

BATES KNOB - TREND STUDY NO. 15-5-09

Vegetation Type: Chained, Seeded P-J

Range Type: Crucial Deer Winter, Crucial Bison Year-Long

NRCS Ecological Site Description: Upland Stony Loam (Wyoming Big Sagebrush), R035XY318UT

Land Ownership: BLM

Elevation: 7,700 ft (2,347 m)

Aspect: southwest

Slope: 7%

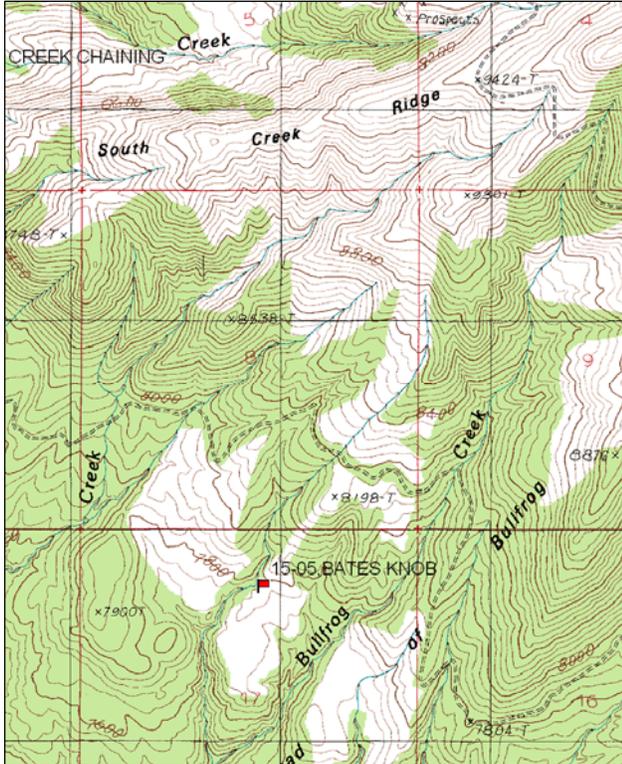
Transect bearing: 165 degrees magnetic.

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

Directions:

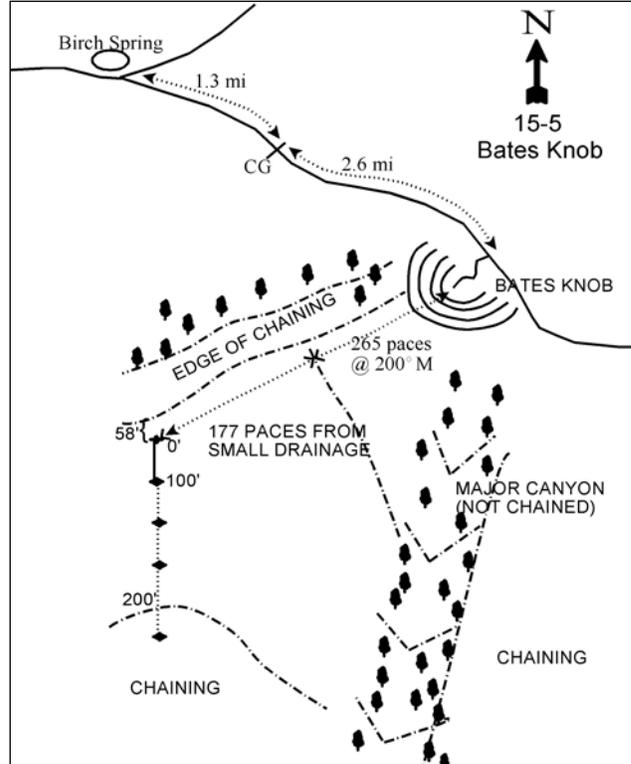
From Birch Spring (see transect 15-4-99), continue southwest on main road for 1.3 miles to a cattleguard. From the cattleguard, go 2.6 miles to a minor road which forks off to the right and goes up on top of a small hill (Bates Knob) overlooking a chaining. From the hilltop, walk down through a chained strip, over a small wash and through the chaining to the baseline stake, about 600 (265 paces) yards bearing 220°M. The transect is marked by 1 ½-foot tall fenceposts. The first baseline stake has a red browse tag, #7421, attached.

