover has been 2% or less of the total ground cover. The density of serviceberry has ranged from 540 plants/acre (1,335 plants/ha) to 1,466 plants/acre (3,630 plants/ha). Between 6% and 35% of the population has consisted of young plants, and decadent plants have comprised 10% or less of the population. The proportion of plants exhibiting poor vigor has ranged from 0% to 14% of the population. In 2007 the average annual leader growth was 3.0 inches (7.6 cm). Browse use on serviceberry

has been light-moderate to moderate.

Other browse species that are present include stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), Wyeth eriogonum (*Eriogonum heracleoides*), Woods' rose (*Rosa woodsii*), and snowberry (*Symphoricarpos oreophilus*). Browse use has been predominantly light on these species. There were some moderately browsed snowberry plants in 1983, and Wyeth eriogonum plants in 2007.

Herbaceous Understory

The herbaceous understory is diverse, but is not very abundant. The grass component has comprised approximately 10% of the total ground cover since 1997. The dominant perennial species are bluebunch wheatgrass (*Agropyron spicatum*), smooth brome (*Bromus inermis*), and mutton bluegrass (*Poa fendleriana*). Ten other perennial grass species have been sampled at low frequencies. Cheatgrass (*Bromus tectorum*) is the only annual species present, but quadrat frequency has been 5% or less.

On average, forb cover has been 9% since 1997. Perennial species, including wild onion (*Allium* sp.), Western aster (*Aster chilensis*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and penstemon (*Penstemon* sp.), have accounted for most of the total forb cover. Houndstongue (*Cynoglossum officinale*), a noxious weed, was sampled in one quadrat in 2002. Otherwise, there have been no noxious weeds sampled.

1997 TREND ASSESSMENT

The browse trend is up. The collective density of the preferred browse species increased 17%. The density of sagebrush increased 91%, and as mentioned previously, most of this increase was attributed to the larger area sampled. The young age class increased from 0% to 10% of the population, and decadence remained stable at 13%. The proportion of sagebrush plants exhibiting poor vigor decreased from 41% to 7%, and browse use remained light. The density of bitterbrush increased 50%, and the population continued to consist largely of mature, healthy plants. The proportion of heavily browsed bitterbrush plants increased from 0% to 30%. Serviceberry was the only preferred browse species that decreased in density. Most of the decrease was attributed to the mature age class. Since there were no decadent and few dead plants sampled, the decrease in density was attributed to the larger area sampled. The grass trend is up. The sum of nested frequency of perennial grasses increased more than three-fold. There was a significant increase in the nested frequencies of bluebunch wheatgrass, and a significant decrease in that of Sandberg bluegrass. Additionally, the number of perennial species sampled increased from five to 12. The forb trend is up. The sum of nested frequency of perennial forbs increased nearly six-fold. There were significant increases in the nested frequencies of three perennial species, and the number of perennial species sampled increased from 12 to 23. The Desirable Components Index (DCI) score was good-excellent due to the high browse cover, low browse decadence, low annual grass cover, and moderately high perennial grass and forb cover.

winter range condition (DCI) - good-excellent (80) Mid-level potential scale
browse - up (+2) grass - up (+2) forb - up (+2)

2002 TREND ASSESSMENT

The browse trend is stable. The collective density of the preferred browse species increased 8%. The density of sagebrush increased 2%. Although there were few seedlings sampled, the young age class decreased to 3% of the population. Decadence increased to 30%, and 10% of the population had poor vigor. The increase in decadence was attributed to drought conditions (Utah Climate Summaries 2007). Browse use on sagebrush remained light. The density of bitterbrush also increased 2%. Young plants increased to 11% of the population, and there were no decadent plants sampled. Browse use on bitterbrush remained moderate, and 28% of the plants had been heavily browsed. The serviceberry density increased 48%. Young plants increased to 35% of the population, and 10% was comprised of decadent plants. Serviceberry plants in poor vigor increased to 5% of the population, and browse use remained light-moderate. The grass trend is slightly down. The sum of nested frequency of perennial grasses decreased 11%. There was a significant decrease in

the nested frequency of mutton bluegrass, and a significant increase in that of Kentucky bluegrass (*Poa pratensis*). The forb trend is down. The sum of nested frequency of perennial forbs decreased 35%, including significant decreases in six perennial species. Houndstongue was sampled for the first time, but only in one quadrat. The DCI score decreased to good due to the decrease in perennial grass cover and the presence of a noxious weed species.

winter range condition (DCI) - good (76) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - down (-2)

