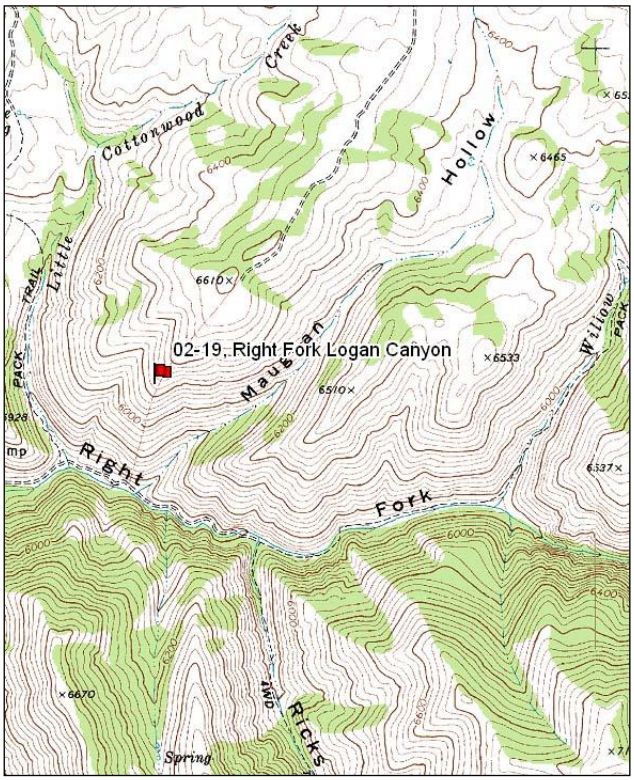
RIGHT FORK LOGAN CANYON - TREND STUDY NO. 2-19-11

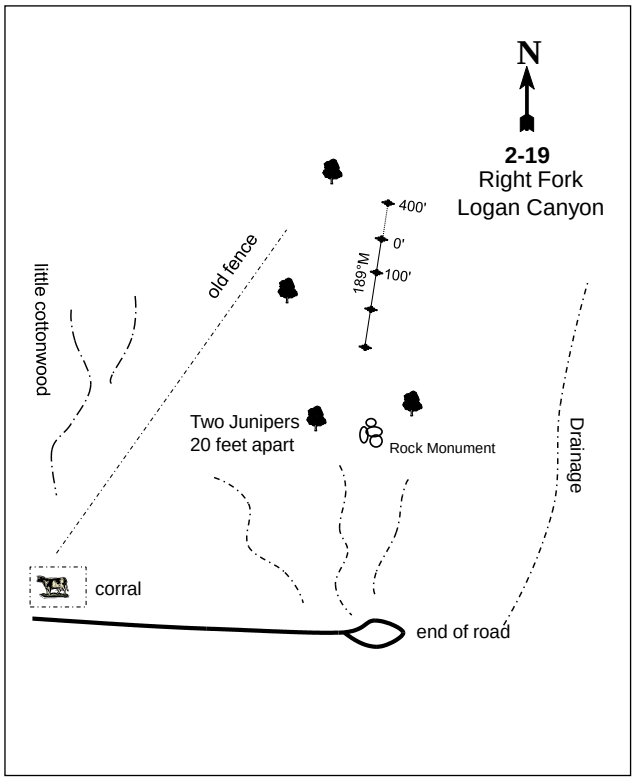
Vegetation Type: Bitterbrush
Range Type: Crucial Deer Winter, Crucial Elk Winter
NRCS Ecological Site Description: Not Available
Land Ownership: USFS
Elevation: 6,200 ft (1,890 m)
Aspect: South
Slope: 35%
Transect bearing: 189° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Rebar: belt 1 on 8ft, belt 3 on 1ft, belt 5 on 8ft.

Directions:
Drive up the Right Fork of Logan Canyon. Bear left at the girls' camp. Go 0.6 miles to the end of the road just past the corral. Hike up the ridge to the north, going about 3/4 mile towards the ridgeline. Look for a rock monument between two junipers that are 20 feet apart. The hike from the bottom to the study is about 600 feet in elevation gain. The baseline runs 189 degrees magnetic. Lines 2 and 3 continue south from the 100 foot baseline. Line 4 runs off the 0-foot baseline stake at 9 degrees magnetic.

