

Trend Study 25C-4-08

Study site name: North Slope .

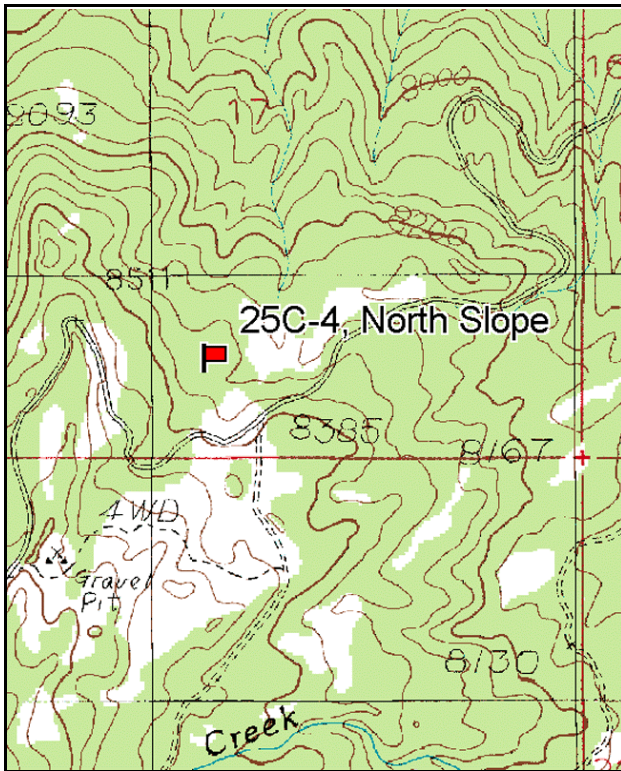
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 167 degrees magnetic. Lines 3-4, 270°M.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (95ft), line 4 (59ft). Rebar: belt 2 on 3ft, belt 5 on 1ft.

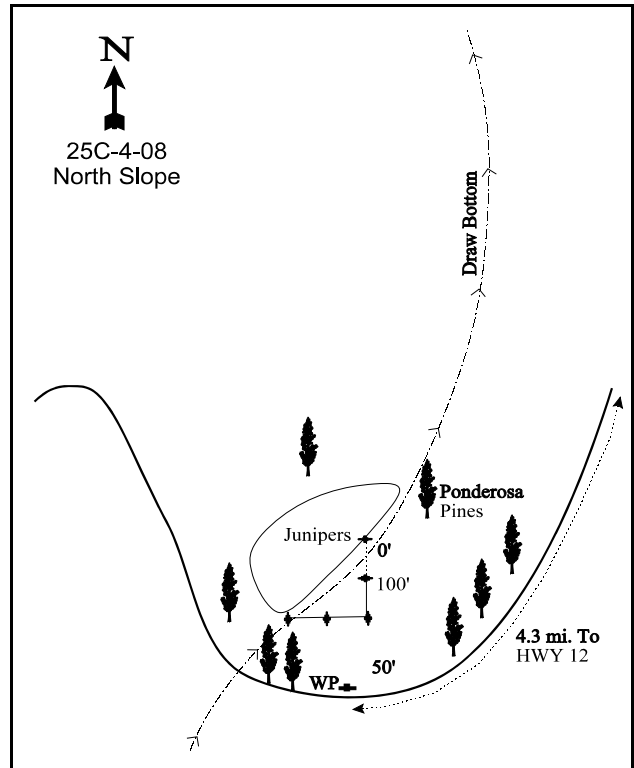
LOCATION DESCRIPTION

From Grover, Utah, go 1.5 miles northwest on SR12 to the North Slope Road. Turn up this road staying left on the main road and continue for 4.3 miles. Stop before you get to a bend in the road near the head of a draw. Look for a witness post at the base of a Ponderosa Pine 10 feet below the road. The witness post is a 2½ foot steel rebar tagged #7181. The 200-foot stake is a full-high post 50 feet from the witness post. The 0-foot baseline stake is marked by browse tag #7077.



