Trend Study 23-5-08

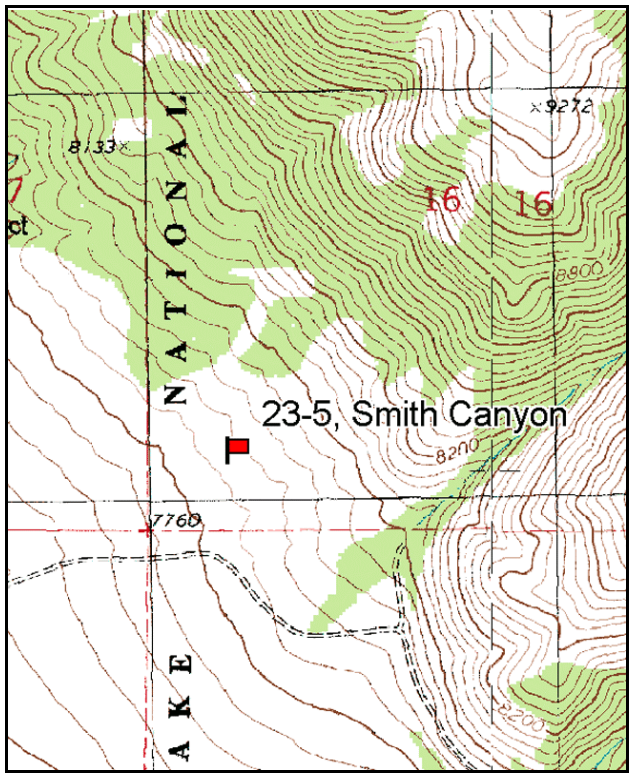
Study site name: Smith Canyon . Vegetation type: Big Sagebrush-Grass .

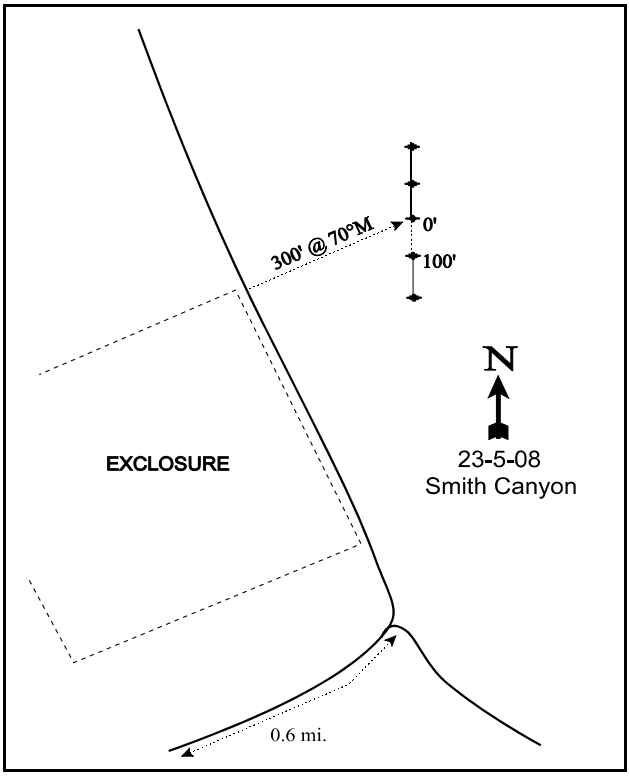
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

From the intersection of Main Street (SR89) and Center Street in Marysvale, turn east and proceed 0.7 miles, crossing a bridge. At a three-way split in the road, stay left and continue 1.9 miles. Keep right and go 0.8 miles. Keep right at the split, then go immediately right again. Proceed another 0.8 miles and make a left turn. Go 2.75 miles up this road to a "T" intersection. Turn right and go 1.0 miles to a cattleguard. Turn hard left here and drive 0.1 miles, then right 0.6 miles to an exclosure. Turn north (left) and go along the east side of a cattle exclosure. From the northeast corner of the exclosure, walk 300 feet at 70 degrees (in line with the north side fence) to the start of the baseline. The 0-foot end is marked by a fencepost with a browse tag #7043 attached.





