

Trend Study 25C-23-08

Study site name: Coal Bench.

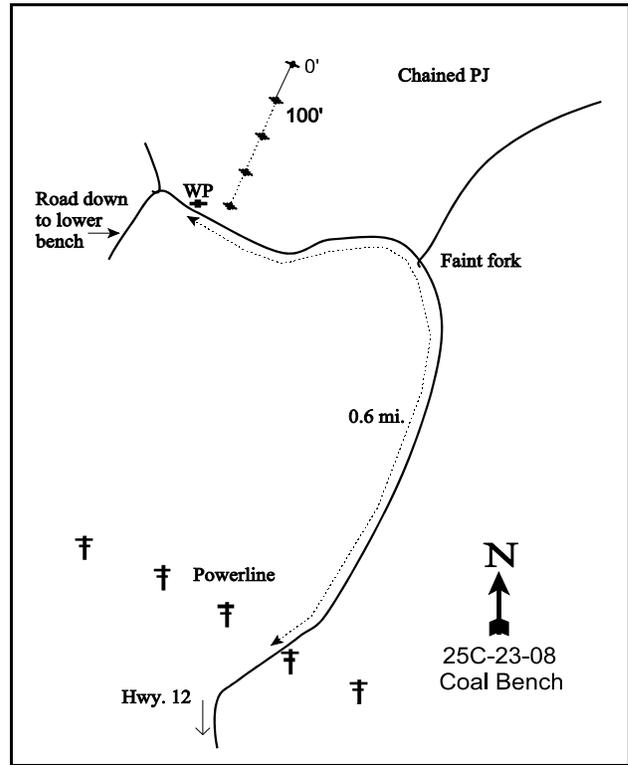
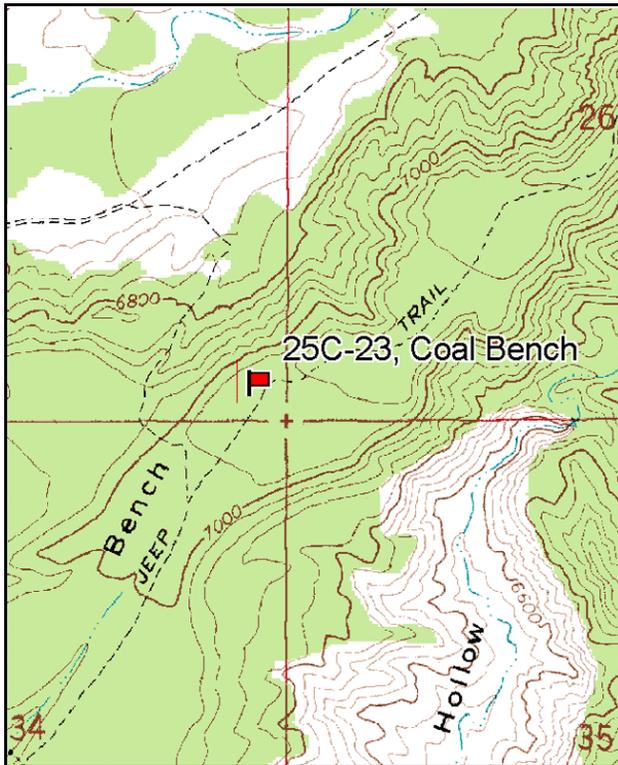
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 208 degrees magnetic.

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

LOCATION DESCRIPTION

Take SR12 west of Escalante towards Henrieville. Go 0.5 mile past mile marker 33, then turn right (north) onto a dirt road which leads toward Coal Bench. Go to a fork (take left fork to cross the wash) and continue 0.3 miles to a gate. From the gate travel 2.0 miles to a fence at the top of the bench. Continue 0.6 miles to a fork, keep right. Continue 1.1 mile to a fence, then pass under the powerlines. Go 1.0 mile to a larger set of powerlines. Continue 0.6 miles to where the road bends and drops down onto a lower bench. There is a witness post (4 foot tall green fencepost) on the right side of the road. From the witness post, walk 100 feet at 114 degrees magnetic to the 400-foot stake. The 0-foot baseline stake, 400 feet northeast, is marked with browse tag #7139.



