

Trend Study 28-7-08

Study site name: Paragonah .

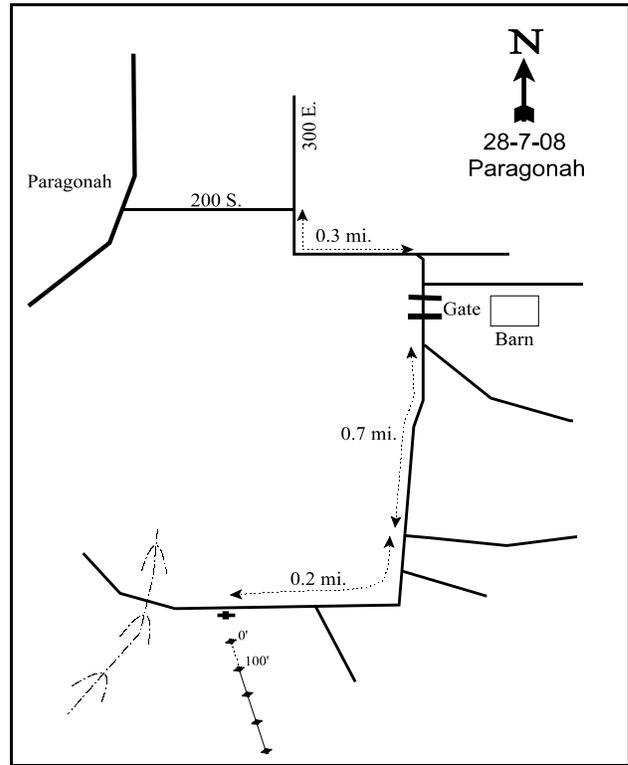
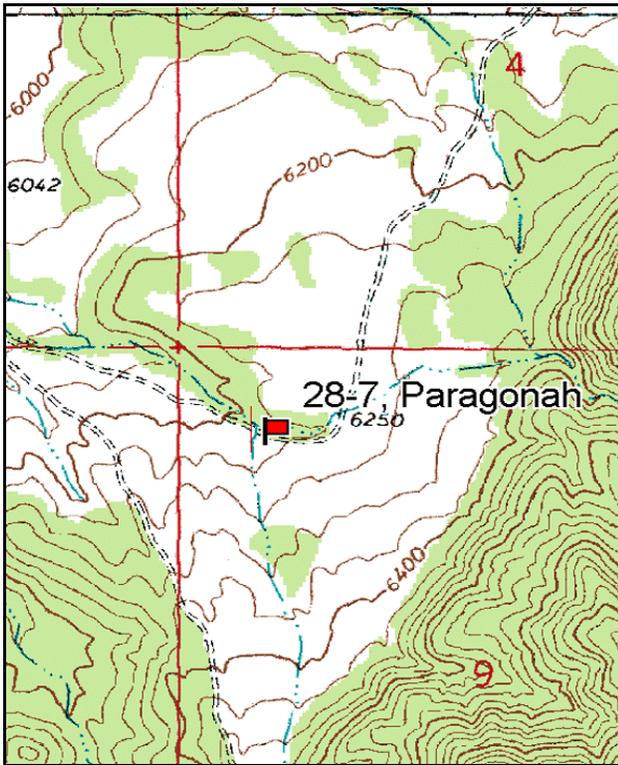
Vegetation type: Chained, Seeded P-J .

Compass bearing: frequency baseline 132 degrees magnetic.

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

LOCATION DESCRIPTION

From 200 South and 300 East in Paragonah, continue south on 300 East for 0.3 miles to where the road turns south. Drive 0.1 miles to a gate and a barn. Go through a series of two gates and to a fork. Stay right on the road that goes south and drive for 0.7 miles to another fork. Continue south for 0.2 miles (the road will bend and go west) to the witness post on the south (left) side of the road (just beyond the witness post is a large gully). The baseline starts 92 feet at 188 degrees magnetic from the witness post. The study is marked by short fenceposts.



