Trend Study 14-19-04

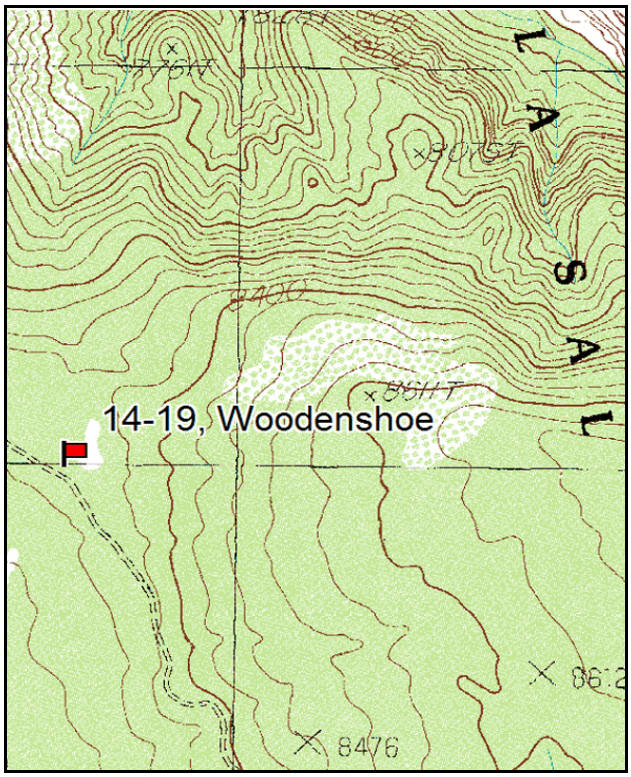
Study site name: Woodenshoe . Vegetation type: Logged Ponderosa Pine .

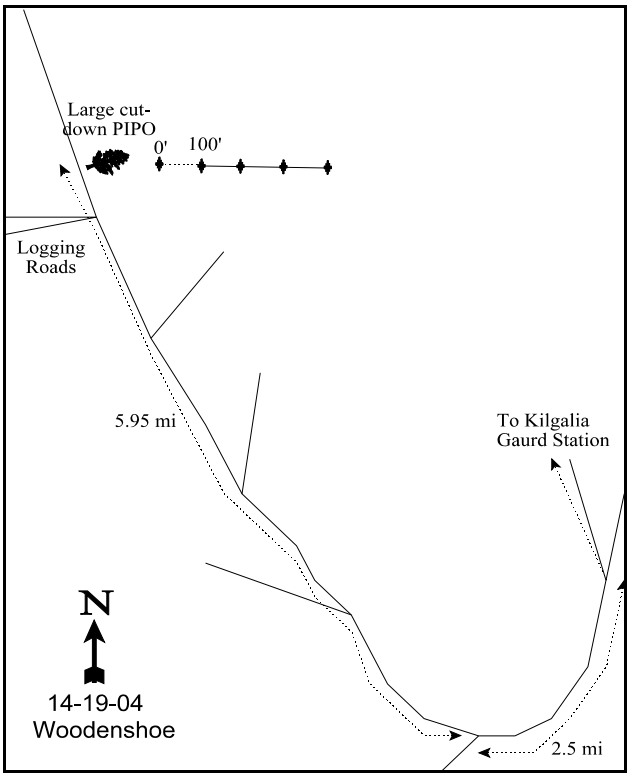
Compass bearing: frequency baseline 64 degrees magnetic.

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

LOCATION DESCRIPTION

From the Kigalia Guard Station turnoff, go 2.5 miles southwest towards the Bears Ears. Turn right at the fork and proceed 2.05 miles to fork located just west of a cattleguard and opposite a corral. Turn right, and go north 1.05 mile to another fork (County Road #271a). Turn left toward Woodenshoe Point and go 1.35 miles to a fork. Stay left and continue 1.45 miles. At this point there are two overgrown, impassable logging roads taking off to the left. Go 0.05 miles (about 210 feet) past the logging roads to a moderately large, cut-down ponderosa on the right and a small clump of tall oak on the left. The transect starting point is about 10 feet east of the pine. The baseline is marked by the 1981 line-intercept red and green steel fence posts 16 inches tall. The 0-foot stake has browse tag #482 attached.