Map Name: Grover

Township 30S, Range 5E, Section 18



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 466142 E, 4227918 N

DISCUSSION

North Slope - Trend Study No. 25C-4

Study Information

This study is located on deer transitional and summer range on the north slope of Boulder Mountain above Fish Creek [elevation: 8,300 feet (2,530 m), slope: 10%-15%, aspect: north]. During the 1998 reading, the old frequency baseline was moved to better sample the site. It was originally established entirely within a thick juniper (*Juniperus scopulorum*) stand with little herbaceous understory while the density plots sampled the more open area across a wash. The new baseline is located entirely within the more open area where the key browse and herbaceous understory are more numerous. Pellet group data taken along the study site baseline show an increasing amount of deer use since 1991. Data from 1991 estimated 40 deer days use/acre (99 ddu/ha), increasing to 50 deer days use/acre in 1998 and 66 in 2003 (124 ddu/ha and 164 ddu/ha). Elk use has remained low at only 3 elk days use/acre in 1998, and 1 day use/acre in 2003. Cattle use was heavy in 1998 at 36 days use/acre (89 cdu/ha) and more moderate at 15 cow days use/acre in 2003 (36 cdu/ha).

Soil

Soil at the site is very rocky on the surface and throughout the profile. Effective rooting depth was estimated at 10 inches. Rooting restrictions are evident in some places where black sagebrush occurs. Soil texture is a sandy loam which is moderately acidic in reaction (pH 5.9). There is a very small amount of bare soil exposed on the site. Relative combined vegetation and litter cover ranged from 67%-74% from 1998 to 2008. Relative combined rock and pavement cover has ranged 16%-22% from 1998 to 2008. Relative bareground cover has ranged from 7%-11% from 1998 to 2008. Some soil movement was noticeable in 1985, but erosion was not a problem through 2003 due to the high percentage of litter and thick vegetation and the erosion condition rating was classified as stable in 2003. Erosion was more noticeable in 2008 with the formation of a small gully with some rills. Erosion may be accentuated by runoff from the adjacent road. The erosion condition class was rated as slight in 2008.

Browse

The vegetative community is composed of pinyon pine (*Pinus edulis*), Rocky mountain juniper (*Juniperus scopulorum*) and some ponderosa pine (*Pinus ponderosa*) with an understory of antelope bitterbrush (*Purshia tridentata*), black sagebrush (*Artemisia nova*), several rabbitbrush species (*Chrysothamnus* spp.) and perennial grass. Point-center quarter data estimated 42 pinyon and 30 Rocky mountain juniper trees/acre in 2003 with little change in density in 2008. A few ponderosa pine trees also occur on the site. The pinyon and juniper provide good escape and thermal cover. Nearby Forest Service chainings provide excellent deer winter range, and more pinyon-juniper chainings have been proposed by DWR for the North Slope area.

A variety of browse species are present, but only bitterbrush is available and palatable enough to be considered a key species. Bitterbrush makes up approximately 50% of the browse cover and density has changed little since 1985 when 1,598 plants/acre were estimated. Many of the older plants, which are above the snow cover in the winter, have been heavily hedged in the past. Vigor has remained normal and percent decadence low, though decadence increased to 37% in 2008.

Black sagebrush and a few mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) are mixed in with the bitterbrush. Both species showed an increase in density between 1991 and 1998, but the larger sample used in 1998 is likely the major reason for the difference. Black sagebrush had mostly light use with the exception of 2008 when it was moderately browsed. There was light use on mountain big sagebrush except for in 1991, 2003, and 2008 when use was moderate. Three species of rabbitbrush are found on the site including dwarf rabbitbrush (*Chrysothamnus depressus*), Parry rabbitbrush (*Chrysothamnus parryi*), and mountain low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*). Of these, mountain low rabbitbrush is the most abundant with a density that has ranged between about 3,000 and 4,000 plants/acre from 1985 to 2008. Most

of these are unutilized. The increaser broom snakeweed (*Gutierrezia sarathrae*) is also found on the site in moderate numbers.