2007 TREND ASSESSMENT

The browse trend is slightly down. The collective density of preferred browse species decreased 8%. The density of sagebrush decreased 12%. The young age class comprised 2% of the population, and decadence increased to 32%. The proportion of plants exhibiting poor vigor increased to 25%, and 19% of the population was classified as dying. Browse use on sagebrush increased to light-moderate. The density of bitterbrush increased 4%. Few seedlings and no young plants were sampled. Decadent plants increased to 8% of the population, and 5% had poor vigor. Browse use shifted to moderate-heavy, with 55% of the plants exhibiting heavy browse use. The density of serviceberry decreased 23%. This decrease was not expected because of the large number of young plants sampled in 2002. Both the young and decadent age classes decreased to 6% of the population. Although browse use remained light-moderate, heavily browsed plants increased to 26% of the sampled plants. The grass trend is stable. The sum of nested frequency of perennial grasses increased 6%, and there were no significant changes of individual species. The forb trend is slightly up. The sum of nested frequency of perennial forbs increased 11%, including significant increases in two species. Additionally, houndstongue was not sampled. The DCI score remained good.

winter range condition (DCI) - good (74) Mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 17 , Study no: 41

Type	Species	Nested Frequency				Average Cover %		
		'83	'97	'02	'07	'97	'02	'07
G	Agropyron spicatum	$_{a}$84	$_{b}$164	$_{b}$178	$_{b}$149	5.03	5.61	3.49
G	Bromus inermis	-	$_{a}$45	$_{a}$50	$_{a}$52	1.74	2.26	2.16
G	Bromus tectorum (a)	-	$_{a}$6	$_{a}$3	$_{a}$9	.01	.03	.07
G	Carex sp.	$_{a}$2	$_{a}$1	-	$_{a}$4	.03	-	.04
G	Koeleria cristata	-	$_{a}$2	$_{ab}$4	$_{b}$17	.03	.03	.36
G	Melica bulbosa	-	$_{b}$12	-	$_{a}$3	.15	-	.00
G	Oryzopsis hymenoides	$_{a}$2	$_{ab}$4	$_{ab}$4	$_{b}$16	.16	.05	.54
G	Phleum pratense	-	9	-	-	.16	-	-
G	Poa fendleriana	-	$_{b}$107	$_{a}$53	$_{a}$66	3.47	.88	2.15
G	Poa pratensis	-	$_{a}$13	$_{b}$26	$_{ab}$26	.45	.75	.96

Type	Species	Nested Frequency				Average Cover %		
		'83	'97	'02	'07	'97	'02	'07
G	Poa secunda	$_{b}$19	$_{a}$1	$_{a}$3	$_{ab}$14	.00	.03	.76
G	Sitanion hystrix	1	-	-	-	-	-	.00
G	Stipa comata	-	9	-	-	.36	-	-
G	Stipa lettermani	-	$_{a}$15	$_{a}$24	$_{a}$14	.22	.62	.12
Total for Annual Grasses		0	6	3	9	0.00	0.03	0.07
Total for Perennial Grasses		108	382	342	361	11.82	10.25	10.62
Total for Grasses		108	388	345	370	11.83	10.28	10.69
F	Achillea millefolium	-	$_{a}$5	$_{a}$3	$_{a}$3	.04	.00	.03
F	Agoseris glauca	-	$_{b}$32	$_{a}$6	$_{ab}$15	.16	.04	.20
F	Alyssum alyssoides (a)	-	-	11	-	-	.04	-
F	Allium sp.	$_{a}$1	$_{c}$107	$_{b}$49	$_{c}$109	1.06	.14	.51
F	Androsace septentrionalis (a)	-	2	-	-	.00	-	-
F	Arabis sp.	-	-	3	-	-	.06	-
F	Astragalus beckwithii	-	$_{a}$10	$_{b}$31	$_{ab}$27	.22	.63	.74
F	Aster chilensis	$_{a}$9	$_{a}$19	$_{a}$34	$_{a}$16	.63	1.17	.33
F	Astragalus convallarius	-	-	$_{a}$1	$_{a}$2	-	.03	.03
F	Aster sp.	-	$_{a}$8	-	$_{a}$17	.04	-	.28
F	Astragalus sp.	-	48	-	-	1.56	-	-
F	Balsamorhiza sagittata	$_{a}$7	$_{a}$14	$_{a}$8	$_{a}$16	1.12	1.13	1.51
F	Castilleja linariaefolia	-	$_{a}$2	-	$_{a}$1	.15	-	.03
F	Calochortus nuttallii	-	18	-	-	.08	-	-
F	Chaenactis douglasii	$_{b}$13	-	$_{a}$3	-	-	.00	-
F	Cirsium sp.	$_{a}$3	$_{a}$9	$_{a}$4	$_{a}$2	.16	.04	.00
F	Comandra pallida	$_{a}$16	$_{b}$37	$_{a}$15	$_{b}$47	.22	.08	.77
F	Collinsia parviflora (a)	-	$_{a}$87	$_{a}$92	$_{b}$128	.27	.39	.72
F	Cynoglossum officinale	-	-	1	-	-	.00	-
F	Eriogonum ovalifolium	-	-	$_{a}$6	$_{a}$2	-	.01	.00
F	Eriogonum umbellatum	$_{a}$9	$_{a}$3	$_{a}$1	$_{a}$6	.15	.03	.06
F	Galium aparine (a)	-	$_{b}$17	$_{ab}$7	$_{a}$2	.08	.01	.03
F	Hackelia patens	$_{a}$3	$_{b}$14	$_{ab}$5	$_{ab}$4	.37	.04	.03
F	Lappula occidentalis (a)	-	-	$_{a}$5	$_{a}$3	-	.03	.00
F	Lygodesmia sp.	-	-	4	-	-	.03	-
F	Machaeranthera canescens	$_{a}$6	$_{a}$4	$_{a}$2	$_{a}$13	.01	.01	.13
F	Orobanche fasciculata	-	30	-	-	.64	-	-
F	Orthocarpus tolmiei (a)	$_{a}$12	$_{b}$55	$_{b}$57	$_{a}$4	1.28	.37	.01
F	Penstemon humilis	$_{a}$7	$_{a}$7	$_{b}$28	$_{ab}$25	.09	.59	.43