Map Name: Marysvale

Diagrammatic Sketch

Township 27S , Range 2.5W , Section 16

GPS: NAD 83, UTM 12S 401130 E, 4257287 N

DISCUSSION

Smith Canyon - Trend Study No. 23-5

Study Information

This study is located on the southwestern side of Marysvale Peak [elevation: 7,830 feet (2,387 m), slope: 5%, aspect: southwest]. The land is administered by the US Forest Service. It was chained and seeded in the past, and it also burned in the Black Bird Mine WFU wildfire in 2006. Judging from a Dixie harrow pipe found near the study, the area seemed to be treated following the fire. Browsing pressure from wintering big game has been heavy at times, but grazing pressure from livestock appears light. Although use is concentrated in winter, tracks and sightings indicate deer use is common year-round. Pellet group data collected along the DWR Smith Canyon transect showed a 10-year (1980-1991) average of 55 deer days use/acre (135 ddu/ha) (Jense et al. 1985, 1991), which is greater than any other transect on the unit. Data collected along the study baseline estimated deer use at 112 days use/acre (277 ddu/ha) in 1998, 139 days use/acre (343 ddu/ha) in 2003, and 25 days use/acre (61 ddu/ha) in 2008 following the fire. Elk use was estimated at 1 day use/acre (2 edu/ha) in 1998, 7 days use/acre (17 edu/ha) in 2003, and 9 days use/acre (22 edu/ha) in 2008. Cattle use was estimated at 14 days use/acre (35 cdu/ha) in 1998, 3 days use/acre (7 cdu/ha) in 2003, and 12 days use/acre (30 cdu/ha) in 2008.

Soil

The soil is a sandy loam with a moderately acidic reaction (pH 5.9). Relative combined vegetation and litter cover decreased from 77% in 1998 and 2003 to 57% in 2008. Relative combined rock and pavement cover increased from 12% in 1998 and 15% in 2003 to 36% in 2008. Relative bare ground cover has remained stable between 7% and 11% since 1998. The soil erosion condition was classified as stable in 2003 and 2008. In 2008, signs of severe erosion were noted just off of the study on the steeper slopes to the northeast.

Browse

Prior to the fire, the browse component consisted of mainly mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*), with an overstory of scattered Utah juniper (*Juniperus osteosperma*), pinyon pine (*Pinus edulis*), Gambel oak (*Quercus gambelii*), and curlleaf mountain mahogany (*Cercocarpus ledifolius*). Sagebrush provided 25% quadrat cover in 1998 and 2003, and 1% cover in 2008. Density decreased from 3,860 plants/acre in 1998 to 1,100 plants/acre in 2008. Population decadence decreased from 26% in 1985 to 18% in 1998, then increased to 41% by 2003. Young recruitment decreased from 11% of the population in 1985 to 1% by 2003. Following the fire, the sagebrush population was 33% young and 67% mature. Plants showing poor vigor decreased from 15% of the population in 1985 to 7% in 2003 and 0% in 2008. Browse use was mostly light-moderate from 1985 to 2003, and light in 2008. Average annual leader growth was 1.7 inches (4.2 cm) in 2003 and 5.3 inches (13.5 cm) in 2008.

Antelope bitterbrush provided 7% quadrat cover in 1998, 4% in 2003, and 0% in 2008. Density decreased from 1,220 plants/acre in 1998 to 120 plants/acre in 2008. Decadence was high in 1991 and 2003 at 55% and 58% of the population, respectively, but was low in all other sample years. Young recruitment has fluctuated between 0% of the population and 19%. Following the fire, the bitterbrush population was 17% young and 83% mature. Plants with poor vigor were only sampled in 2003, and comprised 35% of the population. Browse use was moderate-heavy from 1985 to 2003, and light-moderate in 2008. Annual leader growth averaged 3.2 inches (8.2 cm) in 2003.

Herbaceous Understory

Total grass cover was 16% in 1998 and 19% in 2003 and 2008. Cheatgrass (*Bromus tectorum*) was present in 1985 and 1991, and has been the most abundant grass since 1998. It provided 68% of the total grass cover in 1998 and 92%-94% in 2003 and 2008. Bluebunch wheatgrass (*Agropyron spicatum*), bottlebrush squirreltail (*Sitanion hystrix*), and mutton bluegrass (*Poa fendleriana*) were also sampled each year.

Forbs are diverse and provided 3% cover in 1998, 5% in 2003, and 9% in 2008. Silvery lupine (*Lupinus argenteus*), redroot eriogonum (*Eriogonum racemosum*), and longleaf phlox (*Phlox longifolia*) have been the most common perennial forbs. Annual stickseed (*Lappula occidentalis*) and tumblemustard (*Sisymbrium altissimum*) became abundant after the fire. Seeded species such as Lewis flax (*Linum lewisii*) and alfalfa (*Medicago sativa*) were present and vigorous in 2008, but were rarely sampled.