Map Name: Mount Ellen



Township: 32S, Range: 10E, Section: 17

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 514835 E 4208910 N

## BATES KNOB - TREND STUDY NO. 15-5

### Site Information

Site Description: The study is located on a pinyon-juniper chaining on the north end of the Pennell Allotment. Water is available seasonally in Buck Canyon, which is just south of the study site. A lop and scatter treatment of pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) was done in 2008 ([WRI project# 1123](#)). There are very few pinyon or juniper trees remaining within the sample area. Bison were observed near or on the site during the 1987, 1999, and 2009 samplings. Pellet group data for bison and cattle were combined due to the difficulty in separating between the species. Bison/cattle use estimates have decreased each sample year since 1999. Deer use estimates have increased each sample year since 1999, but still only show light to moderate use (Table - Pellet Group Data).

Browse: Green rubber rabbitbrush (*Chrysothamnus nauseosus graveolens*) has been the dominant browse species on the site with an average cover of around 7% since 1994 (Table - Browse Trends). Density of rubber rabbitbrush has decreased since 1994 with a large increase in decadence and plants displaying poor vigor in 2009. Recruitment of young rubber rabbitbrush plants has steadily declined since 1994 (Table \_Browse Characteristics).

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the dominant preferred browse on the site and has been increasing in cover since 1994 (Table - Browse Trends). Sagebrush is now the co-dominant species on the site with rubber rabbitbrush. Density of sagebrush has increased markedly since 1994 with very good recruitment of young sagebrush plants. Decadence and vigor of sagebrush have also been very good since 1994.

Prior to the lop and scatter treatment, pinyon and juniper had begun to reestablish and were the dominant browse species on the site. After the treatment there were few pinyon or juniper trees in the sample area, though pinyon and juniper trees were common surrounding the site. The treatment reduced pinyon density from 34 trees/acre in 2004 to 8 trees/acre in 2009. Juniper density was reduced from 32 trees/acre in 2004 to 6 trees acre in 2009. Pinyon cover was reduced from 4% to 0% in 2009.

Herbaceous Understory: The grasses on the site are abundant, but not very diverse. Crested wheatgrass (*Agropyron cristatum*) is the dominant species on the site providing over 80% of the total grass cover since 1994. Crested wheatgrass cover has varied from 5-12%. Cheatgrass (*Bromus tectorum*) has been observed on the site in moderate amounts in the past, but is currently rare on the site (Table - Herbaceous Trends).

Forbs have been quite diverse on the site, but currently they are rare and provide little cover. The dominant forb is a rhizomatous alfalfa (*Medicago sativa*) which has been declining in cover since 1994 (Table - Herbaceous Trends).

Soil: The soils at the site are a light colored, sandy clay loam of granitic origin with an estimated effective rooting depth is about 15 inches and a neutral pH (7.1) (Table - Soil Analysis Data). There is some noticeable trailing by animals through some areas. Bare ground cover has been moderate on the site over the sample years, with most protective ground cover coming from litter (Table - Basic Cover). The soil erosion condition classification was rated as stable in 2004, but was moderate in 2009 due to flow patterns, pedestaling around plants, and surface litter and soil movement.

## Trend Assessments

### Browse:

- **1987 to 1994 - up (+2):** Differences in density may be related to the larger sample area used in 1994; therefore, trend was determined using other parameters. Decadence of mountain big sagebrush and the proportion of sagebrush plants displaying poor vigor each decreased from 50% to 0%. Recruitment of young sagebrush plants increased and is very high at 66% of the population.
- **1994 to 1999 - up (+2):** Mountain big sagebrush density increased markedly to 4,740 plants/acre, and cover increased from 2% to 4%. Recruitment of young sagebrush plants is still high at 48%.
- **1999 to 2004 - stable (0):** Mountain big sagebrush density decreased 30% to 3,320 plants/acre, though cover has increased to 6%. Recruitment of young sagebrush plants has fallen to 11% of the population. Average height and crown measurements have doubled. With the increase in size and cover of sagebrush and the decrease in density and recruitment it appears this stand is maturing and going through a period of self-thinning.
- **2004 to 2009 - up (+2):** Mountain big sagebrush density increased to 8,520 plants/acre, the highest value since sampling began. Cover of sagebrush increased to 8% and recruitment of young sagebrush has increased to 28%. Sagebrush now provides nearly as much cover as green rubber rabbitbrush. Pinyon cover was reduced from 4% to 0% by the lop and scatter treatment.