Type	Species	Nested Frequency				Average Cover %		
		'83	'97	'02	'07	'97	'02	'07
F	Penstemon sp.	$_{a}$21	$_{ab}$43	$_{b}$62	$_{b}$53	1.00	1.81	1.91
F	Phlox longifolia	-	$_{a}$38	$_{a}$58	$_{a}$35	.15	.30	.29
F	Polygonum douglasii (a)	-	49	-	-	.16	-	-
F	Senecio integerrimus	-	$_{b}$58	$_{a}$23	$_{a}$8	.48	.25	.07
F	Sphaeralcea coccinea	-	-	3	-	-	.15	-
F	Streptanthus cordatus	$_{a}$1	-	$_{a}$4	$_{a}$1	-	.06	.00
F	Stanleya pinnata	-	1	-	-	.00	-	-
F	Viola sp.	-	$_{b}$41	$_{a}$7	-	.13	.04	-
F	Zigadenus paniculatus	-	$_{b}$14	$_{a}$2	-	.08	.03	-
Total for Annual Forbs		12	210	172	137	1.81	0.86	0.76
Total for Perennial Forbs		96	562	363	402	8.61	6.75	7.39
Total for Forbs		108	772	535	539	10.43	7.61	8.16

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

BROWSE TRENDS --
Management unit 17 , Study no: 41

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	Amelanchier alnifolia	23	24	26	1.68	2.04	1.10
B	Artemisia tridentata vaseyana	72	64	57	12.18	17.21	11.17
B	Chrysothamnus depressus	0	1	1	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	73	74	67	7.76	9.29	7.07
B	Eriogonum heracleoides	26	27	23	1.19	1.06	.87
B	Juniperus osteosperma	1	3	2	.00	1.63	1.26
B	Mahonia repens	31	41	28	1.91	1.44	.90
B	Purshia tridentata	53	54	54	12.17	14.23	10.17
B	Rosa woodsii	14	19	18	.99	.69	.85
B	Symphoricarpos oreophilus	68	78	72	6.60	7.40	8.42
Total for Browse		361	385	348	44.53	55.04	41.84

CANOPY COVER, LINE INTERCEPT --
Management unit 17 , Study no: 41

Species	Percent Cover	
	'02	'07
Amelanchier alnifolia	2.38	.80
Artemisia tridentata vaseyana	17.29	10.94
Chrysothamnus viscidiflorus viscidiflorus	9.51	10.23
Eriogonum heracleoides	.61	1.03
Juniperus osteosperma	2.28	3.90
Mahonia repens	1.73	1.25
Purshia tridentata	18.75	7.18
Rosa woodsii	.55	1.10
Symphoricarpos oreophilus	7.43	12.80

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 17 , Study no: 41

Species	Average leader growth (in)	
	'02	'07
Amelanchier alnifolia	-	3.0
Artemisia tridentata vaseyana	1.6	1.9
Purshia tridentata	0.9	2.2

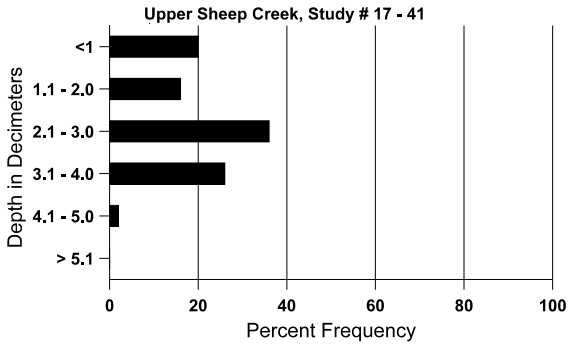
BASIC COVER --
Management unit 17 , Study no: 41