Map Name: Pine Lake

Diagrammatic Sketch

Township 36S, Range 2W, Section 34

GPS: NAD 83, UTM 12S 413113 E, 4166069 N

DISCUSSION

Coal Bench - Trend Study No. 25C-23

Study Information

This trend study is located on the large Coal Bench Mesa, below the Table Cliffs on a southwest point of the Aquarius Plateau [elevation: 7,000 feet (2,134 m), slope: 3%-5%, aspect: south]. Most of the suitable acreage (3,500 acres) on Coal Bench has been chained and/or plowed and seeded. Treatments were completed in 1966. The transect is located on the narrow, northern end of upper Coal Bench. Deer use the area as a major spring and fall migration route from the Dixie National Forest to winter ranges further south. In mild winters, some deer stay in the area. Pellet group data taken during the 1991 reading estimated 14 deer days use/acre (35 ddu/ha). Deer use was estimated to be light in 1998, 2003, and 2008 with an average of 6 days use/acre (15 ddu/ha). Deer pellet groups were concentrated around cliffrose (*Cowania mexicana* ssp. *stansburiana*) plants in 1998. There was only one elk pellet group found in 1998 and 2008, and elk use was estimated to be light in 2003 (2 edu/acre:5 edu/ha). Cattle use was estimated to be light in 1998, 2003, and 2008 (4 cdu/acre:10 cdu/ha, 11 cdu/acre:27 cdu/ha, and 2 cdu/acre:5 cdu/ha, respectively). This area is within a 3 pasture rest rotation grazing system with use occurring in the spring or summer.

Soil

The soil is relatively deep with an estimated effective rooting depth of almost 15 inches. At that depth, a hard pan layer was encountered which was impenetrable to the soil penetrometer. Soil texture is a sandy clay loam which is neutral in reactivity (pH 7.0). The soil was formed in alluvium from sandstone and shale. Phosphorus is low at only 4 ppm, limiting plant growth and development (Tiedemann and Lopez 2004). Relative combined vegetation and litter cover has decreased from 68% in 1998 to 54% in 2008. Relative combined rock and pavement increased from 6% in 1998 to 12% in 2008. Relative bare ground cover was 25% in 1998, 35% in 2003, and 34% in 2008. Some areas have evidence of continued soil movement with rills, exposed plant roots, soil pedestaling and localized concentrations of pavement on the surface. The soil erosion condition class was considered to be stable in 2003 and slight in 2008.

Browse

Twenty years after the chaining, and prior to the 1998 reading, young (5-8 foot tall) pinyon pine (*Pinus edulis*) and juniper (*Juniperus osteosperma*) trees were common on the site. Density did not appear great enough to effect understory plants in 1991. During the spring or early summer of 1998, prior to the 1998 reading, there was a lop and scatter treatment on pinyon and juniper over the study area. Point-quarter data estimated 14 pinyon and 24 juniper trees/acre still on the site in 1998. Of these, 1/3 of the juniper trees sampled were cut, but still living because they were not cut close enough to the ground. Pinyon had an average basal diameter of only 1 inch while uncut surviving juniper averaged 2.7 inches in diameter. Shrub density strip data estimated a total of 260 dead pinyon and juniper trees/acre that were killed by the treatment. Point-quarter data from 2003 estimated 13 pinyon and 14 juniper trees/acre with average basal diameters of 2.5 and 2.9 inches, respectively. Eighty percent of the pinyon and 64% of the juniper trees sampled were in the 1 to 4 foot height class. There was no point-quarter data gathered in 2008.

Black sagebrush (*Artemisia nova*) is the most common browse species and made up 90% of the total browse cover in 2008. Density was estimated at 933 plants/acre in 1987 increasing to 4,599 by 1991. The much larger sample used in 1998 estimated 2,840 plants/acre, and increased to around 3,500 plants/acre in 2003 and 2008. Young recruitment has been good during all readings with the exception of marginal recruitment in 2003 and 2008. Utilization was mostly light to moderate with a few plants displaying heavy use. Use was heavier in 1991 when 64% of the shrubs sampled displayed moderate use, and 2008 when 22% of the sagebrush displayed heavy use and 27% displayed moderate use. Vigor has been good during all readings and percent decadence has remained low.