### Grass:

- **1987 to 1994 - down (-2):** The sum of nested frequency of perennial grasses decreased by 20%. There was a significant decrease in the nested frequency of crested wheatgrass and bottlebrush squirreltail.
- **1994 to 1999 - stable (0):** There was little change in the nested frequency of perennial grasses, though cover increased slightly.
- **1999 to 2004 - down (-2):** The sum of nested frequency of perennial grasses decreased by 43%, and cover decreased from 12% to 5%. There was a significant decrease in nested frequency of crested wheatgrass and cheatgrass.
- **2004 to 2009 - up (+2):** The sum of nested frequency of perennial grasses increased by 44%, and cover increased to 8%. There was a significant increase in nested frequency of crested wheatgrass.

### Forb:

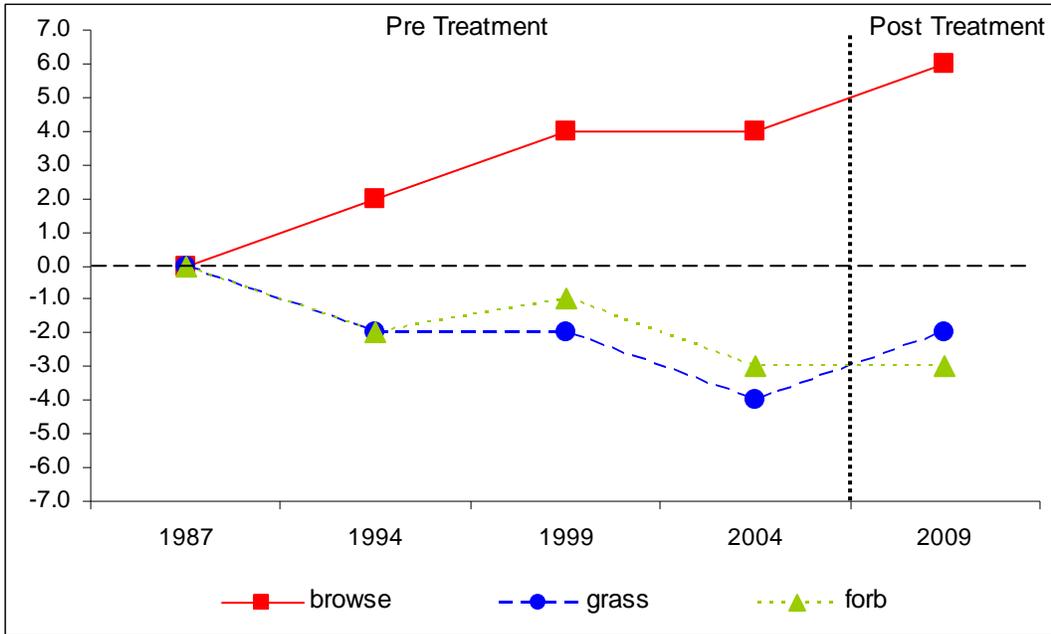
- **1987 to 1994 - down (-2):** The sum of nested frequency of perennial forbs decreased by 60%. There was a significant decrease in the nested frequency of alfalfa.
- **1994 to 1999 - slightly up (+1):** The sum of nested frequency of perennial forbs increased, but cover decreased slightly.
- **1999 to 2004 - down (-2):** The sum of nested frequency of perennial forbs decreased markedly, but cover remained similar.
- **2004 to 2009 - stable (0):** There was no change in the sum of nested frequency of perennial forbs, but cover decreased to less than 1%.