Herbaceous Understory

Several perennial grasses are found on the site with blue grama (*Bouteloua gracilis*), a sedge (*Carex sp.*), mutton bluegrass (*Poa fendleriana*), and bottlebrush squirreltail (*Sitanion hystrix*) being most numerous. All grasses combined to produce 23% of the total cover in 1998, declining to only 13% in 2003, and increasing to 19% in 2008. The large decline in grass cover in 2003 came primarily from a 53% decline in mutton bluegrass cover. Grasses were heavily utilized in 2003 and most of the larger preferred grasses were found only within the protection of shrub canopies. Shrub interspaces consist mostly of low growing mutton bluegrass and blue grama. There are a large variety of forbs on the site, although Louisiana sage (*Artemisia ludoviciana*), silvery lupine (*Lupinus argenteus*), and pussytoes (*Antennaria parvifolia*) are the most abundant and provide the majority of the forb cover. Average forb cover was estimated at 14% in 1998, declining to only 5% in 2003, perhaps due to drought conditions, and declined further to just under 4% in 2008.

1991 TREND ASSESSMENT

The key browse, antelope bitterbrush, is fairly stable at around 1,500 plants/acre. The number of decadent plants has increased from 4% in 1985 to 17%. This level of decadence is still low, but of real concern is that the increaser species have expanded during this same period. The browse trend is considered stable. The grass trend is stable without any notable change in the sum of nested frequency of perennial grass. The trend for forbs is slightly down with a decrease in the sum of nested frequency for perennial forbs primarily caused by a decrease in Louisiana sagebrush and silvery lupine.

browse - stable (0)

grass - stable (0)

forb - slightly down (-1)

1998 TREND ASSESSMENT

The original frequency baseline was moved out of a thick juniper stand in order to sample the more important bitterbrush-grass vegetation. For this reason direct comparisons should not be made between 1991 and 1998 with regard herbaceous trends. The original baseline had a much higher pinyon and juniper density with considerable litter cover around these trees. Herbaceous vegetation was lacking. With this in mind, trend for bitterbrush is stable. There were less young plants sampled in 1998, but density of mature plants is similar to 1985 estimates. Utilization is more moderate, vigor normal, and decadence is low at only 3%. Density of increasers, including broom snakeweed and three species of rabbitbrush, are up for rabbitbrush, although down for snakeweed. More sagebrush, black sagebrush and mountain big sagebrush, was sampled in the larger sample of 1998. Trend for browse is considered stable. The herbaceous understory is diverse and abundant. Sum of nested frequency has increased dramatically, but much of the improvement is due to the relocation of the original frequency baseline. No trend can be given for forbs and grasses due to the movement of the frequency baseline.

winter range condition (DCI) - excellent (85) Mid-level potential scale

browse - stable (0)

grass - no trend

forb - no trend

2003 TREND ASSESSMENT

Trend for the key browse species, bitterbrush, is stable. The number of decadent bitterbrush plants increased to 12% of the population, but this is still low. Annual leader growth of bitterbrush was fair averaging nearly 3 inches. Increasers, Parry and mountain low rabbitbrush and broom snakeweed have remained relatively stable in density and average cover. Trend for the grasses is slightly down. Sum of nested frequency of perennial grasses declined 18% since 1998, with a significant decline in nested frequency of bottlebrush squirreltail and bluebunch wheatgrass. Mutton bluegrass declined slightly in nested frequency but average cover dropped 53% since 1998. Total grass cover declined 44% since 1998 due to drought conditions. The trend for forbs is down. The forb composition is dominated by Louisiana sage and silvery lupine. Sum of nested frequency of

perennial forbs declined 43% since 1998 and average cover dropped from 13% in 1998 to 4%.

winter range condition (DCI) - good (73) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is considered to be stable. The density of the key browse species, bitterbrush, did not change, but the production was down from 16% cover in 2003 to 10% cover. Vigor remains good, however, decadence has increased to 37%, the highest since data began being collected in 1985. Use of bitterbrush continued to be moderate to heavy. The browse species black sagebrush increased in density to 1,720 plants/acre and had signs of moderate use. Vigor was good, decadence was low, and recruitment was good with young plants comprising 45% of the population. The increaser species rabbitbrush has decreased in density, but broom snakeweed density has increased. The trend for grasses is stable. There was no significant change in the sum of nested frequency of perennial grasses, however, the frequency of mutton bluegrass decreased significantly and the frequency of the sedge and needle-and-thread grass (*Stipa comata*) increased significantly. The trend for forbs is stable. The sum of nested frequency of perennial forbs stayed relatively constant as did the production. Annual forbs decreased significantly in both frequency and cover.