Map Name: Parowan

Diagrammatic Sketch

Township 34S, Range 8W, Section 9

GPS: NAD 83, UTM 12S 344091 E, 4192360 N

DISCUSSION

Paragonah - Trend Study No. 28-7

Study Information

This study is located in an old chained and seeded pinyon-juniper area on critical winter range for deer [elevation: 6,200 feet (1,890 m), slope: 10%, aspect: northwest]. The site slopes away from the cliffs and towards the fields at the base of the bench. There was considerable regrowth of pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) on this site until a lop and scatter treatment was done prior to the 2003 survey. Pellet group transect data estimated about 23 deer days use/acre (58 ddu/ha) in 1998 and 2003, and 30 deer days use/acre (73 ddu/ha) in 2008.

Soils

Soil textural and chemical analysis indicates a sandy loam with a slightly acidic pH (6.3). Phosphorus and potassium levels are low at 6.0 ppm and 3.2 ppm, respectively, and only have low availability to for plant growth and development (Tiedemann and Lopez 2004). Relative combined average vegetation and litter cover has been moderately high at 52%-67%, and relative combined average rock and pavement cover has been 15%-26% since 1992. Relative average bare ground cover has been 13%-21% since 1992. An erosion condition class assessment rated soils as stable in 2003, but increased to slight in 2008 due to flow patterns, rills, and gully formation.

Browse

Ten species of shrubs or trees have been sampled on the site in at least one sample year, but only black sagebrush (*Artemisia nova*), broom snakeweed (*Gutierrezia sarothrae*), and Gambel oak (*Quercus gambelii*) are abundant. Black sagebrush is the key browse species comprising 72% of the browse cover in 2008. Density of black sagebrush has ranged from a high of 4,480 plants/acre in 2008 and a low of 2,540 plants/acre in 1998. The black sagebrush population steadily became more mature and decadent with every reading from 1987 to 2003, then decadence declined again markedly in 2008. The increase in decadence in 2003 is not surprising with the drought experienced prior to and including the 2003 sampling year. Vigor of black sagebrush was good in all sample years, but the proportion of plants displaying poor vigor increased slightly in 2003 before decreasing again in 2008. Recruitment of young sagebrush plants has been good except in 2003 when young plants comprised only 5% of the population. Utilization on black sagebrush was heavy in 1987 when 76% of the shrubs displayed heavy use. Use declined to a more moderate level in 1992, and was mostly light in 1998, 2003, and 2008. Small numbers of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) also occur on the site, and some of the black sagebrush are hybrids with mountain big sagebrush.

Broom snakeweed was the most abundant shrub during the initial reading in 1987, and its density has fluctuated greatly over the sample years from an estimated high of 7,932 plants/acre in 1987 to a low of 1,320 plants/acre in 1998. A significant portion of the snakeweed population has been made up of young plants since 1992. Gambel oak on the site occurs in large scattered clones. Oak has shown mostly light use in all surveys and is used primarily for cover by wintering animals. Line-intercept canopy cover of oak was estimated at about 6% in both 1998 and 2003, but decreased to only 1% in 2008.

Pinyon and juniper, although not numerous, figured prominently in the structure of this site prior to the lop and scatter treatment. Point-center quarter data in 1998 estimated 49 Utah juniper trees/acre and 71 pinyon pine trees/acre for a total of 120 trees/acre. Tree density in 2008 was estimated at 21 juniper trees/acre and 48 pinyon trees/acre. Combined pinyon-juniper line-intercept canopy cover was estimated at 23% in 1998. Following the lop and scatter treatment, pinyon-juniper line-intercept canopy cover was reduced to less than 1% in 2003 increasing to 3% in 2008.

Herbaceous Understory

The herbaceous understory is dominated by a patchy stand of crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*). Cheatgrass (*Bromus tectorum*) significantly increased in 1998, but also declined in 2003 with drought conditions. Crested wheatgrass and cheatgrass increased significantly in 2008 while intermediate wheatgrass remained stable. Perennial forbs are diverse but are rarely encountered. The only common perennial forb encountered during every sample year was the prostrate fendler spurge (*Euphorbia fendleri*). Annual forbs increased in 2003 due primarily to bur buttercup (*Ranunculus testiculatus*), but have decreased again in 2008.