DEER DESIRABLE COMPONENTS INDEX – MID-LEVEL POTENTIAL SCALE --  
Management unit 15, study no: 5

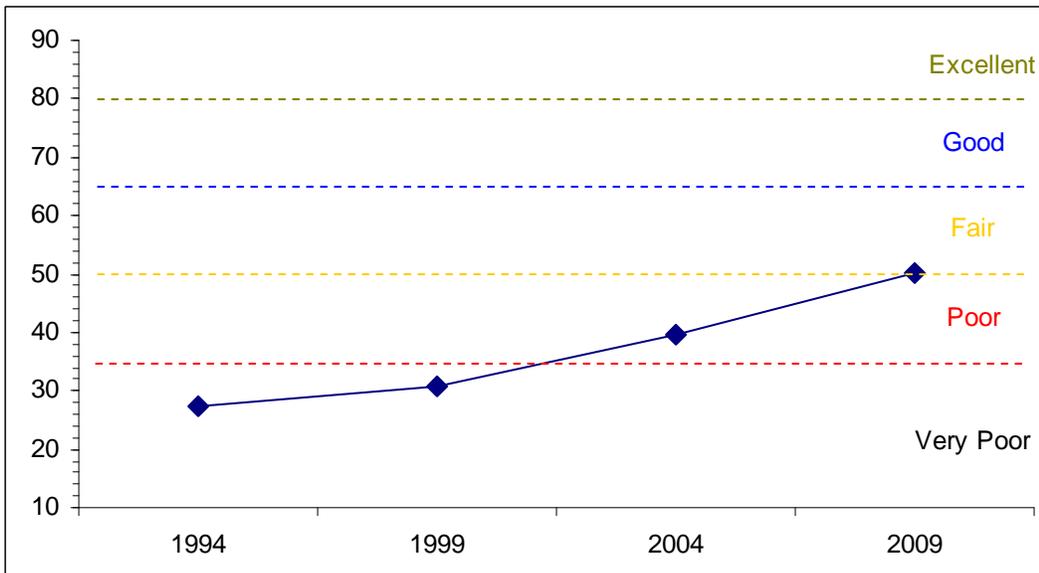
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
94	2.2	0	0	20.9	-0.5	4.8	0	<b>27.4</b>	Very Poor
99	4.5	0	0	24	-1.7	3.9	0	<b>30.7</b>	Very Poor
04	6.9	13.8	5.5	9.5	0	3.8	0	<b>39.5</b>	Poor
09	10.0	14.7	7.9	16.2	0.0	1.5	0.0	<b>50.3</b>	Poor-Fair

## Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--  
Management unit 15 Study no: 5



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL  
Management unit 15, Study no: 5