Map Name: Woodenshoe Butte

Diagrammatic Sketch

Township 35S , Range 18E , Section 34

GPS: NAD 27, UTM 12S 4171977 N, 595609 E

DISCUSSION

Woodenshoe - Trend Study No. 14-19

The Woodenshoe summer range study is located on a plateau on the southwest portion of Elk Ridge. The study elevation is 8,400 feet, located in the middle of the gently sloping, southwest-facing plateau. The plateau drains west into the steep slickrock of Woodenshoe Canyon. This area was burned in the summer of 2003 by a wildfire caused by a campfire. Prior to burning the vegetation was dense and dominated mainly by Ponderosa pine, Gambel oak, snowberry, sagebrush, and various perennial grasses. The area appears to be drier than the other summer range studies, which explains the lack of aspen. The trend study was established in 1986, at the same location as an old line intercept study. The 1986 trend study baseline sampled only a 100 ft baseline, mainly under Ponderosa pine. In 1992, the baseline was lengthened to better sample the area. The longer baseline samples some open meadow areas along with the Ponderosa pine forest. There has been selective removal of ponderosa pines, but no large scale logging has taken place on the site.

Like Kigalia Point, this study is on the Twin Springs allotment and is managed for summer grazing under a rest-rotation system by the Manti-LaSal National Forest. The numerous roads traversing the plateau facilitate logging, grazing management, and easy access to mining claims. There has been geophysical exploration, heavy uranium drilling, and oil-gas leasing in the general area. In addition to these uses, the area receives moderate summer deer use and also some elk use in late fall and early winter. Pellet group data from 1999 estimated 7 deer days use/acre (17 ddu/ha), 3 elk days use/acre (7 edu/ha), and 26 cow days use/acre (64 cdu/ha). Cows and deer were observed near the site in 1999. In 2004, 12 deer days use/acre (31 ddu/ha), 7 elk days use/acre (17 edu/ha), and 26 cow days use/acre (64 cdu/ha) were estimated. Most cow pats sampled were older, but there was evidence of cow use during the summer of 2004.

The soil is moderately deep but rocky. Effective rooting depth is estimated at nearly 19 inches. Texture is a loam with a slightly acid pH (6.5). Phosphorus is low at just 7.6 ppm. Values below 10 ppm may effect plant growth and development. Parent material of the soil is granite, with bedrock near the surface in some places. Stoniness measurements show that the majority of the rock occurs in the top 8 inches of soil profile. There is little rock or pavement on the surface due to the high amounts of vegetation and litter cover. Erosion on the site is minimal and localized. After the fire bare ground was higher, but ground cover was still good and the site was rated as stable for erosion.

The fire burned mostly as an understory fire, although a few Ponderosa pines did completely burn. Ponderosa pine was the dominant tree species. Many trees are large (75-100 ft.) and they visually dominate the area. Overhead ponderosa cover was estimated at 21% in 1999. This was reduced to 6% in 2004. Gambel oak density was reduced from 3,580 plants/acre in 1999 to 1,460 plants/acre in 2004. Cover decreased from 6 to 2% after the fire. Mountain big sagebrush density was reduced by 64% by the fire down to 540 plants/acre. However, 48% of the population was young. Prior to the fire, density was relatively stable. Decadence was high in 1986, but has declined with each reading. Use has been light to moderate on all readings. Other palatable shrubs are less common, but includes some chokecherry, bitterbrush, and ceanothus. Observed use is generally light except for bitterbrush which has displayed moderate to heavy use since 1986. Bitterbrush density was reduced by 80% to only 40 plants/acre after the fire.

Although overall density is rather low and restricted by the tree and shrub overstory, the herbaceous understory has been rather diverse. The small openings in the overstory support a good, dry meadow-like stand of grasses. Common species are mutton bluegrass, Kentucky bluegrass, bottlebrush squirreltail, Letterman needlegrass, and sedge. Kentucky bluegrass was more common in the openings, but declined significantly in 2004 as it is not as drought tolerant as the other species. In 1999, it made up 70% of the total grass cover, but was down to only 20% in 2004. Several species of productive, palatable forbs are also found. Utilization of forbs is light. More notable species include trailing fleabane, thickleaf peavine, Rocky

Mountain penstemon, redroot eriogonum, and silky lupine. Nested frequency of grasses and forbs was lower in 2004, probably due to the fire. It is expected that grasses and forbs should flourish with the reduced competition from woody species, after they have recovered from the fire.