1992 TREND ASSESSMENT

Trend for browse is stable. Density differences for browse species may be related to the larger sample area used in 1992, therefore, trend for browse was determined using other parameters. The key browse on the site consist of black sagebrush, mountain big sagebrush, and Gambel oak. Vigor was good in all three species, but decadence increased slightly in black sagebrush and oak. Recruitment of young plants was good in all three species. There was an increase in pinyon and juniper trees which appear to be regaining dominance of the site. Trend for grasses is down. The sum of nested frequency of perennial grasses declined by 37%. There was a significant decrease in the nested frequency of crested wheatgrass, intermediate wheatgrass, and bottlebrush squirreltail. The trend for forbs is stable. The sum of nested frequency of perennial forbs changed little from 1987, and forbs are rare on the site.

winter range condition (DCI) - good (48) Low potential scale
browse - stable (0) grass - down (-2) forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. Density of the primary browse species, black sagebrush, has decreased by 41% since 1992 to 2,540 plants/acre. Black sagebrush appears to be thinning itself as the stand matures as cover on the site increased slightly since 1992. Decadence of black sagebrush has decreased slightly, but is still moderate at 20%. Recruitment of young black sagebrush plants has declined to 19% of the population. Gambel oak density has decreased by 61% since 1992 to 1,020 stems/acre. Mountain big sagebrush measurements have remained similar to 1992 levels. Trend for grasses is slightly up. The sum of nested frequency of perennial grasses increased by 43% from 1992, and production of perennial grasses increased from 4% of the total cover to 7% cover. There was a significant increase in the nested frequency of intermediate wheatgrass. However, cheatgrass also had a significant increase in nested frequency, and production increased from less than 1% of the total cover to over 3% cover. Cheatgrass currently accounts for 27% of the total herbaceous understory cover. Crested wheatgrass and intermediate wheatgrass are the dominate perennial species and together contribute 55% of the herbaceous understory cover. Trend for forbs is stable. There was a slight decline in the sum of nested frequency of perennial forbs, and forbs are rare on the site.

winter range condition (DCI) - good (54) Low potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is slightly down. Density of the primary browse species, black sagebrush, increased, but so did decadence and plants displaying poor vigor. Recruitment of young black sagebrush plants has declined to just 5% of the population. Density of mountain big sagebrush declined by 75% since 1998 to just 60 plants/acre. Mountain big sagebrush decadence increased to 67%, no young were sampled, and 33% of the population displayed poor vigor. There was a pinyon-juniper thinning treatment prior to the 2003 reading that should help both sagebrush species as well as the herbaceous understory. Trend for the grasses is down. Sum of nested frequency of perennial grasses has decreased by 51% since 1998, and production of perennial grasses declined to just 1% of the total cover. There was a significant decrease in the nested frequency of both of the

seeded grasses, crested wheatgrass and intermediate wheatgrass. Cheatgrass also had a significant decrease in its nested frequency, and it decreased to less than 1% of the total cover. Trend for forbs is slightly down. There has been a continued decrease in the sum of nested frequency of perennial forbs since 1992, and production of perennial forbs has decreased to less than 1% of the total cover. The annual species, burr buttercup, had a significant increase in nested frequency.

winter range condition (DCI) - fair (29) Low potential scale

browse - slightly down (-1)

grass - down (-2)

forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for browse is up. The density of the primary browse species, black sagebrush, increased 34% to 4,480 plants/acre. Decadence of black sagebrush has decreased to 13%, and vigor has improved. Recruitment of young black sagebrush plants is the highest since sampling began with young plants comprising 33% of the population. Density of mountain big sagebrush more than doubled to 180 plants/acre, and decadence and vigor improved markedly. The trend for grasses and forbs is up. The sum of nested frequency of perennial grasses and perennial forbs had around a two-fold increase. Production of perennial grasses and perennial forbs increased to 9% of the total cover and over 2% of the total cover, respectively. There was a significant increase in the nested frequency of crested wheatgrass, bottlebrush squirreltail, and cheatgrass. There was a significant decrease in the nested frequency of burr buttercup. Forbs are still a minor component on this site.