Map Name: Temple Peak



Diagrammatic Sketch:



Township: 12N Range: 3E Section: 16

GPS: NAD 83, UTM 12S 449531 E 4625350 N

RIGHT FORK LOGAN CANYON - TREND STUDY NO. 2-19

Site Information

Site Description: This study was established in 1990 and samples important elk and deer winter range that extends from Cowley to Willow Canyon. The land is administered by the United States Forest Service (USFS). Pellet group data suggests this area serves as important elk winter range. Elk pellet groups were common in 1996, and elk pellet groups have been sampled in high abundance since 2001. Deer pellet groups have been sampled in low abundance since 2001. Sampled cattle sign has been low since 2001 (Table - Pellet Group Data). Cattle graze in the Little Cottonwood drainage for part of the summer and typically stay off of the higher, steeper slopes where the study is located. It has been noted that cattle have been seen in the area during every sample year.

Browse: The dominant and key browse species within the browse community is antelope bitterbrush (*Purshia tridentata*). The bitterbrush population is moderately dense. Since the outset of the study, utilization within the bitterbrush population has been heavy. Due to heavy use, the bitterbrush plants on the site display a clubbed growth form with some armoring taking place. The bitterbrush population has maintained vigorous health and decadence has fluctuated within the population, but has generally been moderate to high over the sample years. The recruitment of young bitterbrush plants to the population has been minimal during all readings. Other key browse species include Saskatoon serviceberry (*Amelanchier alnifolia*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), which offer additional preferred forage, but occur in small numbers. Serviceberry has displayed moderate and occasional heavy use since 1990. The serviceberry is a mature population, with a moderate amount of recruitment. Mountain big sagebrush use has been light to moderate over the duration of the study (Table - Browse Characteristics).

Herbaceous Understory: The area supports a vigorous stand of bluebunch wheatgrass (*Agropyron spicatum*), but the weedy species bulbous bluegrass (*Poa bulbosa*) is the most abundant species and provides the majority of the vegetation cover on the study site. The annual grasses cheatgrass (*Bromus tectorum*) and rattlesnake brome (*B. brizaeformis*) are also present, but are not abundant. Forbs are diverse and moderately productive with an average of approximately 10% cover of perennials since 1996. Perennial forbs are primarily early season species, yet are numerous enough to provide some spring forage. Spring parsley (*Cymopterus spp.*) is the most abundant perennial forb and provides the most forb cover. Arrowleaf balsamroot (*Balsamorhiza sagittata*) and tapertip hawksbeard (*Crepis acuminata*) are also moderately abundant. The noxious weed Dyer's woad (*Isatis tinctoria*) is also present, but occurs in very low abundance (Table - Herbaceous Trends).

Soil: Natural Resources Conservation Service (NRCS) soil data was not available for this site. The soil texture is a clay loam with slightly alkaline soil reactivity (pH 7.6). Erosion potential is high due to the steep slopes on the site. Bare ground cover was high in 1990 to 2006, but was low in 2011. Rock, pavement, vegetation, and litter have provided adequate protective ground cover. In 2001, there was evidence of some soil movement and pedestaling; therefore, the soil erosion condition was classified as slight, but was stable in 2006 and 2011.

Trend Assessments

Browse:

- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence within the antelope bitterbrush population decreased from 72% to 19%. Poor vigor also decreased from 14% to 0% of the population. Mountain big sagebrush did not appear in the smaller sample in 1990, but was observed in the larger sample plot in 1996. Decadence and poor vigor within the sagebrush population were estimated to affect 13% of the sagebrush population.