1991 TREND ASSESSMENT

The browse trend is slightly up. Sagebrush density increased from 6,066 plants/acre to 7,199 plants/acre, and decadence decreased slightly from 26% of the population to 22%. Young recruitment decreased from 11% of the population to 2%, and plants displaying poor vigor also slightly decreased from 15% of the population to 12%. Bitterbrush density increased from 1,066 plants/acre to 1,332 plants/acre. However, decadence increased from 0% of the population to 55%, and young recruitment decreased from 19% of the population to 5%. Vigor remained excellent. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased 13%, and mutton bluegrass increased significantly in nested frequency. The trend for forbs is slightly up. The sum of nested frequency for perennial forbs increased 23%, and redroot eriogonum increased significantly in nested frequency.

browse - slightly up (+1) grass - slightly up (+1) forb - slightly up (+1)

1998 TREND ASSESSMENT

The browse trend is stable. Density changes for browse species may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence slightly decreased from 22% of the population to 18%, and young recruitment remained low at 4%. Plants exhibiting poor vigor decreased from 12% of the population to 5%. Bitterbrush decadence decreased from 55% of the population to 8%, and young recruitment increased from 5% of the population to 15%. Vigor remained good on all sampled plants. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 18%. Mutton bluegrass and bottlebrush squirreltail decreased significantly in nested frequency. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 53%. Redroot eriogonum, longleaf phlox, and silvery lupine decreased significantly in nested frequency, while that for Utah deervetch (*Lotus utahensis*) increased significantly. The winter range condition, determined by the Desirable Components Index (DCI), was rated as poor-fair due to high preferred browse cover, but moderate perennial herbaceous cover and moderate cheatgrass cover.

winter range condition (DCI) - poor-fair (51) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - down (-2)

2003 TREND ASSESSMENT

The browse trend is down. Sagebrush density decreased 12%, and decadence increased from 18% of the population to 41%. Young recruitment remained very low at 1% of the population, and plants displaying poor vigor remained relatively stable at 7% of the population. Bitterbrush density decreased 15%, and decadence increased from 8% of the population to 58%. No young plants were sampled, and vigor declined, with 35% of the population showing poor vigor. The trend for grass is down. The sum of nested frequency for perennial grasses decreased 43%. Bluebunch wheatgrass decreased significantly in nested frequency, while cheatgrass increased significantly in nested frequency. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 47%. Utah deervetch decreased significantly in nested frequency, while annuals such as slender phlox (*Microsteris gracilis*) and blue-eyed Mary (*Collinsia parviflora*) increased significantly in nested frequency. The DCI rating declined to very poor due to increased decadence of preferred browse, as well as a decrease in perennial herbaceous cover and an increase in cheatgrass cover.

winter range condition (DCI) - very poor (25) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - down (-2)

2008 TREND ASSESSMENT

The browse trend is down. Due to the fire, sagebrush density decreased 68%. However, the age structure of the remaining population was favorable, with 33% young and 67% mature plants. Bitterbrush density was reduced 88%, and the remaining population was 17% young and 83% mature. No sagebrush or bitterbrush seedlings were sampled. The trend for grass is down. The sum of nested frequency for perennial grasses decreased 74%. Bluebunch wheatgrass, bottlebrush squirreltail, and cheatgrass decreased significantly in nested frequency. However, cheatgrass quadrat frequency remained high at 99%. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Redroot eriogonum and pale alyssum (*Alyssum alyssoides*) increased significantly in nested frequency. The DCI rating remained very poor.

winter range condition (DCI) - very poor (0) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 23 , Study no: 5