Other preferred browse species consist of small numbers of curlleaf mountain mahogany (*Cercocarpus ledifolius*) and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Curlleaf was first picked up in

1998 with the larger sample. Cliffrose numbered an estimated 100 plants/acre in 2008. Many of these are 6 to 7 feet tall and mostly heavily utilized where available. Annual leader growth was good, averaging about 3 inches in 2003 and 2008. Annual leaders were only found on plants which had received browsing use during the past winter. Most cliffrose was vigorous in 2003 and 2008. There were no decadent cliffrose plants encountered until 2008 when decadence was estimated at 40%. Other browse found on the site include a few Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), rubber rabbitbrush (*Chrysothamnus nauseosus*), bitterbrush (*Purshia tridentata*), and broom snakeweed (*Gutierrezia sarothrae*).

Herbaceous Understory

The understory is productive but dominated by crested wheatgrass (*Agropyron cristatum*) which provided 73% of the total vegetation cover in 1998. Crested wheatgrass has provided approximately 100% of the grass cover from 1998 to 2008. Heavy litter buildup is associated with these mature plants. The bunchgrass provides excellent soil protection where it occurs, but there is a lot of exposed soil between plants. Native grasses are uncommon. Forbs are rare and only a large-leaved *Cryptantha* sp. was found more than occasionally.

1991 TREND ASSESSMENT

Most of the more important browse species are in very low numbers, 66 plants/acre or less. The one key species that occurs in high numbers is black sagebrush. Density was estimated at 4,599 plants/acre, up from 933 plants/acre in 1987. Trend for browse is up. The trend for grasses is stable with the only common grass species being crested wheatgrass and its sum of nested frequency remaining fairly constant. The trend for forbs is slightly down. There was a slight decrease in the sum of nested frequency of perennial forbs as well as a decrease in the number of forb species encountered from 8 in 1987 to 5 in 1991. The only common forb is a *Cryptantha* species.

browse - up (+2)

grass - stable (0)

forb - slightly down (-1)

1998 TREND ASSESSMENT

Trend for browse is considered stable. Density of the key species, black sagebrush, declined 38% due to a reduced number of young plants (3,233 to 1,060 plants/acre). There is still more than enough young plants to maintain the population at current levels. In addition, the number of seedlings has increased. Vigor is good and decadence low at only 4%. Other preferred species, curlleaf mountain mahogany and cliffrose, have low but stable densities. Trend for the grasses is stable. Sum of nested frequency of crested wheatgrass has remained similar to 1991. Trend for the forbs is slightly up. The sum of nested frequency of perennial forbs increased slightly, primarily due to a significant increase in frequency of the *Cryptantha* sp. Composition of all herbaceous species is poor with crested wheatgrass providing 94% of the herbaceous cover.

winter range condition (DCI) - fair (39) Low potential scale

browse - stable (0)

grass - stable (0)

forb - slightly up (+1)

2003 TREND ASSESSMENT

Trend for browse is up slightly for black sagebrush and stable for cliffrose. Black sagebrush increased 22% in density to 3,620 plants/acre. Vigor is normal on most plants. The number of decadent plants did increase to 15% of the population but young sagebrush are abundant enough to maintain the stand. Cliffrose has remained at a density of 60 plants/acre. All are mature, treelike shrubs with an average height of 5 feet. Browsing is moderate where available. Vigor remains good but there is no sign of seedling or young recruitment. Trend for the grasses and forbs is down. Sum of nested frequency of perennial grasses declined 35% and the sum of nested frequency of perennial forbs declined 66%. In addition, the 2 most abundant species, crested wheatgrass and *Cryptantha* species declined significantly in nested frequency. Production also dropped dramatically. Average grass and forb cover declined 3 fold since 1998. This site appears to be quite dry and likely effected by the past few drought years. Weather data from Escalante shows below normal spring precipitation (April-June) for the past 4 years with exceptionally dry conditions in 2000 and 2002.

winter range condition (DCI) - fair (36) Low potential scale

browse - slightly up (+1)

grass - down (-2)

forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is stable. Density of the primary browse species, black sagebrush, is similar to 2003. The number of decadent sagebrush has increased slightly from 15% in 2003 to 27%. Sagebrush vigor was good and recruitment was moderate with 200 young plants/acre. Density of cliffrose increased slightly to 100 plants/acre. Decadent cliffrose plants were encountered for the first time since the study was established and decadence was high at 40%. Vigor remains good. There was no recruitment of young cliffrose plants in 2008. The trend for the grasses is slightly up. Sum of nested frequency of perennial grasses increased. Crested wheatgrass increased in both frequency and production. Crested wheatgrass remains the primary grass cover. The trend for forbs is down. Sum of nested frequency of perennial forbs continued to decline. Forbs continue to be very rare on the site.