Cover Type	Average Cover %			
	'83	'97	'02	'07
Vegetation	4.25	55.15	59.53	54.45
Rock	7.50	2.80	4.45	3.19
Pavement	16.50	4.88	2.00	3.29
Litter	53.50	54.82	47.53	36.46
Cryptogams	0	.18	.04	.00
Bare Ground	18.25	10.18	13.63	16.87

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 41, Upper Sheep Creek

Effective rooting depth (in)	Temp °F (depth)	pH	Clay			%0M	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
12.8	41.6 (16.0)	6.6	31.4	22.7	45.8	4.3	17.6	384.0	.5

Stoniness Index



PELLET GROUP DATA --
Management unit 17 , Study no: 41

Type	Quadrat Frequency		
	'97	'02	'07
Rabbit	-	2	6
Elk	5	3	2
Deer	33	23	23
Cattle	6	2	1

Days use per acre (ha)	
'02	'07
-	-
3 (7)	11 (28)
46 (114)	66 (162)
13 (32)	12 (29)

BROWSE CHARACTERISTICS --
Management unit 17 , Study no: 41

		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												
83	**1466**	-	133	1333	-	-	77	14	0	-	14	30/20
97	**540**	140	80	460	-	40	30	4	0	-	0	30/35
02	**800**	-	280	440	80	-	43	13	10	5	5	33/33
07	**620**	40	40	540	40	-	35	26	6	-	0	31/27
Artemisia tridentata vaseyana												
83	**1133**	-	-	1000	133	-	18	0	12	-	41	29/35
97	**2160**	-	220	1660	280	200	22	5	13	7	7	31/41
02	**2200**	20	60	1480	660	160	21	4	30	9	10	31/37
07	**1940**	20	40	1280	620	160	40	12	32	19	25	30/37
Cercocarpus montanus												
83	**66**	-	-	66	-	-	100	0	-	-	0	67/77
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
02	**0**	-	-	-	-	-	0	0	-	-	0	-/-
07	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		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)
Chrysothamnus depressus												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
02	**20**	-	-	20	-	-	0	0	-	-	0	6/15
07	**20**	-	-	20	-	-	0	0	-	-	0	5/13
Chrysothamnus viscidiflorus viscidiflorus												
83	**3000**	-	-	3000	-	-	0	0	0	-	0	18/18
97	**5000**	-	100	4900	-	-	0	0	0	-	0	13/19
02	**8720**	20	160	8100	460	20	.91	0	5	2	2	12/15
07	**7220**	-	200	7020	-	-	0	0	0	-	0	11/16
Eriogonum heracleoides												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**840**	20	60	780	-	-	0	0	-	-	0	6/11
02	**1620**	-	80	1540	-	-	0	0	-	-	0	8/11
07	**1020**	-	-	1020	-	-	27	0	-	-	0	6/11
Juniperus osteosperma												
83	**199**	-	66	133	-	-	0	0	-	-	0	55/41
97	**20**	-	20	-	-	-	0	0	-	-	0	115/105
02	**60**	-	20	40	-	-	0	0	-	-	0	-/-
07	**40**	-	20	20	-	-	0	0	-	-	0	-/-
Mahonia repens												
83	**932**	-	66	866	-	-	0	0	0	-	0	4/6
97	**3640**	20	580	3060	-	-	0	0	0	-	0	4/6
02	**5480**	-	80	5300	100	40	0	0	2	.72	3	3/5
07	**4640**	-	400	4200	40	-	0	0	1	.86	.86	3/3
Purshia tridentata												
83	**1066**	-	-	1066	-	-	50	0	0	-	0	19/26
97	**1600**	100	60	1500	40	20	34	30	3	-	0	20/43
02	**1640**	-	180	1460	-	-	55	28	0	-	0	23/52
07	**1700**	20	-	1560	140	-	38	55	8	2	5	20/41
Rosa woodsii												
83	**3732**	-	3466	266	-	-	0	0	0	-	18	30/10
97	**840**	20	280	540	20	-	0	0	2	-	5	11/12
02	**700**	-	120	580	-	-	0	0	0	-	0	14/15
07	**1180**	-	-	1180	-	-	0	0	0	-	0	8/8

		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)
Symphoricarpos oreophilus												
83	**6066**	-	933	5133	-	-	14	0	0	-	3	19/17
97	**4380**	60	560	3800	20	-	0	.45	0	.45	.45	15/23
02	**5420**	-	700	4640	80	-	1	0	1	-	0	14/20
07	**4280**	-	460	3820	-	-	.46	0	0	-	0	15/23