

Trend Study 17-39-07

Study site name: Little Diamond Fork.

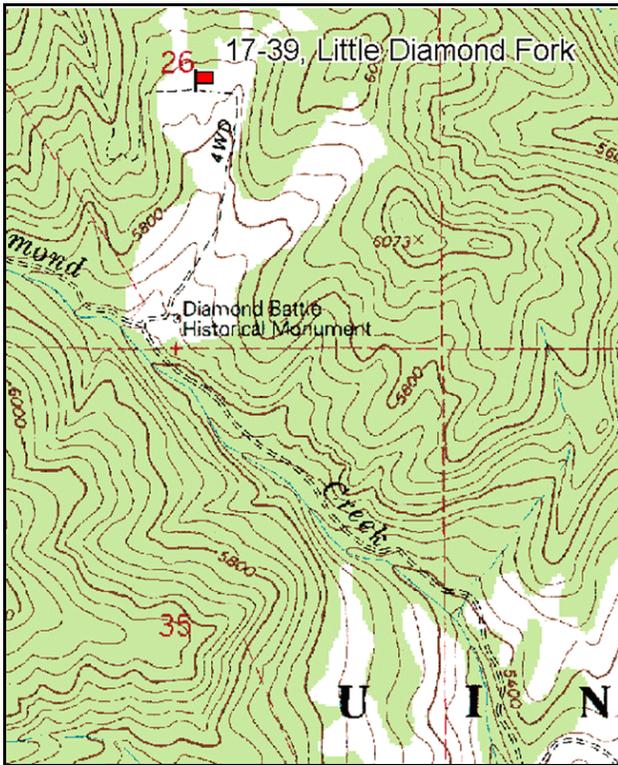
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 154 degrees magnetic (line 2-4 @ 201°M).

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

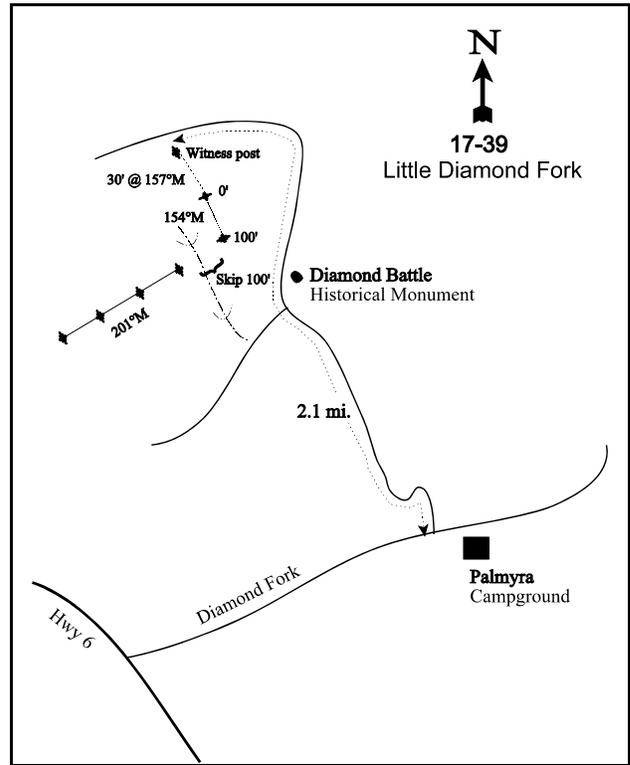
LOCATION DESCRIPTION

From the intersection of Highway 6 and Diamond Fork Canyon proceed northeasterly up Diamond Fork to Palmyra Campground. From Palmyra Campground take the road to the northwest 2.10 miles up Little Diamond Creek to a distinct sagebrush-grass plateau, and a witness post. From the witness post road, walk 30 feet at 157 degrees magnetic to the 0-foot baseline stake. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3923, is attached to the 0-foot baseline stake.