HERBACEOUS TRENDS--  
Management unit 15, Study no: 5

Type	Species	Nested Frequency					Average Cover %			
		'87	'94	'99	'04	'09	'94	'99	'04	'09
G	Agropyron cristatum	d300	bc253	cd269	a153	b221	10.38	11.92	4.75	8.06
G	Agropyron intermedium	3	-	-	-	-	-	-	-	-
G	Bouteloua gracilis	-	1	2	-	5	.00	.03	-	.03
G	Bromus tectorum (a)	-	b41	c112	ab7	a-	.71	2.20	.02	-
G	Oryzopsis hymenoides	1	-	-	-	-	-	-	-	-
G	Sitanion hystrix	b24	a8	a5	a5	a-	.04	.04	.01	-
G	Sporobolus cryptandrus	1	1	2	-	1	.00	.00	-	.00
Total for Annual Grasses		0	41	112	7	0	0.71	2.20	0.01	0
Total for Perennial Grasses		329	263	278	158	227	10.44	12.00	4.76	8.10
Total for Grasses		329	304	390	165	227	11.15	14.20	4.78	8.10
F	Arabis sp.	-	3	4	-	-	.00	.01	-	-
F	Artemisia ludoviciana	b38	a2	a-	a-	a-	.03	-	.03	-
F	Aster sp.	-	1	-	-	-	.00	-	-	-
F	Astragalus sp.	-	5	2	5	6	.04	.00	.03	.02
F	Astragalus utahensis	-	4	1	6	2	.01	.00	.03	.03
F	Chaenactis douglasii	3	1	3	-	-	.00	.01	-	-
F	Chenopodium album (a)	-	10	-	-	3	.02	-	-	.03
F	Chenopodium fremontii (a)	-	a-	a-	b15	a-	-	-	.09	-
F	Cymopterus purpureus	-	2	-	-	-	.00	-	-	-
F	Descurainia pinnata (a)	-	c47	b24	ab3	a1	.25	.07	.01	.00
F	Eriogonum alatum	b26	a-	a-	a-	a3	-	-	-	.03
F	Gayophytum ramosissimum(a)	-	ab18	a1	b32	a-	.03	.00	.09	-
F	Hymenoxys acaulis	9	-	-	2	-	-	-	.00	-
F	Lappula occidentalis (a)	-	c88	ab15	b26	a1	.77	.03	.13	.01
F	Lesquerella kingii	b21	bc26	c43	a-	b11	.09	.30	-	.05
F	Machaeranthera canescens	4	8	2	-	4	.01	.01	.00	.03
F	Medicago sativa	b109	a30	a49	a23	a23	2.13	1.48	1.62	.55
F	Penstemon sp.	-	-	3	3	-	-	.00	.06	-
F	Petradoria pumila	-	-	6	-	-	-	.09	-	-
F	Phlox longifolia	-	2	5	6	-	.03	.01	.06	-
F	Polygonum douglasii (a)	-	b49	a1	ab7	ab17	.25	.00	.02	.03
F	Senecio multilobatus	-	3	-	2	1	.03	-	.03	.03
F	Sisymbrium altissimum (a)	-	b21	ab7	a-	a-	.24	.04	-	-
F	Tragopogon dubius	1	1	-	3	-	.00	-	.00	-
F	Unknown forb-perennial	9	-	-	-	-	-	-	-	-
Total for Annual Forbs		0	233	48	83	22	1.57	0.15	0.35	0.08
Total for Perennial Forbs		220	88	118	50	50	2.41	1.93	1.89	0.75
Total for Forbs		220	321	166	133	72	3.99	2.09	2.24	0.84

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

BROWSE TRENDS--

Management unit 15, Study no: 5

Type	Species	Strip Frequency				Average Cover %			
		'94	'99	'04	'09	'94	'99	'04	'09
B	Artemisia carruthii	6	5	5	4	.00	.06	.18	.38
B	Artemisia tridentata vaseyana	20	34	29	66	1.77	3.59	5.52	7.86
B	Atriplex canescens	0	0	0	0	-	-	-	.15
B	Chrysothamnus nauseosus graveolens	73	78	56	64	5.67	7.78	7.45	8.20
B	Chrysothamnus viscidiflorus viscidiflorus	3	1	0	0	.17	.00	-	-
B	Gutierrezia sarothrae	13	29	22	23	.00	.64	.66	1.00
B	Juniperus osteosperma	0	1	0	1	-	.38	.38	.00
B	Pinus edulis	0	4	4	1	1.79	1.79	3.51	.00
Total for Browse		115	152	116	159	9.42	14.25	17.72	17.60

CANOPY COVER, LINE INTERCEPT--

Management unit 15, Study no: 5

Species	Percent Cover		
	'99	'04	'09
Artemisia carruthii	-	.15	.03
Artemisia tridentata vaseyana	-	7.66	16.70
Chrysothamnus nauseosus graveolens	-	9.21	9.48
Gutierrezia sarothrae	-	.20	2.00
Pinus edulis	1.00	3.58	-

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 15, Study no: 5

Species	Average leader growth (in)	
	'04	'09
Artemisia tridentata vaseyana	2.7	1.8

POINT-QUARTER TREE DATA--

Management unit 15, Study no: 5

Species	Trees per Acre			Average diameter (in)		
	'99	'04	'09	'99	'04	'09
Juniperus osteosperma	20	32	8	5.3	5.6	4.7
Pinus edulis	16	34	6	3.8	4.2	4.0

**BASIC COVER--**

Management unit 15, Study no: 5

Cover Type	Average Cover %				
	'87	'94	'99	'04	'09
Vegetation	6.00	25.36	28.06	23.93	25.42
Rock	5.25	5.65	7.41	7.75	9.02
Pavement	5.50	.68	1.61	2.55	3.06
Litter	57.50	39.38	47.73	31.77	53.77
Cryptogams	0	0	.21	.04	.04
Bare Ground	25.75	18.68	19.11	27.37	22.60