winter range condition (DCI) - good (63) Low potential scale

browse - slightly up (+1)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --

Management unit 28 , Study no: 7

T y p e	Species	Nested Frequency					Average Cover %			
		'87	'92	'98	'03	'08	'92	'98	'03	'08
G	Agropyron cristatum	c211	b146	bc154	a90	b140	3.39	4.71	.71	6.98
G	Agropyron intermedium	bc58	a27	c59	a13	ab29	.49	2.13	.05	.64
G	Agropyron smithii	-	-	11	-	-	-	.02	-	-
G	Agropyron spicatum	-	-	-	-	1	-	-	-	.03
G	Aristida purpurea	-	-	-	-	8	-	-	-	.19
G	Bromus tectorum (a)	-	a45	d219	b91	c145	.33	3.40	.33	1.00
G	Oryzopsis hymenoides	10	8	5	1	5	.07	.18	.15	.19
G	Poa secunda	a2	ab3	c24	bc21	c25	.00	.19	.12	.30
G	Sitanion hystrix	b13	a-	ab7	a4	c37	.00	.19	.01	.94
G	Sporobolus cryptandrus	-	-	-	-	1	-	-	-	.06
G	Stipa comata	-	-	3	-	-	-	.00	-	-
G	Vulpia octoflora (a)	-	-	a-	b12	a-	-	-	.03	-
Total for Annual Grasses		0	45	219	103	145	0.32	3.40	0.36	1.00
Total for Perennial Grasses		294	184	263	129	246	3.97	7.46	1.04	9.34
Total for Grasses		294	229	482	232	391	4.30	10.87	1.40	10.35
F	Alyssum alyssoides (a)	-	a3	a7	a10	b33	.00	.02	.02	.12

Type	Species	Nested Frequency					Average Cover %			
		'87	'92	'98	'03	'08	'92	'98	'03	'08
F	Arabis sp.	-	3	-	-	-	.00	-	-	-
F	Artemisia dracunculus	-	-	4	-	-	-	.03	-	-
F	Astragalus lentiginosus	-	2	-	-	5	.01	-	-	.06
F	Astragalus newberryi	1	4	3	-	8	.01	.01	-	.04
F	Castilleja linariaefolia	-	-	-	-	2	-	-	-	.01
F	Calochortus nuttallii	-	-	-	-	20	-	-	-	.27
F	Collinsia parviflora (a)	-	-	-	5	-	-	-	.01	-
F	Delphinium nuttallianum	a-	a-	a-	a ²	b ¹³	-	-	.00	.22
F	Draba sp. (a)	-	-	-	7	2	-	-	.02	.00
F	Eriogonum cernuum (a)	-	2	-	-	-	.00	-	-	-
F	Erigeron sp.	-	-	-	-	1	-	-	-	.03
F	Erigeron pumilus	b ¹⁰	ab ¹⁰	a ⁴	a-	a ³	.04	.01	-	.01
F	Eriogonum racemosum	-	1	-	3	4	.00	-	.00	.06
F	Eriogonum umbellatum	5	1	3	3	6	.03	.01	.00	.01
F	Euphorbia fendleri	b ⁸⁰	ab ⁷⁵	ab ⁵⁵	a ⁴⁰	ab ⁵⁰	1.12	.88	.40	.21
F	Lactuca serriola	-	1	6	-	-	.00	.02	-	-
F	Leucelene ericoides	a-	b ¹²	a ⁸	b ¹⁵	b ²²	.22	.30	.36	1.13
F	Lithospermum ruderale	a-	b ¹³	a ²	a ³	a ¹	.06	.15	.01	.01
F	Lygodesmia sp.	-	-	-	-	1	-	-	-	.03
F	Machaeranthera canescens	3	3	-	-	3	.03	-	-	.15
F	Microsteris gracilis (a)	-	-	-	4	4	-	-	.01	.01
F	Penstemon eatoni	-	-	-	-	-	-	.00	-	-
F	Petradoria pumila	1	-	-	-	-	-	-	-	-
F	Phlox longifolia	-	-	7	6	5	-	.01	.01	.01
F	Ranunculus testiculatus (a)	-	ab ¹⁸	a ⁷	c ⁹⁸	b ⁴¹	.09	.02	.74	.08
F	Senecio douglasii	2	-	-	-	-	-	-	-	-
F	Sphaeralcea coccinea	-	10	2	1	11	.19	.03	.03	.05
F	Streptanthus cordatus	3	9	10	9	12	.31	.09	.02	.05
F	Taraxacum officinale	-	-	-	-	4	-	-	-	.01
F	Tragopogon dubius	1	-	-	-	-	-	-	-	.03
F	Unknown forb-perennial	b ²⁴	a-	a-	a-	a-	-	-	-	-
Total for Annual Forbs		0	23	14	124	80	0.09	0.04	0.80	0.22
Total for Perennial Forbs		130	144	104	82	171	2.05	1.57	0.85	2.44
Total for Forbs		130	167	118	206	251	2.15	1.61	1.66	2.67