Map Name: Billies Mountain

Township 9S , Range 4E, Section 26



Diagrammatic Sketch

GPS: NAD 83, UTM 12T 461515 E 4437712 N

DISCUSSION

Little Diamond Fork - Trend Study No. 17-39

Study Information

This study samples an important deer and elk winter range located approximately 0.5 miles (0.8 km) north of the Diamond Battle Historical Monument in Little Diamond Creek drainage. This was part of the Forest Service's 1,500 acre (607 ha) Lower Diamond Revegetation Project [elevation: 5,850 feet (1,785 m), slope: 5-10%, aspect: south]. The study was chained and aurally seeded with four perennial grass species in 1969. The nearest source of perennial water is Little Diamond Creek, located 0.5 miles (0.8 km) to the south. Since the study was established in 1983, the principal foragers have been cattle. The cattle grazing period has varied from early summer to early fall. Deer and elk use have been relatively lighter and occur in the fall and winter. From the pellet group transect, there were 29 deer days use/acre (73 ddu/ha) in 2002 and 15 deer days use/acre (38 ddu/ha) in 2007. Elk use was estimated at 16 days use/acre (40 edu/ha) in 2002, which decreased to 1 day use/acre (3 edu/ha) in 2007. Cattle use was estimated at 41 days use/acre (101 cdu/ha) in 2002 and 40 days use/acre (99 cdu/ha) in 2007.

Soil

The soil has a sandy clay loam texture with a moderately acidic soil reaction (pH of 5.9). Since 1997, bare ground has comprised an average of 8% of the relative ground cover. The soil surface is hard and appears to have been compacted from grazing animals. Vegetation and litter have dominated the ground cover since 1997. The relative vegetation cover has steadily increased from 55% in 1997 to 71% in 2007. For the same period, relative litter cover has decreased from 35% to 21%. An ephemeral channel runs through the middle of the valley, cutting a 10-15 foot (3-5 m) deep gully through the sagebrush flat. There is no accelerated erosion apparent. Nearby gullies have become re-vegetated. The erosion condition was classified as stable in 2002 and 2007.

Browse

Mountain big sagebrush (*Artemisia tridentata* ssp. *tridentata*) is the dominant preferred browse species. Sagebrush canopy cover was 8% in 2002 and 13% in 2007. The density of sagebrush increased from 665 plants/acre (1,643 plants/ha) in 1983 to 1,520 plants/acre (3,756 plants/ha) in 2002, and decreased to 1,400 plants/acre (3,459 plants/ha) in 2007. Seedling plants were not sampled prior to 1997, and since then the density has ranged from 20 seedlings/acre (50 seedlings/ha) in 2002 to 220 seedlings/acre (545 seedlings/ha) in 2007. Young plants have comprised 0%-15% of the population. Decadence increased from 20% of the population in 1983 to a high of 57% in 1989, then decreased to 11% by 2007. Since 1997, the density of dead plants has decreased from 660 plants/acre (1,635 plants/ha) to 180 plants/acre (445 plants/ha). The proportion of plants with poor vigor has been low, except in 1997 when 25% of the plants were classified as dying. The average annual leader growth was approximately 2.5 inches (6.4 cm) in 2002 and 2007. Browse use has varied from light to light-moderate.

Other browse species that are present include Utah serviceberry (*Amelanchier utahensis*), white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*), broom snakeweed (*Gutierrezia sarothrae*), and Woods' rose (*Rosa woodsii*). Utah serviceberry and white rubber rabbitbrush are the only species with any browse use, and these species occur at a very low density.

Herbaceous Understory

The herbaceous understory is dominated by perennial grasses and forbs. Since 1997, perennial grass cover has increased from 39% to 55%. The most abundant species is bulbous bluegrass, which has comprised an average 71% of the grass cover since 1997. Bulbous bluegrass has a phenology that is similar to annual grasses (Stewart and Hull 1949), and may be limiting the establishment of other species. Three of the four species that were aurally seeded in 1969, intermediate wheatgrass (*Agropyron intermedium*), western

wheatgrass (*Agropyron smithii*), and smooth brome (*Bromus inermis*), have accounted for the majority of the remaining grass cover. The fourth seeded species, orchard grass (*Dactylis glomerata*), has never been sampled. Identification of the perennial grasses has been difficult when sampling was preceded by cattle grazing. The only annual species present is cheatgrass (*Bromus tectorum*), which was sampled for the first time in 2007 and had a quadrat frequency of 1%.