- **1996 to 2001 - stable (0):** The density for bitterbrush increased 19% from 320 plants/acre to 380 plants/acre. Decadence was observed within 11% of the bitterbrush population, but poor vigor was not observed. The density for mountain big sagebrush decreased 13% from 160 plants/acre to 140 plants/acre. Decadence and poor vigor was not observed within the population.
- **2001 to 2006 - down (-2):** The density for bitterbrush decreased 42% to 220 plants/acre. Decadence and poor vigor affected 9% of the bitterbrush population. The density for sagebrush decreased 57% to 60 plants/acre. Decadence and poor vigor was not observed within the sagebrush population.
- **2006 to 2011 - slightly up (+1):** The density for bitterbrush increased 27% to 280 plants/acre. Decadence in bitterbrush increased to 9%. Poor vigor increased to 14% of the bitterbrush population. The density for sagebrush did not change; however, decadence and poor vigor both increased to 33% of the population.

Grass:

- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 22%. The preferred perennial species bluebunch wheatgrass increased significantly in nested frequency and had a cover of 11%, but Sandberg bluegrass (*Poa secunda*) decreased significantly in nested frequency. The nested frequency for the weedy species bulbous bluegrass increased significantly, and had a cover of 18%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial grasses remained similar. All perennial grass species maintained stable populations. The weedy species cheatgrass decreased significantly in nested frequency, though cover remained similar at 1%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses decreased 13%. Bulbous bluegrass decreased significantly in nested frequency, though cover increased from 15% to 18%. Annual grasses remained similar in nested frequency and cover.
- **2006 to 2011 - down (-2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 23%. Sandberg bluegrass decreased significantly. The weedy perennial species bulbous bluegrass maintained dominance within the perennial community, and cover increased to 21%. Since the outset of the study in 1990, the sum of nested frequency of perennial grasses excluding bulbous bluegrass has decreased 49%, and cover has decreased from 11% to 5%.

Forb:

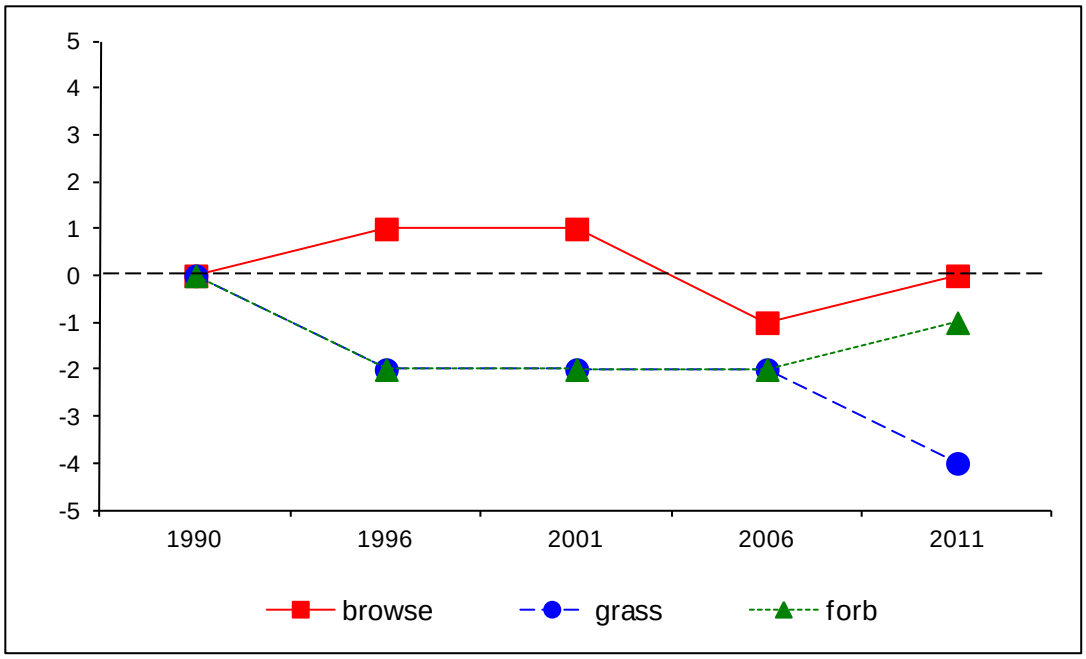
- **1990 to 1996 - down (-2):** The sum of nested frequency for perennial forbs decreased 24%. Tapertip hawksbeard decreased significantly in nested frequency, and had a cover of 1%.
- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The weedy annual species pale alyssum (*Alyssum alyssoides*) increased significantly in nested frequency and had a cover of 2%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Arrowleaf Balsam root increased significantly in nested frequency, and had a cover of less than 1%. Pale alyssum decreased significantly in nested frequency, and cover decreased from 2% to less than 1%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency for perennial forbs increased 11%. The increase is associated with the significant increase in nested frequency for wild onion (*Allium sp.*).