winter range condition (DCI) - fair-good (66) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
 Management unit 25C, Study no: 4

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron spicatum	a1	ab5	b16	a-	ab3	.35	-	.01
G	Bouteloua gracilis	ab172	a139	b206	b203	b218	8.07	6.58	11.87
G	Bromus anomalus	2	3	-	-	-	-	-	-
G	Carex sp.	a28	a29	ab51	a31	b89	1.17	.41	2.61
G	Oryzopsis hymenoides	3	3	-	1	3	-	.00	.03
G	Poa fendleriana	a46	a48	b192	b173	a84	11.08	5.25	2.78
G	Sitanion hystrix	a43	a56	b104	a56	a28	2.24	.53	.50
G	Stipa comata	a-	a-	b23	b19	c43	.41	.40	1.26
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		295	283	592	483	468	23.33	13.19	19.07
Total for Grasses		295	283	592	483	468	23.33	13.19	19.07
F	Alyssum alyssoides (a)	-	-	a-	b15	a-	-	.23	-
F	Allium sp.	-	-	1	-	-	.00	-	-
F	Antennaria parvifolia	a5	a8	b31	ab26	b35	1.68	.20	1.08
F	Androsace septentrionalis (a)	-	-	c95	b27	a-	.93	.08	-
F	Arabis demissa	8	17	8	5	6	.07	.04	.01
F	Artemisia dracunculus	c54	a-	b23	b10	a-	.91	.14	-
F	Artemisia ludoviciana	b70	a2	c116	b52	b70	3.14	.86	.63

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	Astragalus sp.	-	-	-	-	8	-	-	.09
F	Castilleja linariaefolia	-	3	-	-	-	-	-	-
F	Chenopodium album (a)	-	-	a-	b53	a-	-	.28	-
F	Chaenactis douglasii	-	-	6	-	-	.01	-	-
F	Chenopodium leptophyllum(a)	-	-	a-	b44	a-	-	.16	-
F	Cirsium sp.	-	-	2	-	1	.00	-	.15
F	Cryptantha sp.	3	-	-	-	3	-	-	.03
F	Descurainia pinnata (a)	-	-	b8	ab3	a-	.02	.03	-
F	Draba sp. (a)	-	-	-	1	-	-	.00	-
F	Eriogonum alatum	-	-	-	-	-	-	.00	-
F	Erigeron eatonii	a6	a3	b17	a4	ab10	.34	.06	.04
F	Erigeron flagellaris	a-	a-	b10	ab9	ab4	.25	.06	.07
F	Eriogonum sp.	-	-	2	-	-	.03	-	-
F	Erigeron pumilus	a-	a-	b10	b12	b13	.24	.15	.18
F	Eriogonum racemosum	a5	a1	b32	b26	b23	.30	.22	.08
F	Gayophytum ramosissimum(a)	-	-	-	6	-	-	.01	-
F	Gilia sp. (a)	-	-	2	-	-	.01	-	-
F	Holosteum umbellatum (a)	-	-	-	3	-	-	.00	-
F	Hymenoxys richardsonii	5	-	3	1	2	.03	.03	.00
F	Lappula occidentalis (a)	-	-	9	8	-	.02	.07	-
F	Lepidium sp. (a)	a-	a-	b31	a8	a-	.11	.02	-
F	Lupinus argenteus	b29	a-	c82	b49	b35	5.08	1.25	.63
F	Lychnis drummondii	-	4	-	-	1	-	-	.03
F	Lygodesmia sp.	a-	a-	b17	b6	ab7	.44	.25	.22
F	Penstemon comarrhenus	a-	a2	a8	a3	b19	.18	.03	.10
F	Petradoria pumila	2	1	1	4	3	.15	.15	.15
F	Potentilla concinna	a-	a-	a-	a1	b15	-	.03	.12
F	Polygonum douglasii (a)	-	-	5	-	-	.01	-	-
F	Potentilla gracilis	a-	b18	ab14	ab6	a1	.12	.05	.03
F	Pteridium aquilinum	-	1	-	-	-	-	-	-
F	Sphaeralcea coccinea	4	10	10	6	5	.07	.21	.04
F	Taraxacum officinale	-	-	1	-	-	.00	-	-
F	Tragopogon dubius	-	-	3	-	-	.01	-	-
F	Unknown forb-perennial	a-	ab3	ab1	b7	a-	.00	.15	-
Total for Annual Forbs		0	0	150	168	0	1.11	0.91	0
Total for Perennial Forbs		191	73	398	227	261	13.12	3.94	3.71