**SOIL ANALYSIS DATA --**

Management unit 15, Study no: 5, Study Name: Bates Knob

Effective rooting depth (in)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15	7.1	46	25.4	28.6	2.8	16.9	121.6	0.7

**PELLET GROUP DATA--**

Management unit 15, Study no: 5

Type	Quadrat Frequency				Days use per acre (ha)		
	'94	'99	'04	'09	'99	'04	'09
Rabbit	14	20	2	36	-	-	-
Deer	3	8	3	10	3 (7)	7 (18)	15 (36)
Bison/Cattle	14	10	5	4	64 (158)	26 (62)	8 (20)

**BROWSE CHARACTERISTICS--**

Management unit 15, Study no: 5

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<b>Amelanchier utahensis</b>									
87	0	0	0	-	-	0	0	0	-/-
94	0	0	0	-	-	0	0	0	-/-
99	0	0	0	-	-	0	0	0	-/-
04	0	0	0	-	-	0	0	0	47/23
09	0	0	0	-	-	0	0	0	-/-
<b>Artemesia carruthii</b>									
87	0	0	0	0	-	0	0	0	-/-
94	740	11	89	0	20	0	0	0	5/9
99	860	77	21	2	260	0	0	2	2/3
04	240	17	83	0	-	0	0	0	7/8
09	440	14	86	0	-	0	0	0	2/1

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<i>Artemisia tridentata vaseyana</i>										
87	66	50	0	50	-	50	0	50	-/-	
94	1780	66	34	0	4480	0	0	0	14/20	
99	4740	48	50	2	220	42	2	0	9/15	
04	3320	11	85	4	3160	31	6	.60	18/29	
09	5860	16	83	1	140	0	3	0	14/23	
<i>Chrysothamnus nauseosus graveolens</i>										
87	365	55	45	0	299	9	0	0	26/37	
94	6100	52	40	7	20320	15	.32	7	22/28	
99	5860	21	74	4	80	47	13	.68	27/29	
04	2300	19	72	9	12280	0	0	3	27/34	
09	2680	3	63	34	-	15	5	25	26/29	
<i>Chrysothamnus viscidiflorus viscidiflorus</i>										
87	0	0	0	-	-	0	0	0	-/-	
94	80	0	100	-	440	0	0	0	5/6	
99	20	0	100	-	-	0	0	0	6/10	
04	0	0	0	-	-	0	0	0	-/-	
09	0	0	0	-	-	0	0	0	-/-	
<i>Gutierrezia sarothrae</i>										
87	199	0	100	0	-	0	0	0	8/5	
94	400	45	55	0	20	10	0	0	20/31	
99	1620	11	85	4	80	0	0	2	7/9	
04	860	5	86	9	60	0	0	9	9/10	
09	1900	7	93	0	120	0	0	0	9/10	
<i>Juniperus osteosperma</i>										
87	33	100	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	20	100	0	-	-	0	0	0	-/-	
04	0	0	0	-	-	0	0	0	-/-	
09	20	100	0	-	-	0	0	0	-/-	
<i>Opuntia sp.</i>										
87	0	0	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	0	0	0	-	-	0	0	0	-/-	
04	0	0	0	-	-	0	0	0	-/-	
09	0	0	0	-	-	0	0	0	7/9	
<i>Pinus edulis</i>										
87	33	100	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	80	0	100	-	-	0	0	0	-/-	
04	140	29	71	-	-	0	0	0	-/-	
09	20	0	100	-	-	0	0	0	-/-	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
<b>Sambucus cerulea</b>										
87	0	0	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	0	0	0	-	-	0	0	0	-/-	
04	0	0	0	-	-	0	0	0	53/79	
09	0	0	0	-	-	0	0	0	-/-	
<b>Shepherdia sp.</b>										
87	0	0	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	0	0	0	-	-	0	0	0	-/-	
04	0	0	0	-	-	0	0	0	-/-	
09	0	0	0	-	-	0	0	0	103/108	