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 2, study no: 19

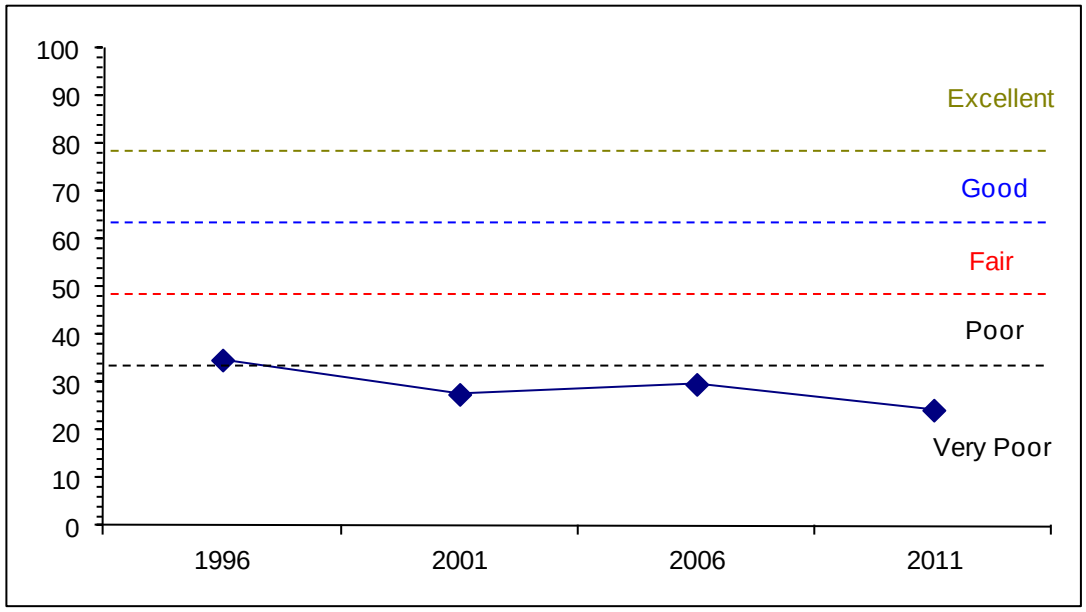
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
96	4.4	0.0	0.0	21.4	-1.0	10.0	0.0	**34.8**	Very Poor-Poor
01	5.7	0.0	0.0	13.0	-1.1	10.0	0.0	**27.6**	Very Poor
06	7.6	0.0	0.0	14.5	-0.5	10.0	-2.0	**29.7**	Very Poor
11	4.3	0.0	0.0	10.4	-0.4	10.0	0.0	**24.3**	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 2 Study no: 19