Since 1997, perennial forb cover has steadily decreased from 21% to 12%. The most abundant species have included Western aster (*Aster chilensis*), spreading fleabane (*Erigeron divergens*), and silvery lupine (*Lupinus argenteus*). Musk thistle (*Carduus nutans*) and houndstongue (*Cynoglossum officinale*), two noxious weed species, have also been sampled. Annual forb cover has been less than 1% since 1997. The composition of the forb species is indicative of the heavy cattle grazing.

1989 TREND ASSESSMENT

The browse trend is slightly up. Although the density of sagebrush increased 40%, other changes in the population countered the increase in density. For example, young plants decreased from 10% to 0%, and decadence increased from 20% to 57% of the population. Although there continued to be no plants that were classified as having poor vigor, the average crown height and crown width decreased by 8 inches (20 cm) and 16 inches (41 cm), respectively. Browse use shifted from light-moderate to light. The grass trend is up. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses increased 82%. The species composition appeared to have partially changed. In 1983, the only wheatgrass sampled was western wheatgrass. In 1989, intermediate wheatgrass was the only wheatgrass sampled. This change was probably the result of misidentification. There was also a significant decrease in the nested frequency of bulbous bluegrass. The forb trend is down. The sum of nested frequency of perennial forbs decreased 27%. There was a significant decrease in the nested frequency of silvery lupine, and American vetch (*Vicia americana*) quadrat frequency decreased from 23% to 0%. Additionally, houndstongue was sampled for the first time.

browse - slightly up (+1)

grass - up (+2)

forb - down (-2)

1997 TREND ASSESSMENT

The browse trend is slightly up. The density of sagebrush increased 28%. Some of the change in density was attributed to the larger area sampled in 1997, and trend was determined from other parameters. Seedling plants were sampled for the first time, and young plants increased to 15% of the population. The density of decadent plants remained stable, but since the overall density increased, decadence decreased to 43% of the population. The density of dead plants increased from 0 to 660 plants/acre (1,635 plants/ha), but since the density of decadent plants remained stable, it appeared that the increase in dead plants was a result of the larger sample area. Plants with poor vigor increased to 25% of the population, and all of those plants were classified as dying. Browse use on sagebrush remained light. The grass trend is down. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses decreased 35%. There were significant decreases in the nested frequencies of intermediate wheatgrass and Sandberg bluegrass, and significant increases in the nested frequencies of smooth brome and bulbous bluegrass. The forb trend is up. Excluding houndstongue, the sum of nested frequency of perennial forbs increased 88%. There were significant increases in the nested frequencies of bigflower agoseris (*Agoseris grandiflora*), spreading fleabane, silvery lupine, and yellow salsify (*Tragopogon dubius*). However, there were also significant, though smaller increases in the nested frequencies of wavyleaf thistle (*Cirsium undulatum*) and houndstongue. The Desirable Components Index (DCI) score was poor-fair due to the moderate preferred browse cover, high browse decadence, moderate browse recruitment, high perennial grass and forb cover, the absence of annual grasses, and the presence of one noxious weed species.

winter range condition (DCI) - poor-fair (48) Mid-level potential scale

browse - slightly up (+1)

grass - down (-2)

forb - up (+2)

2002 TREND ASSESSMENT

The browse trend is up. The density of sagebrush increased 27%. There was a decrease in the density of seedlings and young plants sampled, and young plants comprised 7% of the population. Decadence decreased to 16% of the population, and the density of dead plants decreased to 400 plants/acre (990 plants/ha). The proportion of plants exhibiting poor vigor/dying decreased to 3% of the population. Browse use on sagebrush remained light. The grass trend is stable. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses increased 2%. There was a significant increase in the nested frequency of smooth brome, and a significant decrease in that of Kentucky bluegrass (*Poa pratensis*). Bulbous bluegrass continues to be the dominant grass. The forb trend is down. Excluding noxious weeds, the sum of nested frequency of perennial forbs decreased 37%, much of which was due to significant decreases in the nested frequencies of spreading fleabane and silvery lupine. Houndstongue was not sampled, but musk thistle was sampled in 2 quadrats. The DCI score increased to fair due to an increase in preferred browse cover, a decrease in browse decadence, and an increase in perennial grass cover.