1986 TREND ASSESSMENT

No significant changes or trends were demonstrated by data from either the old line intercept transect data or observations from the frequency-density study. The parameters studied show consistency between years especially in terms of species composition and age structure of the population. Most data indicate an increase in the density and production of the major browse species. There also is evidence of an increase in total production, but this parameter is related more to seasonal precipitation and sampling techniques than actual trends. Overall, the vegetative community appears to be in a stable and healthy condition, supporting a variety of plants and wildlife species. The soil trend is also stable to possibly even improving with continued addition of litter forming a deep organic matter layer.

1992 TREND ASSESSMENT

With the examination of photographs and basic cover data, soil trend would be considered stable at this time for this site. But, there have been some obvious problems in the past from grazing and/or logging, for there is a large active gully near the last 100 foot frequency belt line of the vegetative transect. Even though litter cover decreased and relative percent cover of bare ground increased, all this would be expected with the drought since 1985. These parameters should improve with better seasonal precipitation patterns of which 1992 had been the best since 1985. The browse trend would involve condition and trend for the most abundant and preferred species which would include: mountain big sagebrush, bitterbrush, Gambel's oak, and snowberry. Bitterbrush and Gambel's oak were the only species that exhibited increases in their densities. It should be noted again that the sampling design is much larger now and species that occur clumped and/or aggregated would be sampled more accurately with better estimates of their respective densities. Snowberry's population decreased by 71%, but the proportion of the population that were classified as having poor vigor have declined from 28% in 1986 to only 3% in 1992. This is indicative of drought which has had a thinning effect on this rhizomatous population. Mountain big sagebrush population is now estimated to be 1,660 plants/acre in 1992. Percent decadence has improved from a high of 63% in 1986 down to 30% in 1992, indicating improvements in it's population. Browse trend for Wooden Shoe area is considered stable for this high elevation site. Trend is up for the herbaceous understory. Both the grasses and forbs have increased nested frequency values and the number of species has also increased for grasses and forbs from 5 to 12 and 14 to 26 respectively. The increase in moisture in 1992 probably had much to do with this improvement in nested frequency values and improved species diversity.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - up (5)

1999 TREND ASSESSMENT

Trend for soil is considered stable. Relative percent cover of litter and bare ground have remained similar since 1992. Trend for browse is stable for the key species, mountain big sagebrush, Gambel oak, and snowberry. Density of sagebrush has declined slightly due to a loss of decadent plants. There is now more mature plants and percent decadence has declined from 30% to 8%. Densities of Gambel oak and snowberry have declined slightly, but some of the difference is due to the change in sample size combined with the difficulty in counting these rhizomatous shrubs. Cover values for these two species are similar to 1992 estimates. Trend for the herbaceous understory is down slightly. Most perennial grass species declined in

nested frequency except Kentucky bluegrass which increased significantly and currently provides 70% of the grass cover. Sum of nested frequency for grasses declined overall. Total grass cover also declined from nearly 15% in 1992 to 10% in 1999. Sum of nested frequency and cover of perennial forbs remained similar to 1992 estimates.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - slightly down (2)

2004 TREND ASSESSMENT

The trend for soil is down due to fire. The ratio of bare soil to protective ground cover (vegetation, litter, and cryptogams) declined from 1:5.2 to 1:3.0. Relative bare ground cover increased from 10% to 21%, but erosion is not considered a problem at this time. As understory species recover from the fire soil conditions should improve. The browse trend is down as all species have declined in density and cover. Sprouting species like Gambel oak and snowberry should recover quickly. Sagebrush and bitterbrush will take longer to become reestablished from seed, but many young and seedling sagebrush were sampled in 2004. The reduction of Ponderosa pine cover should be beneficial to understory and lower shrub species. The herbaceous understory trend is down. The sum of nested frequency for both grasses and forbs is a one-third lower than it was in 1999. Cover is down 40% for grasses. The fire should benefit the herbaceous understory once it has recovered from the initial disturbance.