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 2, Study no: 19



HERBACEOUS TRENDS--
Management unit 02, Study no: 19

Type	Species	Nested Frequency					Average Cover %			
		'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a161	b229	b180	b173	b155	10.63	6.05	6.98	5.21
G	Bromus brizaeformis (a)	-	a14	a27	a36	b93	.23	.53	.11	.53
G	Bromus tectorum (a)	-	c148	b83	b90	a8	1.09	.92	.58	.06
G	Poa bulbosa	a208	c342	c340	b283	b277	17.93	14.90	18.02	20.67
G	Poa pratensis	2	-	3	6	-	-	.15	.09	-
G	Poa secunda	c144	ab10	b36	b27	a3	.07	.26	.18	.01
Total for Annual Grasses		0	162	110	126	101	1.33	1.45	0.69	0.59
Total for Perennial Grasses		515	581	559	489	435	28.64	21.38	25.28	25.89
Total for Grasses		515	743	669	615	536	29.97	22.83	25.97	26.49
F	Agoseris glauca	-	-	1	5	9	-	.00	.01	.01
F	Allium sp.	a5	a-	a-	a3	b26	-	-	.00	.09
F	Alyssum alyssoides (a)	-	b179	c253	a35	b144	.48	2.07	.08	.51
F	Aster chilensis	-	3	-	4	-	.15	-	.01	-
F	Astragalus utahensis	8	2	3	6	1	.06	.06	.06	.00
F	Balsamorhiza sagittata	a-	ab1	a-	b6	ab3	.71	.42	.39	.04
F	Calochortus nuttallii	-	-	-	-	2	-	-	-	.00
F	Camelina microcarpa (a)	-	-	-	-	3	-	-	-	.00
F	Chaenactis douglasii	-	-	-	-	-	.00	-	-	-
F	Cirsium undulatum	-	1	1	2	-	.00	.00	.03	-
F	Collinsia parviflora (a)	-	a6	a-	a-	b38	.03	-	-	.17
F	Collomia linearis (a)	-	3	-	-	6	.00	-	-	.01
F	Comandra pallida	2	5	8	7	9	.07	.19	.09	.21
F	Crepis acuminata	b89	a29	a45	a34	a38	.62	.76	.68	.68

Type	Species	Nested Frequency					Average Cover %			
		'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Cymopterus sp.	234	205	209	203	210	7.01	7.31	8.52	11.46
F	Descurainia pinnata (a)	-	2	-	-	-	.00	-	-	-
F	Epilobium brachycarpum (a)	-	7	-	-	-	.01	-	-	-
F	Erodium cicutarium (a)	-	3	-	-	6	.00	-	-	.03
F	Hackelia patens	2	-	2	-	-	-	.03	-	-
F	Holosteum umbellatum (a)	-	-	-	-	1	-	-	-	.00
F	Isatis tinctoria	-	-	-	-	-	-	-	.00	-
F	Lactuca serriola (a)	15	4	15	4	23	.01	.13	.02	.13
F	Machaeranthera canescens	-	2	3	-	-	.03	.03	-	-
F	Microsteris gracilis (a)	-	-	-	1	-	-	-	.00	-
F	Penstemon humilis	9	17	7	7	8	.12	.07	.09	.19
F	Phacelia sp.	-	2	-	-	-	.03	-	-	-
F	Phlox longifolia	-	-	1	-	-	-	.00	-	-
F	Sisymbrium altissimum (a)	16	-	15	3	2	-	.14	.01	.03
F	Tragopogon dubius (a)	$_{a}$7	$_{b}$48	$_{b}$41	$_{a}$12	$_{b}$42	.42	.63	.08	.60
F	Veronica biloba (a)	-	3	-	3	7	.00	-	.00	.01
Total for Annual Forbs		38	255	324	58	272	0.99	2.99	0.19	1.51
Total for Perennial Forbs		349	267	280	277	306	8.82	8.91	9.91	12.72
Total for Forbs		387	522	604	335	578	9.81	11.90	10.11	14.23

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

BROWSE TRENDS--
Management unit 02, Study no: 19

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	3	2	2	2	.18	.03	-	-
B	Artemisia tridentata vaseyana	6	6	3	3	.03	.66	.18	.15
B	Chrysothamnus viscidiflorus viscidiflorus	15	17	11	9	.48	1.38	.24	.21
B	Mahonia repens	4	5	7	8	.21	.16	.09	.13
B	Purshia tridentata	12	15	9	12	2.35	2.59	4.30	2.12
B	Sambucus cerulea	2	1	1	1	.38	.63	.63	.63
B	Symphoricarpos oreophilus	8	6	6	6	2.04	2.04	1.95	2.04
Total for Browse		50	52	39	41	5.68	7.52	7.39	5.29