winter range condition (DCI) - fair (62) Mid-level potential scale
browse - up (+2) grass - stable (0) forb - down (-2)

2007 TREND ASSESSMENT

The browse trend is stable. The density of sagebrush decreased 8%. The densities of both seedling and young plants increased, and young plants comprised 13% of the population. Decadence decreased further to 11% of the population, and the density of dead plants decreased to 180 plants/acre (445 plants/ha). The proportion of plants exhibiting poor vigor increased to 6%, and all of these plants were classified as dying. Browse use remained light. The grass trend is down. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses decreased 27%. There was a significant decrease in the nested frequency of western wheatgrass, and three bluegrass species that had been sampled previously, were not this year. Bulbous bluegrass continued to dominate the understory. Additionally, cheatgrass was sampled for the first time, but only in one quadrat. The forb trend is slightly down. The sum of nested frequency of perennial forbs decreased 27%, which would normally correspond to a down trend. However, no noxious weeds were sampled. There was a significant decrease in the nested frequency of bigflower agoseris. The DCI score increased to good due to an increase in browse recruitment and perennial grass cover, and the absence of noxious weeds.

winter range condition (DCI) - good (71) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - slightly down (-1)

HERBACEOUS TRENDS --
 Management unit 17 , Study no: 39

T y p e	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
G	Agropyron intermedium	-	_b 267	_a 57	_a 64	_a 64	2.35	4.18	3.54
G	Agropyron sp.	-	-	7	-	-	.41	-	-
G	Agropyron smithii	_c 227	-	_b 105	_b 99	_a 31	.89	1.46	1.05
G	Bromus inermis	_a 3	_a 13	_b 89	_c 127	_c 151	5.55	8.04	12.58
G	Bromus tectorum (a)	-	-	-	-	2	-	-	.00
G	Poa bulbosa	_c 364	_a 240	_b 321	_{bc} 351	_c 369	28.03	34.79	37.54
G	Poa fendleriana	_a 2	_a 7	_a 2	_a 8	-	.00	.01	-

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
G	<i>Poa pratensis</i>	_b 49	_{ab} 25	_b 58	_a 15	-	.95	.22	-
G	<i>Poa secunda</i>	-	_b 189	_a 12	_a 25	-	.47	.30	-
G	<i>Stipa lettermani</i>	-	10	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	0	2	0	0	0.00
Total for Perennial Grasses		645	751	651	689	615	38.69	49.03	54.72
Total for Grasses		645	751	651	689	617	38.69	49.03	54.73
F	<i>Agoseris grandiflora</i>	_a 8	_a 3	_b 23	_b 22	_a 3	.24	.11	.00
F	<i>Antennaria rosea</i>	-	4	-	-	-	-	-	-
F	<i>Arabis</i> sp.	-	_a 1	_a 3	-	_a 3	.03	-	.00
F	<i>Artemisia ludoviciana</i>	-	-	_a 3	_a 8	_a 9	.85	.33	.59
F	<i>Aster chilensis</i>	_a 185	_a 198	_a 165	_a 160	_a 166	9.25	10.82	8.17
F	<i>Astragalus convallarius</i>	_a 9	_a 6	_a 15	_b 37	_{ab} 21	.75	.60	.58
F	<i>Astragalus</i> sp.	-	-	_a 1	_a 2	-	.00	.03	-
F	<i>Brodiaea douglasii</i>	2	-	-	-	-	-	-	-
F	<i>Carduus nutans</i> (a)	-	-	-	5	-	-	.38	-
F	<i>Cirsium undulatum</i>	_a 10	_a 4	_b 32	_a 12	-	.93	.26	-
F	<i>Collomia linearis</i> (a)	-	-	_a 10	_a 13	_a 9	.02	.03	.04
F	<i>Collinsia parviflora</i> (a)	-	-	_a 15	_a 5	_a 5	.02	.01	.01
F	<i>Crepis acuminata</i>	-	-	-	_a 1	_a 3	-	.00	.03
F	<i>Cynoglossum officinale</i>	-	_a 6	_b 24	-	-	.27	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	3	-	-	.00	-	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	_a 3	_a 14	_a 8	.01	.03	.02
F	<i>Erodium cicutarium</i> (a)	-	-	1	-	-	.00	-	-
F	<i>Erigeron divergens</i>	_b 49	_b 44	_c 143	_a 1	_a 16	2.08	.03	.41
F	<i>Eriogonum racemosum</i>	_a 7	_a 4	_a 3	-	-	.00	-	-
F	<i>Eriogonum umbellatum</i>	-	-	_a 4	_a 3	-	.03	.03	-
F	<i>Galium aparine</i> (a)	-	-	2	-	-	.00	-	-
F	<i>Gilia</i> sp. (a)	-	-	-	2	-	-	.00	-
F	<i>Holosteum umbellatum</i> (a)	-	-	-	3	-	-	.00	-
F	<i>Lactuca serriola</i>	-	-	_a 7	_a 3	_a 3	.07	.00	.01
F	<i>Lupinus argenteus</i>	_b 100	_a 42	_b 115	_a 61	_a 31	5.40	3.80	1.37
F	<i>Medicago sativa</i>	-	-	3	-	-	.00	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	-	1	-	-	.00	-
F	<i>Oenothera</i> sp.	-	-	_a 16	_a 20	-	.11	.13	-
F	<i>Polygonum douglasii</i> (a)	-	-	_b 42	_a 5	-	.12	.01	-
F	<i>Taraxacum officinale</i>	-	-	_b 27	_a 8	-	.27	.05	-