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
	Total for Forbs	191	73	548	395	261	14.24	4.85	3.71

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

BROWSE TRENDS --

Management unit 25C, Study no: 4

T y p e	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia nova</i>	15	11	25	1.84	1.52	.98
B	<i>Artemisia tridentata vaseyana</i>	4	7	12	.30	.33	.89
B	<i>Chrysothamnus depressus</i>	7	0	0	.19	-	-
B	<i>Chrysothamnus parryi</i>	22	25	12	.81	.82	.45
B	<i>Chrysothamnus viscidiflorus lanceolatus</i>	80	80	72	7.83	8.01	2.47
B	<i>Gutierrezia sarothrae</i>	29	17	26	.80	.36	.48
B	<i>Juniperus scopulorum</i>	0	0	1	1.48	1.48	1.02
B	<i>Pediocactus simpsonii</i>	3	4	4	.09	.06	.03
B	<i>Pinus edulis</i>	2	1	2	.78	1.75	2.07
B	<i>Potentilla fruticosa</i>	0	0	0	-	.00	-
B	<i>Purshia tridentata</i>	51	48	51	14.16	15.80	9.93
B	<i>Tetradymia canescens</i>	4	5	6	.15	.03	.03
	Total for Browse	217	198	211	28.46	30.18	18.39

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 4

Species	Percent Cover		
	'98	'03	'08
Artemisia nova	-	1.79	1.78
Artemisia tridentata vaseyana	-	.18	.05
Chrysothamnus parryi	-	.75	.45
Chrysothamnus viscidiflorus lanceolatus	-	6.03	3.34
Gutierrezia sarothrae	-	.40	.55
Juniperus scopulorum	2.59	2.11	2.65
Pinus edulis	2.20	1.93	2.13
Pinus ponderosa	-	-	1.10
Purshia tridentata	-	17.85	19.03
Tetradymia canescens	-	.05	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 4

Species	Average leader growth (in)	
	'03	'08
Purshia tridentata	2.9	1.8

POINT-QUARTER TREE DATA --

Management unit 25C, Study no: 4

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma/scopulorum	10	30	31
Pinus edulis	17	42	44
Pinus ponderosa	8	<18	25

Average diameter (in)		
'98	'03	'08
4.6	6.6	7.5
4.4	4.2	5.2
15.1	-	9.3

BASIC COVER --

Management unit 25C, Study no: 4

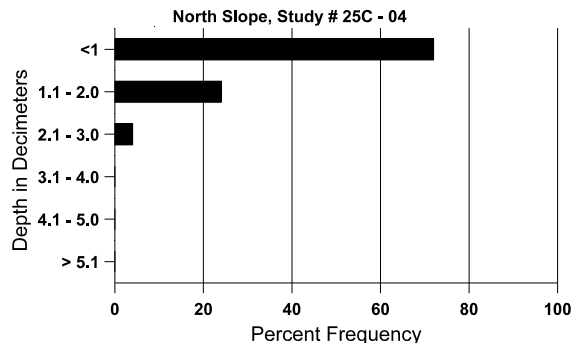
Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	4.00	3.25	54.93	45.06	46.79
Rock	21.00	22.25	14.30	17.25	15.19
Pavement	9.00	5.25	8.15	7.00	10.06
Litter	60.00	62.00	49.14	39.52	29.68
Cryptogams	1.75	1.50	4.07	.19	.36
Bare Ground	4.25	5.75	9.61	10.79	12.02