TREND ASSESSMENT
soil - down (1)
browse - down (1)
herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 14 , Study no: 19

Type	Species	Nested Frequency				Average Cover %		
		'86	'92	'99	'04	'92	'99	'04
G	Agropyron trachycaulum	$_{a}$-	$_{b}$29	$_{b}$43	$_{a}$-	.41	.55	-
G	Bouteloua gracilis	-	7	-	-	.06	-	-
G	Bromus anomalus	5	12	16	11	.29	.13	.34
G	Carex spp.	44	32	23	38	2.24	.93	2.08
G	Koeleria cristata	-	2	-	-	.03	-	-
G	Muhlenbergia montana	-	8	7	6	.45	.06	.03
G	Poa fendleriana	$_{bc}$54	$_{c}$99	$_{ab}$36	$_{a}$7	1.75	.70	.05
G	Poa pratensis	$_{a}$-	$_{b}$82	$_{c}$126	$_{b}$58	3.87	7.08	1.25
G	Sitanion hystrix	$_{bc}$63	$_{c}$92	$_{a}$10	$_{ab}$30	3.43	.18	1.17
G	Stipa columbiana	$_{a}$-	$_{b}$22	$_{ab}$9	$_{ab}$6	.73	.12	.10
G	Stipa comata	$_{b}$30	$_{ab}$12	$_{a}$8	$_{a}$1	.39	.07	.03
G	Stipa lettermani	$_{a}$-	$_{c}$40	$_{b}$8	$_{c}$33	1.21	.27	1.03

Type	Species	Nested Frequency				Average Cover %		
		'86	'92	'99	'04	'92	'99	'04
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		196	437	286	190	14.90	10.13	6.11
Total for Grasses		196	437	286	190	14.90	10.13	6.11
F	Achillea millefolium	26	32	40	23	.89	1.39	.81
F	Agoseris glauca	$_{a}$-	$_{a}$-	$_{ab}$6	$_{b}$11	-	.02	.08
F	Arenaria congesta	1	3	6	3	.03	.12	.15
F	Artemisia ludoviciana	8	-	-	-	-	-	-
F	Aster chilensis	$_{a}$-	$_{ab}$5	$_{b}$14	$_{ab}$3	.06	.06	.03
F	Astragalus spp.	-	-	-	4	-	-	.03
F	Castilleja linariaefolia	$_{b}$25	$_{a}$2	$_{a}$-	$_{a}$-	.00	-	-
F	Calochortus nuttallii	-	-	3	-	-	.00	-
F	Chenopodium spp. (a)	-	5	-	2	.01	-	.00
F	Collomia linearis (a)	-	-	-	2	-	-	.01
F	Comandra pallida	2	-	1	-	-	.00	-
F	Collinsia parviflora (a)	-	-	3	130	-	.01	2.06
F	Crepis acuminata	-	-	-	4	-	-	.03
F	Delphinium nuttallianum	-	-	-	3	-	-	.00
F	Epilobium brachycarpum (a)	-	8	-	-	.04	-	-
F	Erigeron divergens	$_{a}$10	$_{b}$23	$_{a}$1	$_{a}$-	.30	.00	-
F	Erigeron eatonii	-	3	-	3	.03	-	.03
F	Erigeron flagellaris	$_{ab}$57	$_{b}$92	$_{b}$94	$_{a}$52	2.71	2.15	1.78
F	Eriogonum racemosum	$_{b}$21	$_{a}$5	$_{ab}$14	$_{a}$6	.05	.08	.07
F	Gayophytum ramosissimum(a)	-	$_{a}$-	$_{a}$-	$_{b}$12	-	-	.45
F	Heterotheca villosa	-	3	-	-	.63	-	-
F	Ipomopsis aggregata	-	4	4	3	.03	.04	.00
F	Lathyrus lanszwertii	$_{b}$77	$_{b}$49	$_{b}$58	$_{a}$18	.93	1.61	.38
F	Lappula occidentalis (a)	-	-	-	2	-	-	.03
F	Lupinus sericeus	28	13	31	17	.14	.91	2.14
F	Lychnis drummondii	-	-	-	-	-	-	.00
F	Microsteris gracilis (a)	-	$_{a}$3	$_{b}$35	$_{b}$30	.00	.18	.36
F	Navarretia intertexta (a)	-	$_{a}$-	$_{a}$-	$_{b}$14	-	-	.09
F	Oenothera spp.	-	2	-	-	.03	-	-
F	Penstemon strictus	$_{b}$35	$_{a}$16	$_{a}$5	$_{a}$6	.10	.07	.07
F	Phacelia spp.	-	4	-	-	.01	.03	-
F	Phlox longifolia	41	60	46	61	.43	.11	1.00
F	Polygonum douglasii (a)	-	$_{b}$74	$_{a}$18	$_{a}$37	.42	.04	.33