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
F	Tragopogon dubius	_{ab} 62	_a 41	_b 78	_{ab} 60	_a 37	.71	.51	.73
F	Unknown forb-annual (a)	-	-	1	-	-	.00	-	-
F	Unknown forb-perennial	-	2	-	-	-	-	-	-
F	Verbascum thapsus	_a 4	_a 2	-	_a 3	_a 2	-	.03	.00
F	Vicia americana	_b 50	-	_a 18	_a 23	_a 12	.16	.32	.07
F	Zigadenus paniculatus	_a 3	_a 1	_a 5	-	-	.03	-	-
Total for Annual Forbs		0	0	77	48	22	0.20	0.48	0.06
Total for Perennial Forbs		489	358	685	424	306	21.23	17.07	12.00
Total for Forbs		489	358	762	472	328	21.44	17.56	12.07

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

BROWSE TRENDS --

Management unit 17 , Study no: 39

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	Amelanchier utahensis	0	1	1	-	-	-
B	Artemisia tridentata vaseyana	48	45	46	6.21	8.78	8.55
B	Chrysothamnus nauseosus albicaulis	1	1	1	-	.03	.15
B	Chrysothamnus viscidiflorus viscidiflorus	2	2	2	.00	-	-
B	Gutierrezia sarothrae	15	19	13	.96	.49	.71
B	Opuntia sp.	3	4	2	-	.16	.03
B	Rosa woodsii	4	4	4	.15	.44	.56
Total for Browse		73	76	69	7.33	9.90	10.00

CANOPY COVER, LINE INTERCEPT --

Management unit 17 , Study no: 39

Species	Percent Cover	
	'02	'07
Amelanchier utahensis	-	.05
Artemisia tridentata vaseyana	8.16	13.38
Chrysothamnus nauseosus albicaulis	-	.31
Chrysothamnus viscidiflorus viscidiflorus	-	.03
Gutierrezia sarothrae	.93	.70
Opuntia sp.	.10	-
Rosa woodsii	-	.41

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17 , Study no: 39

Species	Average leader growth (in)	
	'02	'07
Artemisia tridentata vaseyana	2.5	2.6

BASIC COVER --

Management unit 17 , Study no: 39

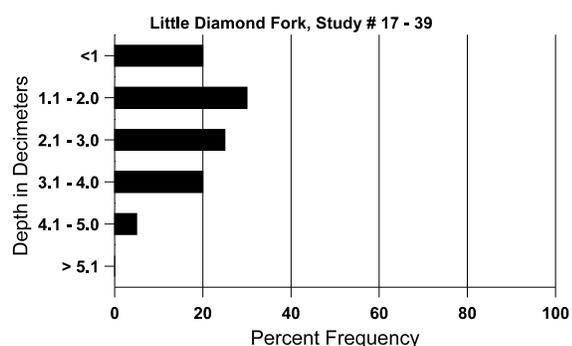
Cover Type	Average Cover %				
	'83	'89	'97	'02	'07
Vegetation	2.50	16.00	56.77	69.70	75.70
Rock	0	.25	.25	.50	.39
Pavement	0	.75	.84	1.20	.26
Litter	82.50	66.50	36.25	37.31	22.00
Cryptogams	.25	.25	.78	.22	.33
Bare Ground	14.75	16.25	8.65	11.30	7.35