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron spicatum	$_{c}$179	$_{c}$176	$_{c}$195	$_{b}$75	$_{a}$28	4.20	.58	.92
G	Bromus tectorum (a)	-	-	$_{a}$305	$_{b}$342	$_{a}$313	10.56	17.33	18.14
G	Hilaria jamesii	-	-	3	-	-	.15	-	-
G	Poa fendleriana	$_{ab}$58	$_{c}$78	$_{b}$28	$_{ab}$32	$_{a}$5	.25	.33	.06
G	Poa secunda	-	-	6	7	-	.01	.21	-
G	Sitanion hystrix	$_{bc}$47	$_{c}$64	$_{ab}$28	$_{b}$36	$_{a}$6	.22	.35	.21
G	Stipa comata	-	4	5	1	-	.18	.00	-
Total for Annual Grasses		0	0	305	342	313	10.56	17.33	18.14
Total for Perennial Grasses		284	322	265	151	39	5.02	1.48	1.19
Total for Grasses		284	322	570	493	352	15.59	18.82	19.34
F	Agoseris glauca	-	6	-	7	-	.00	.01	-
F	Alyssum alyssoides (a)	-	-	$_{a}$3	$_{a}$11	$_{b}$37	.00	.07	.36
F	Arabis sp.	-	4	3	-	-	.00	-	-
F	Astragalus convallarius	17	6	9	10	1	.19	.16	.03
F	Astragalus sp.	-	12	3	2	3	.01	.03	.00
F	Balsamorhiza sagittata	-	5	2	-	-	.01	-	.00
F	Calochortus nuttallii	$_{a}$-	$_{b}$9	$_{ab}$1	$_{a}$-	$_{ab}$5	.00	-	.02
F	Chaenactis douglasii	-	-	5	-	-	.01	-	-
F	Comandra pallida	5	5	1	4	-	.03	.03	-
F	Collinsia parviflora (a)	-	-	$_{a}$2	$_{b}$82	$_{b}$53	.00	.69	.10
F	Crepis acuminata	$_{ab}$4	$_{b}$14	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
F	Cryptantha nana	3	-	-	-	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	-	7	-	-	.33

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	Eriogonum racemosum	$_{ab}$20	$_{c}$59	$_{ab}$21	$_{a}$9	$_{bc}$41	.29	.12	1.90
F	Eriogonum umbellatum	-	-	3	11	-	.00	.08	-
F	Gayophytum ramosissimum(a)	-	-	-	-	3	-	-	.01
F	Lappula occidentalis (a)	-	-	$_{a}$-	$_{a}$-	$_{b}$65	-	-	1.08
F	Linum lewisii	-	-	-	-	-	-	-	.03
F	Lithospermum ruderale	-	-	-	-	4	-	-	.33
F	Lotus utahensis	$_{a}$-	$_{a}$1	$_{b}$16	$_{a}$1	$_{a}$-	.30	.00	.00
F	Lupinus argenteus	$_{b}$74	$_{b}$46	$_{a}$18	$_{a}$6	$_{a}$7	1.55	.76	2.76
F	Microsteris gracilis (a)	-	-	$_{a}$11	$_{b}$170	$_{a}$-	.02	2.63	-
F	Phlox longifolia	$_{bc}$42	$_{c}$50	$_{ab}$21	$_{a}$3	$_{a}$-	.11	.00	-
F	Sisymbrium altissimum (a)	-	-	-	-	14	-	-	1.92
F	Sphaeralcea coccinea	-	3	-	-	-	-	-	-
F	Streptanthus cordatus	4	2	1	2	1	.00	.00	.01
F	Wyethia amplexicaulis	$_{b}$11	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-
Total for Annual Forbs		0	0	16	263	179	0.02	3.40	3.83
Total for Perennial Forbs		180	222	104	55	62	2.53	1.22	5.11
Total for Forbs		180	222	120	318	241	2.56	4.62	8.94

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

BROWSE TRENDS --
Management unit 23 , Study no: 5

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata vaseyana	88	88	28	24.61	24.54	.78
B	Chrysothamnus nauseosus albicaulis	1	0	1	.00	-	.00
B	Chrysothamnus viscidiflorus viscidiflorus	2	0	0	.00	-	-
B	Eriogonum microthecum	2	0	0	.00	-	-
B	Pinus edulis	1	1	0	.00	.00	-
B	Purshia tridentata	44	36	5	6.61	3.71	.00
B	Sclerocactus sp.	2	0	0	.00	-	-
B	Symphoricarpos oreophilus	1	2	1	.00	.00	.03
B	Tetradymia canescens	0	1	1	-	.00	.00
Total for Browse		141	128	36	31.22	28.26	0.81

CANOPY COVER, LINE INTERCEPT --
Management unit 23 , Study no: 5

Species	Percent Cover	
	'03	'08
Artemisia tridentata vaseyana	28.85	1.01
Chrysothamnus nauseosus albicaulis	-	.10
Purshia tridentata	5.46	.03
Symphoricarpos oreophilus	.10	-