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

BROWSE TRENDS --

Management unit 28 , Study no: 7

Type	Species	Strip Frequency				Average Cover %			
		'92	'98	'03	'08	'92	'98	'03	'08
B	Artemisia nova	59	50	47	56	4.31	5.88	3.88	9.34
B	Artemisia tridentata vaseyana	7	8	3	6	.03	.15	.00	.06
B	Brickellia sp.	1	0	0	0	.00	-	-	-
B	Chrysothamnus nauseosus	1	2	0	4	.00	.00	-	.15
B	Eriogonum microthecum	12	4	2	3	1.05	.07	.03	.03
B	Gutierrezia sarothrae	49	30	43	48	1.46	.79	1.07	1.18
B	Juniperus osteosperma	4	2	0	0	1.92	1.25	-	-
B	Leptodactylon pungens	11	7	5	13	.27	.39	.15	.42
B	Opuntia sp.	2	2	1	5	.03	.04	.15	.15
B	Pediocactus simpsonii	0	0	0	2	-	-	-	.00
B	Pinus edulis	13	14	0	2	8.71	9.66	.39	.16
B	Quercus gambelii	8	7	9	8	4.50	4.65	3.42	1.50
Total for Browse		167	126	110	147	22.31	22.91	9.11	13.02

CANOPY COVER, LINE INTERCEPT --

Management unit 28 , Study no: 7

Species	Percent Cover		
	'98	'03	'08
Artemisia nova	-	3.26	4.41
Artemisia tridentata vaseyana	-	-	.08
Chrysothamnus nauseosus	-	-	.13
Gutierrezia sarothrae	-	.61	.30
Juniperus osteosperma	4.19	.40	-
Leptodactylon pungens	-	.03	.21
Opuntia sp.	-	-	.01
Pinus edulis	18.60	.50	2.91
Quercus gambelii	6.00	5.31	1.41

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28 , Study no: 7

Species	Average leader growth (in)	
	'03	'08
Artemisia nova	1.6	0.5

POINT-QUARTER TREE DATA --
Management unit 28 , Study no: 7

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	49	-	21
Pinus edulis	71	18	48

Average diameter (in)		
'98	'03	'08
4.7	-	1.2
5.1	1.0	3.9

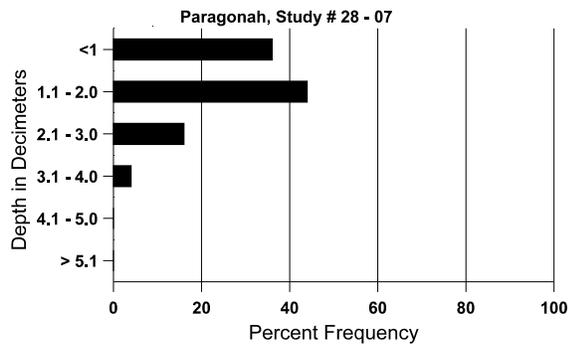
BASIC COVER --
Management unit 28 , Study no: 7

Cover Type	Average Cover %				
	'87	'92	'98	'03	'08
Vegetation	2.75	25.71	35.17	11.72	22.99
Rock	12.25	29.99	9.75	7.34	6.84
Pavement	27.00	0	18.49	9.14	12.12
Litter	43.50	34.60	47.87	57.23	52.14
Cryptogams	0	2.03	2.18	1.27	.38
Bare Ground	14.50	24.43	17.53	20.29	18.04

SOIL ANALYSIS DATA --
Management unit 28, Study no: 7, Study Name: Paragonah

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
10.9	68.4 (12.1)	6.3	65.4	20.4	14.2	2.2	6.0	3.2	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 28 , Study no: 7

Type	Quadrat Frequency			
	'92	'98	'03	'08
Sheep	2	-	-	-
Rabbit	84	56	24	50
Elk	-	1	-	-
Deer	26	28	4	26