winter range condition (DCI) - fair (36) Low potential scale

browse - stable (0)

grass - slightly up (+1)

forb - down (-2)

HERBACEOUS TRENDS --

Management unit 25C, Study no: 23

T y p e	Species	Nested Frequency					Average Cover %		
		'87	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	c277	bc250	c249	a151	ab199	16.34	5.03	7.78
G	Agropyron smithii	-	-	3	-	-	.01	-	-
G	Aristida purpurea	a-	a3	a-	b11	a3	-	.05	.03
G	Oryzopsis hymenoides	3	5	-	-	7	-	-	.07
G	Sitanion hystrix	1	-	-	3	3	-	.00	.00
G	Unknown grass - perennial	3	-	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	0	0	0	0	0
Total for Perennial Grasses		284	258	252	165	212	16.35	5.08	7.90
Total for Grasses		284	258	252	165	212	16.35	5.08	7.90
F	Arabis demissa	-	4	-	-	-	-	-	-
F	Astragalus sp.	3	-	2	-	-	.03	-	-
F	Cruciferae	1	-	-	-	-	-	-	-
F	Cryptantha sp.	ab40	a32	b57	a22	a12	1.06	.38	.24
F	Gilia sp. (a)	-	-	-	-	-	.00	-	-
F	Ipomopsis aggregata	2	-	8	-	-	.02	-	-
F	Lesquerella intermedia	2	-	-	-	-	-	-	-
F	Lithospermum ruderales	6	-	-	-	-	-	-	-
F	Penstemon sp.	-	2	-	1	-	-	.03	-
F	Phlox austromontana	2	3	3	1	-	.01	.00	-
F	Townsendia incana	2	1	-	-	-	-	-	-
Total for Annual Forbs		0	0	0	0	0	0.00	0	0
Total for Perennial Forbs		58	42	70	24	12	1.12	0.41	0.24
Total for Forbs		58	42	70	24	12	1.12	0.41	0.24

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

BROWSE TRENDS --

Management unit 25C, Study no: 23

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Artemisia frigida</i>	44	49	48	.00	.38	.00
B	<i>Artemisia nova</i>	0	0	0	4.08	7.31	7.56
B	<i>Cercocarpus ledifolius</i>	2	0	0	.38	-	-
B	<i>Chrysothamnus nauseosus</i>	1	2	2	.00	.63	.00
B	<i>Cowania mexicana stansburiana</i>	3	3	4	.53	.81	.71
B	<i>Gutierrezia sarothrae</i>	1	16	6	.00	.22	.02
B	<i>Juniperus osteosperma</i>	1	1	0	0.0	0.0	-
B	<i>Opuntia</i> sp.	1	0	0	0.0	-	-
B	<i>Pinus edulis</i>	3	2	3	.03	.18	.15
B	<i>Sclerocactus</i> sp.	1	0	0	0.0	-	-
Total for Browse		57	73	63	5.03	9.54	8.44

CANOPY COVER, LINE INTERCEPT --

Management unit 25C, Study no: 23

Species	Percent Cover	
	'03	'08
<i>Artemisia nova</i>	5.90	8.25
<i>Chrysothamnus nauseosus</i>	.56	-
<i>Cowania mexicana stansburiana</i>	.70	1.48
<i>Gutierrezia sarothrae</i>	.08	-
<i>Pinus edulis</i>	.21	.73
<i>Purshia tridentata</i>	.23	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 25C, Study no: 23

Species	Average leader growth (in)	
	'03	'08
<i>Artemisia nova</i>	1.5	1.3
<i>Cowania mexicana stansburiana</i>	2.9	3.1

POINT-QUARTER TREE DATA --
Management unit 25C, Study no: 23

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	24	14	<18
Pinus edulis	14	13	<18

Average diameter (in)		
'98	'03	'08
2.3	2.9	-
1.0	2.5	-

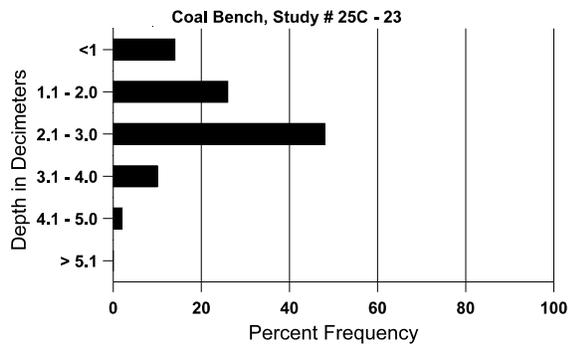
BASIC COVER --
Management unit 25C, Study no: 23