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 23 , Study no: 5

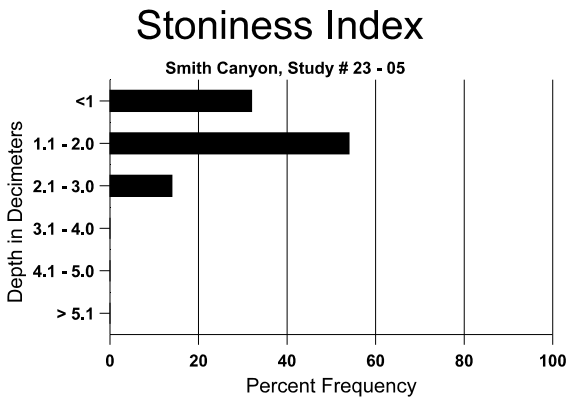
Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.7	5.3
Purshia tridentata	3.2	-

BASIC COVER --
Management unit 23 , Study no: 5

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	8.00	4.25	40.73	49.27	35.97
Rock	1.00	1.25	2.75	2.19	4.04
Pavement	18.50	8.75	12.96	16.32	36.84
Litter	68.25	73.25	54.14	45.69	29.92
Cryptogams	.75	1.25	.12	.03	0
Bare Ground	3.50	11.25	13.71	10.39	7.83

SOIL ANALYSIS DATA --
Management unit 23, Study no: 5, Study Name: Smith Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.9	66.7 (11.9)	5.9	54.0	29.4	16.6	3.5	21.9	281.6	0.4



PELLET GROUP DATA --
Management unit 23 , Study no: 5

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	26	3	16
Elk	-	-	4
Deer	34	27	25
Cattle	3	-	3

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	7 (17)	9 (22)
112 (277)	139 (344)	25 (61)
14 (35)	3 (7)	12 (30)

BROWSE CHARACTERISTICS --
Management unit 23 , Study no: 5

		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												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	24/17
03	**0**	-	-	-	-	-	0	0	-	-	0	9/9
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata vaseyana												
85	**6064**	66	666	3799	1599	-	54	11	26	.65	15	24/27
91	**7198**	-	133	5466	1599	-	50	3	22	2	12	22/30
98	**3860**	-	140	3040	680	840	46	7	18	4	5	32/44
03	**3400**	-	20	1980	1400	660	26	5	41	7	7	31/39
08	**1100**	-	360	740	-	-	0	0	0	-	0	13/15
Chrysothamnus nauseosus albicaulis												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
98	**20**	-	-	-	20	-	0	0	100	-	0	-/-
03	**0**	-	-	-	-	-	0	0	0	-	0	-/-
08	**20**	-	-	20	-	-	0	0	0	-	0	14/20
Chrysothamnus viscidiflorus viscidiflorus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**40**	-	-	40	-	-	0	50	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	15/22
Eriogonum microthecum												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**199**	-	133	66	-	-	0	33	-	-	0	1/2
98	**60**	-	40	20	-	-	0	33	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**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)
Opuntia sp.												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	5/11
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Pinus edulis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**20**	-	20	-	-	-	0	0	-	-	0	-/-
03	**20**	-	-	20	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	**1065**	66	199	866	-	-	69	31	0	-	0	20/27
91	**1332**	-	66	533	733	-	15	80	55	-	0	13/20
98	**1220**	-	180	940	100	120	26	67	8	-	0	20/37
03	**1040**	-	-	440	600	20	15	79	58	35	35	19/39
08	**120**	-	20	100	-	-	33	17	0	-	0	10/24
Quercus gambelii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	28/26
Sclerocactus sp.												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
98	**80**	-	-	20	60	-	0	75	75	-	0	-/-
03	**0**	-	-	-	-	-	0	0	0	-	0	-/-
08	**0**	-	-	-	-	-	0	0	0	-	0	-/-
Symphoricarpos oreophilus												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**66**	-	66	-	-	-	0	100	0	-	0	-/-
98	**20**	-	-	20	-	-	0	0	0	-	0	13/28
03	**60**	-	-	40	20	-	0	0	33	33	33	8/14
08	**20**	-	-	20	-	-	0	0	0	-	0	13/25

		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)
Tetradymia canescens												
85	**133**	-	133	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**20**	-	-	20	-	-	0	0	-	-	0	11/13
08	**20**	-	-	20	-	-	0	0	-	-	0	13/16