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	-
-	-	-
23 (57)	23 (58)	29 (73)

BROWSE CHARACTERISTICS --

Management unit 28 , Study no: 7

		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 nova</i>												
87	3665	333	466	2933	266	-	11	76	7	.54	2	10/18
92	4300	440	840	2200	1260	-	53	22	29	-	1	-/-
98	2540	100	480	1560	500	260	13	0	20	3	3	11/21
03	2960	-	140	1560	1260	160	9	4	43	11	11	9/15
08	4480	3040	1460	2440	580	100	28	4	13	3	3	10/22
<i>Artemisia tridentata vaseyana</i>												
87	199	66	133	-	66	-	0	100	33	-	0	-/-
92	280	40	120	100	60	-	21	14	21	-	0	-/-
98	240	20	60	120	60	40	25	0	25	-	0	14/26
03	60	-	-	20	40	-	0	33	67	33	33	22/33
08	180	-	100	60	20	-	11	0	11	11	11	24/38
<i>Brickellia sp.</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
92	20	-	-	20	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Cercocarpus montanus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
92	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	8/9

		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)
Chrysothamnus nauseosus												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
92	20	20	20	-	-	-	0	0	0	-	0	-/-
98	40	-	-	40	-	-	0	0	0	-	0	8/12
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	80	-	-	40	40	20	0	0	50	25	25	10/8
Eriogonum microthecum												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
92	520	20	120	400	-	-	4	8	0	-	0	-/-
98	140	-	80	40	20	-	0	29	14	-	29	7/11
03	80	-	-	80	-	-	0	25	0	-	0	5/6
08	80	20	20	40	20	-	0	25	25	25	25	3/6
Gutierrezia sarothrae												
87	7931	466	399	7266	266	-	0	0	3	.75	3	8/5
92	4320	120	1640	2660	20	-	0	0	0	-	0	-/-
98	1320	20	400	900	20	40	0	0	2	-	2	9/9
03	2560	60	420	2120	20	80	0	0	1	.78	.78	6/6
08	3040	1000	800	1800	440	1080	0	0	14	11	11	5/6
Juniperus osteosperma												
87	0	66	-	-	-	-	0	0	-	-	0	-/-
92	80	20	-	80	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	80	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Leptodactylon pungens												
87	932	-	66	866	-	-	0	0	0	-	93	3/5
92	600	-	80	520	-	-	3	0	0	-	0	-/-
98	360	-	40	300	20	-	0	0	6	-	0	7/12
03	320	-	60	240	20	-	0	0	6	6	6	4/7
08	820	40	260	400	160	-	0	0	20	-	0	6/8
Opuntia sp.												
87	66	-	-	66	-	-	0	0	0	-	100	2/8
92	100	20	20	60	20	-	0	0	20	-	20	-/-
98	60	20	20	20	20	-	0	0	33	33	67	5/9
03	60	-	-	60	-	-	0	0	0	-	0	6/11
08	160	-	40	120	-	-	0	0	0	-	0	4/6

		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													
87	0	-	-	-	-	-	0	0	-	-	0	-/-	
92	0	-	-	-	-	-	0	0	-	-	0	-/-	
98	0	-	-	-	-	-	0	0	-	-	0	-/-	
03	0	-	-	-	-	-	0	0	-	-	0	-/-	
08	40	-	-	40	-	-	0	0	-	-	0	1/2	
Pinus edulis													
87	199	-	-	199	-	-	0	0	-	-	0	85/47	
92	400	-	240	160	-	-	0	0	-	-	0	-/-	
98	300	60	80	220	-	20	0	0	-	-	0	-/-	
03	0	80	-	-	-	180	0	0	-	-	0	-/-	
08	80	80	80	-	-	-	0	0	-	-	0	-/-	
Quercus gambelii													
87	199	-	199	-	-	-	0	0	0	-	0	-/-	
92	2620	400	1860	520	240	-	9	18	9	-	6	-/-	
98	1020	-	640	380	-	80	0	0	0	-	0	87/29	
03	2160	-	740	1340	80	160	0	0	4	2	2	59/31	
08	3280	-	1420	1860	-	-	0	0	0	-	0	76/40	