Cover Type	Average Cover %				
	'87	'91	'98	'03	'08
Vegetation	4.25	5.50	24.64	14.16	17.26
Rock	.50	1.50	.23	.36	.57
Pavement	10.00	4.75	6.96	7.98	11.49
Litter	53.75	45.75	48.13	46.87	40.42
Cryptogams	.50	1.00	.87	.15	.31
Bare Ground	31.00	41.50	26.76	37.06	35.85

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 23, Study Name: Coal Bench

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
14.9	64.3 (13.6)	7.0	54.0	19.4	26.6	4.6	4.0	76.8	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 25C, Study no: 23

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	42	33	88
Elk	-	3	2
Deer	20	9	14
Cattle	1	2	3

Days use per acre (ha)		
'98	'03	'08
-	-	-
1 (2)	2 (5)	1 (2)
7 (17)	7 (18)	5 (13)
4 (10)	11 (27)	2 (5)

BROWSE CHARACTERISTICS --

Management unit 25C, Study no: 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)
<i>Artemisia nova</i>												
87	932	3133	299	633	-	-	29	7	0	-	4	10/14
91	4599	33	3233	1233	133	-	64	2	3	-	0	8/10
98	2840	1000	1060	1660	120	120	18	6	4	-	0	11/17
03	3620	-	300	2760	560	140	15	.55	15	7	7	13/19
08	3460	260	200	2320	940	80	27	22	27	6	8	13/24
<i>Artemisia tridentata wyomingensis</i>												
87	33	-	-	33	-	-	0	0	-	-	0	26/16
91	33	-	-	33	-	-	100	0	-	-	0	20/27
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	31/44
08	0	-	-	-	-	-	0	0	-	-	0	36/30
<i>Cercocarpus ledifolius</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	100	-	-	60	40	-	0	0	40	-	0	5/8
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	0	0	0	-	0	-/-
<i>Cercocarpus montanus</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	109/141

		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>Chrysothamnus nauseosus</i>												
87	33	-	-	-	33	-	100	0	100	-	0	-/-
91	0	-	-	-	-	-	0	0	0	-	0	-/-
98	20	-	-	20	-	-	100	0	0	-	0	34/41
03	40	-	-	-	40	-	0	0	100	100	100	34/43
08	40	-	-	-	40	60	0	0	100	50	50	35/60
<i>Cowania mexicana stansburiana</i>												
87	66	-	-	66	-	-	100	0	0	-	0	84/96
91	33	33	-	33	-	-	0	0	0	-	0	93/107
98	60	-	40	20	-	-	0	0	0	-	0	74/73
03	60	-	-	60	-	-	67	0	0	-	0	62/61
08	100	-	-	60	40	-	0	60	40	-	0	77/71
<i>Eriogonum microthecum</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	2/4
<i>Gutierrezia sarothrae</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	140	20	-	-	-	0	0	-	-	0	10/10
03	540	-	100	440	-	-	0	0	-	-	0	9/11
08	140	200	20	120	-	140	0	0	-	-	0	6/7
<i>Juniperus osteosperma</i>												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	40	0	0	-	-	0	-/-
03	20	-	20	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
87	0	-	-	-	-	-	0	0	0	-	0	-/-
91	99	-	33	33	33	-	0	0	33	-	0	4/8
98	40	20	-	40	-	-	0	0	0	-	0	5/13
03	0	-	-	-	-	-	0	0	0	-	0	-/-
08	0	-	-	-	-	-	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)
Pinus edulis												
87	33	-	33	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	80	20	80	-	-	220	0	0	-	-	0	-/-
03	40	-	40	-	-	-	0	0	-	-	0	-/-
08	60	-	20	40	-	-	0	0	-	-	0	-/-
Purshia tridentata												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	17/24
03	0	-	-	-	-	-	0	0	-	-	0	23/30
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Sclerocactus sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	20	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Shepherdia rotundifolia												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	75/108
08	0	-	-	-	-	-	0	0	-	-	0	39/82
Yucca sp.												
87	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	19/26