CANOPY COVER, LINE INTERCEPT--
Management unit 02, Study no: 19

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.36	.05
Artemisia tridentata vaseyana	.81	.93
Chrysothamnus viscidiflorus viscidiflorus	.06	.46
Mahonia repens	.03	.21
Purshia tridentata	7.51	5.21
Sambucus cerulea	.35	.16
Symphoricarpos oreophilus	2.91	2.70

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 02, Study no: 19

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	-	2.1	3.4
Purshia tridentata	3.0	1.5	4.8

BASIC COVER--
Management unit 02, Study no: 19

Cover Type	Average Cover %				
	'90	'96	'01	'06	'11
Vegetation	10.00	42.68	46.01	42.00	47.52
Rock	31.50	23.11	21.66	19.88	15.64
Pavement	12.50	3.64	5.80	4.00	4.40
Litter	26.25	30.87	20.84	17.52	13.69
Cryptogams	1.00	1.75	3.45	3.77	.88
Bare Ground	18.75	13.05	14.32	12.17	4.80

SOIL ANALYSIS DATA --
Management unit 02, Study no: 19, Study Name: Right Fork Logan Canyon

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
8.4	7.6	27.6	34.4	38.0	4.2	13.8	115.2	0.7

PELLET GROUP DATA--
Management unit 02, Study no: 19

Type	Quadrat Frequency			
	'96	'01	'06	'11
Elk	47	53	55	40
Deer	22	22	18	8
Cattle	1	-	1	-

Days use per acre (ha)		
'01	'06	'11
83 (205)	158 (390)	148 (365)
17 (41)	6 (15)	9 (22)
2 (4)	3 (7)	-

BROWSE CHARACTERISTICS--
Management unit 02, Study no: 19

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia									
90	**66**	100	0	0	33	50	50	0	-/-
96	**60**	0	67	33	-	67	33	100	25/28
01	**40**	0	100	0	-	100	0	0	29/33
06	**60**	33	67	0	-	0	67	0	30/33
11	**60**	67	33	0	60	33	0	0	26/28
Artemisia tridentata vaseyana									
90	**0**	0	0	0	-	0	0	0	-/-
96	**160**	25	63	13	-	25	0	13	28/45
01	**140**	0	100	0	-	29	14	0	27/34
06	**60**	0	100	0	-	0	0	0	26/43
11	**60**	0	67	33	-	33	0	33	24/33
Chrysothamnus viscidiflorus viscidiflorus									
90	**599**	11	89	0	-	28	22	0	13/15
96	**340**	12	88	0	-	0	0	0	15/26
01	**400**	10	80	10	-	5	0	0	15/26
06	**220**	0	100	0	-	0	0	0	13/22
11	**280**	0	100	0	-	0	0	0	12/17
Mahonia repens									
90	**0**	0	0	-	-	0	0	0	-/-
96	**520**	8	92	-	-	0	0	0	3/4
01	**760**	8	92	-	-	0	0	0	3/6
06	**940**	0	100	-	-	0	0	0	2/4
11	**1640**	0	100	-	-	0	0	0	3/5
Purshia tridentata									
90	**232**	0	28	72	-	0	100	14	29/56
96	**320**	6	75	19	-	56	44	0	40/74
01	**380**	0	89	11	-	37	42	0	43/72
06	**220**	0	91	9	-	18	82	9	41/67
11	**280**	0	50	50	-	43	43	14	34/55
Ribes sp.									
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	43/93

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Sambucus cerulea									
90	**0**	0	0	-	-	0	0	0	-/-
96	**40**	0	100	-	-	0	0	0	29/44
01	**40**	0	100	-	-	0	0	0	37/77
06	**20**	0	100	-	-	100	0	0	47/69
11	**40**	0	100	-	-	100	0	0	32/34
Symphoricarpos oreophilus									
90	**1531**	15	78	6	-	11	2	7	26/21
96	**200**	10	90	0	-	0	0	10	27/50
01	**120**	0	100	0	-	0	0	0	33/50
06	**180**	0	89	11	-	0	0	33	28/48
11	**160**	0	100	0	-	25	0	0	25/45
Tetradymia canescens									
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	13/27
11	**0**	0	0	-	-	0	0	0	-/-