Type	Species	Nested Frequency				Average Cover %		
		'86	'92	'99	'04	'92	'99	'04
F	Senecio canus	$_{b}$28	$_{a}$4	$_{a}$7	$_{a}$9	.01	.01	.09
F	Senecio multilobatus	-	-	2	3	.00	.00	.00
F	Stellaria jamesiana	-	1	4	1	.03	.03	.03
F	Taraxacum officinale	$_{a}$-	$_{b}$26	$_{b}$27	$_{a}$-	.49	.29	-
F	Tragopogon dubius	-	8	3	4	.20	.03	.03
F	Unknown forb-annual (a)	-	8	-	-	.07	-	-
F	Unknown forb-perennial	$_{ab}$2	$_{b}$12	$_{a}$-	$_{a}$-	.02	-	-
Total for Annual Forbs		0	98	56	229	0.55	0.23	3.36
Total for Perennial Forbs		361	367	366	234	7.18	7.00	6.79
Total for Forbs		361	465	422	463	7.73	7.24	10.15

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

BROWSE TRENDS --
Management unit 14 , Study no: 19

Type	Species	Strip Frequency			Average Cover %		
		'92	'99	'04	'92	'99	'04
B	Artemisia tridentata vaseyana	44	41	11	3.44	2.59	.71
B	Chrysothamnus depressus	1	1	0	-	-	-
B	Mahonia repens	30	29	27	.71	1.04	1.23
B	Pinus ponderosa	8	8	7	19.45	1.32	1.48
B	Prunus virginiana	1	0	1	-	-	-
B	Purshia tridentata	8	9	2	.97	.21	.06
B	Quercus gambelii	36	37	26	5.79	6.10	1.96
B	Rosa woodsii	2	1	0	.00	-	-
B	Symphoricarpos oreophilus	58	53	38	12.09	11.84	4.14
Total for Browse		188	179	112	42.47	23.13	9.60

CANOPY COVER, LINE INTERCEPT --
Management unit 14 , Study no: 19

Species	Percent Cover	
	'99	'04
Artemisia tridentata vaseyana	-	1.48
Mahonia repens	-	.60
Pinus ponderosa	21.39	5.84
Purshia tridentata	-	.06
Quercus gambelii	3.00	1.04
Symphoricarpos oreophilus	-	5.46

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 14 , Study no: 19

Species	Average leader growth (in)
	'04
Artemisia tridentata vaseyana	2.7
Purshia tridentata	3.3

POINT-QUARTER TREE DATA --
Management unit 14 , Study no: 19

Species	Trees per Acre	
	'99	'04
Pinus ponderosa	52	-
Quercus gambelii	100	-

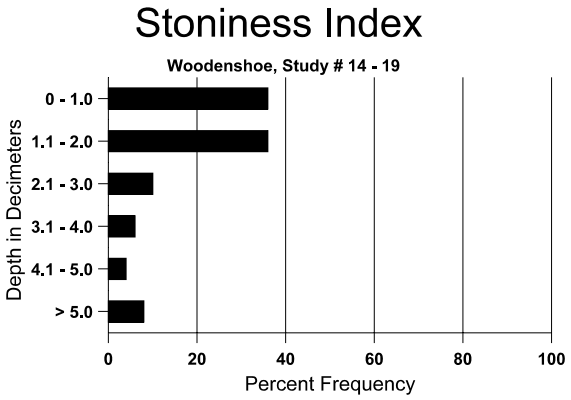
Average diameter (in)	
'99	'04
12.8	-
2.7	-