SOIL ANALYSIS DATA --

Management unit 25C, Study no: 4, Study Name: North Slope

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
10.0	56.3 (10.4)	5.9	64.0	19.4	16.6	2.8	12.0	137.6	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 4

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	25	24	63
Elk	4	4	7
Deer	30	37	29
Cattle	12	5	6

Days use per acre (ha)			
'98	'03	'08	'08
-	-	-	-
9 (22)	3 (7)	1 (2)	3 (8)
40 (99)	50 (124)	66 (164)	45 (111)
-	36 (89)	15 (36)	2 (4)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 4

		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 nova												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	265	-	66	199	-	-	0	0	0	-	0	7/8
98	1000	40	500	480	20	40	2	0	2	2	2	12/19
03	820	-	-	620	200	120	17	0	24	20	20	10/14
08	1720	240	780	800	140	40	34	3	8	-	1	8/18

		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>Artemisia tridentata vaseyana</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	66	-	66	-	-	-	100	0	0	-	0	-/-
98	220	-	60	160	-	60	0	0	0	-	0	19/27
03	300	-	20	280	-	20	47	7	0	-	0	22/25
08	540	20	180	300	60	80	63	0	11	7	7	13/21
<i>Chrysothamnus depressus</i>												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	332	-	-	266	66	-	0	60	20	-	0	4/7
98	260	-	-	240	20	-	0	0	8	-	0	8/11
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Chrysothamnus parryi</i>												
85	2398	-	399	1999	-	-	3	0	0	-	0	8/7
91	466	-	-	466	-	-	0	0	0	-	0	6/9
98	940	-	60	720	160	-	0	0	17	-	0	10/10
03	820	-	80	740	-	-	49	7	0	-	0	8/10
08	480	-	60	400	20	-	4	0	4	-	0	7/8
<i>Chrysothamnus viscidiflorus lanceolatus</i>												
85	3864	599	666	2999	199	-	10	0	5	-	2	19/13
91	2865	-	533	1799	533	-	19	7	19	.69	2	13/16
98	4060	-	300	3300	460	20	2	0	11	-	.98	18/20
03	4300	40	320	3500	480	20	7	0	11	-	.46	16/20
08	2820	-	20	940	1860	60	21	9	66	35	46	14/18
<i>Gutierrezia sarothrae</i>												
85	665	-	66	599	-	-	0	0	0	-	0	9/7
91	3065	66	1066	1733	266	-	2	0	9	-	0	6/5
98	1400	-	60	1260	80	-	0	0	6	-	3	9/11
03	900	-	140	760	-	-	0	0	0	-	0	7/6
08	1480	40	120	1320	40	20	14	0	3	3	3	6/8
<i>Juniperus scopulorum</i>												
85	66	-	-	66	-	-	0	0	-	-	0	69/89
91	66	-	-	66	-	-	0	0	-	-	0	109/125
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	20	-	-	-	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)
Pediocactus simpsonii												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	80	20	-	80	-	-	0	0	-	-	0	1/4
03	80	-	-	80	-	-	0	0	-	-	0	1/4
08	100	-	-	100	-	-	0	0	-	-	0	2/3
Pinus edulis												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	133	-	-	-	-	0	0	-	-	0	-/-
98	40	20	20	20	-	-	0	0	-	-	0	-/-
03	20	20	20	-	-	-	0	0	-	-	0	-/-
08	40	-	20	20	-	-	0	0	-	-	0	-/-
Potentilla fruticosa												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	20	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
85	1598	266	266	1266	66	-	50	33	4	-	0	24/35
91	1531	-	399	866	266	-	48	30	17	1	4	14/28
98	2000	120	180	1760	60	80	77	1	3	-	0	21/45
03	1540	-	60	1300	180	20	31	62	12	-	0	25/52
08	1580	20	120	880	580	140	47	16	37	6	6	19/40
Sclerocactus sp.												
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	4/9
Tetradymia canescens												
85	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	80	-	-	60	20	-	0	0	25	-	0	12/15
03	120	-	-	80	40	-	0	17	33	17	17	8/12
08	160	-	20	60	80	-	0	0	50	25	50	9/15