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 39, Little Diamond Fork

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy clay loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
14.8	51.0 (16.2)	5.9	55.4	24.7	19.8	2.4	25.7	579.2	.4

Stoniness Index



PELLET GROUP DATA --

Management unit 17 , Study no: 39

Type	Quadrat Frequency		
	'97	'02	'07
Sheep	-	1	-
Rabbit	-	-	1
Elk	3	-	2
Deer	3	12	3
Cattle	2	14	12

Days use per acre (ha)	
'02	'07
-	-
-	-
16 (40)	1 (3)
29 (73)	15 (38)
41 (100)	40 (99)

BROWSE CHARACTERISTICS --

Management unit 17 , Study no: 39

		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 utahensis												
83	0	-	-	-	-	-	0	0	-	-	0	-/-
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	22/27
02	20	-	-	20	-	-	100	0	-	-	0	24/23
07	40	-	-	40	-	-	100	0	-	-	0	24/22
Artemisia tridentata vaseyana												
83	665	-	66	466	133	-	60	0	20	-	0	30/41
89	933	-	-	400	533	-	21	0	57	-	0	22/25
97	1200	80	180	500	520	660	7	0	43	25	25	25/37
02	1520	20	100	1180	240	400	18	0	16	3	3	22/32
07	1400	220	180	1060	160	180	10	3	11	6	6	29/41

		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)
Chrysothamnus nauseosus albicaulis												
83	0	-	-	-	-	-	0	0	-	-	0	-/-
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	20	-	-	20	-	-	100	0	-	-	0	42/59
02	20	-	-	20	-	-	0	100	-	-	0	26/36
07	20	-	-	20	-	-	0	0	-	-	0	21/33
Chrysothamnus viscidiflorus viscidiflorus												
83	0	-	-	-	-	-	0	0	-	-	0	-/-
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	60	-	-	60	-	-	0	0	-	-	0	12/14
02	60	-	-	60	-	-	0	0	-	-	0	15/26
07	60	-	-	60	-	-	0	0	-	-	0	15/19
Gutierrezia sarothrae												
83	1399	-	1133	266	-	-	0	0	0	-	0	11/13
89	3066	-	133	2600	333	-	0	0	11	-	0	10/7
97	1580	180	500	1080	-	-	0	0	0	-	0	10/11
02	1820	-	-	1800	20	-	0	0	1	-	0	8/11
07	900	-	20	860	20	-	0	0	2	2	2	8/8
Opuntia sp.												
83	466	-	-	466	-	-	0	0	0	-	0	7/16
89	600	200	400	200	-	-	0	0	0	-	0	7/23
97	440	-	-	440	-	-	0	0	0	-	0	7/13
02	300	-	-	40	260	-	0	0	87	80	80	6/19
07	40	-	-	40	-	-	0	0	0	-	0	7/21
Quercus gambelii												
83	0	-	-	-	-	-	0	0	-	-	0	-/-
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
02	0	-	-	-	-	-	0	0	-	-	0	37/14
07	0	-	-	-	-	-	0	0	-	-	0	55/44
Rosa woodsii												
83	0	-	-	-	-	-	0	0	-	-	0	-/-
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	280	20	260	20	-	-	0	0	-	-	0	23/21
02	280	-	-	280	-	-	0	0	-	-	0	9/14
07	420	-	220	200	-	-	0	0	-	-	0	11/9

		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)
<i>Symphoricarpos oreophilus</i>												
83	0	-	-	-	-	-	0	0	-	-	0	-/-
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
02	0	-	-	-	-	-	0	0	-	-	0	18/19
07	0	-	-	-	-	-	0	0	-	-	0	-/-