BASIC COVER --
Management unit 14 , Study no: 19

Cover Type	Average Cover %			
	'86	'92	'99	'04
Vegetation	8.75	54.92	40.18	27.22
Rock	3.50	2.12	1.31	2.61
Pavement	0	0	.16	.18
Litter	79.25	61.79	62.31	54.27
Cryptogams	0	.92	.07	1.48
Bare Ground	8.50	14.34	11.56	23.31

SOIL ANALYSIS DATA --
Management unit 14, Study no: 19, Study Name: Woodenshoe

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
18.9	50.3 (15.7)	6.5	48.4	31.1	20.6	3.8	7.6	204.8	0.4



PELLET GROUP DATA --
Management unit 14 , Study no: 19

Type	Quadrat Frequency		
	'92	'99	'04
Rabbit	11	3	2
Grouse	4	-	-
Elk	4	1	-
Deer	11	8	4
Cattle	4	8	3

Days use per acre (ha)	
'99	'04
-	-
-	-
3 (7)	7 (17)
7 (17)	13 (31)
26 (65)	26 (65)

BROWSE CHARACTERISTICS --
Management unit 14 , Study no: 19

		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)
Artemisia tridentata vaseyana												
86	**1998**	266	66	666	1266	-	33	7	63	5	20	26/18
92	**1660**	460	640	520	500	-	17	2	30	1	7	-/-
99	**1500**	80	460	920	120	240	15	3	8	1	1	25/35
04	**540**	60	260	260	20	140	41	0	4	4	4	16/23

		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)
Ceanothus fendleri												
86	**132**	-	66	66	-	-	0	0	-	-	0	7/20
92	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus depressus												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**20**	-	-	20	-	-	0	0	-	-	0	-/-
99	**20**	-	-	20	-	-	0	100	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Mahonia repens												
86	**4599**	266	133	4466	-	-	0	0	-	-	0	6/6
92	**4600**	120	2560	2040	-	-	2	0	-	-	0	-/-
99	**3640**	80	1120	2520	-	-	0	0	-	-	0	4/8
04	**2380**	-	680	1700	-	-	0	0	-	-	0	4/6
Pinus edulis												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**0**	20	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Pinus ponderosa												
86	**133**	-	133	-	-	-	0	0	0	-	0	-/-
92	**180**	60	40	140	-	-	0	0	0	-	0	-/-
99	**160**	-	20	140	-	-	0	0	0	-	0	-/-
04	**160**	-	-	120	40	-	0	0	25	-	13	-/-
Populus tremuloides												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**0**	20	-	-	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Prunus virginiana												
86	**200**	-	200	-	-	-	0	0	-	-	0	-/-
92	**40**	-	-	40	-	-	0	0	-	-	0	-/-
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**40**	-	20	20	-	-	0	0	-	-	0	25/13

		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)
Purshia tridentata												
86	**66**	-	-	66	-	-	100	0	0	-	0	19/13
92	**200**	-	120	60	20	-	50	30	10	-	0	-/-
99	**200**	-	20	140	40	-	70	20	20	10	10	11/23
04	**40**	-	20	20	-	-	0	50	0	-	0	6/13
Quercus gambelii												
86	**2666**	2733	2000	666	-	-	3	0	0	-	0	77/44
92	**4000**	9420	3060	840	100	-	22	.50	3	-	.50	-/-
99	**3580**	1220	2600	900	80	160	.55	0	2	1	1	49/44
04	**1460**	20	1160	300	-	-	3	0	0	-	0	20/14
Rosa woodsii												
86	**533**	-	333	200	-	-	0	0	-	-	13	24/17
92	**80**	-	80	-	-	-	0	0	-	-	0	-/-
99	**40**	-	-	40	-	-	0	0	-	-	0	11/15
04	**0**	-	-	-	-	-	0	0	-	-	0	13/7
Symphoricarpos oreophilus												
86	**15066**	2400	6000	9066	-	-	4	0	0	-	29	26/16
92	**4320**	460	1360	2860	100	-	13	2	2	-	3	-/-
99	**3280**	240	1180	2100	-	40	0	0	0	-	0	31/50
04	**2400**	-	840	1560	-	-	3	7	0	-	0	16/30