

AIRPLANE SPRING - TREND STUDY NO. 15-7-09

Vegetation Type: Chained, Seeded P-J

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

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

Land Ownership: BLM

Elevation: 7,800 ft (2,377 m)

Aspect: southwest

Slope: 18%-20%

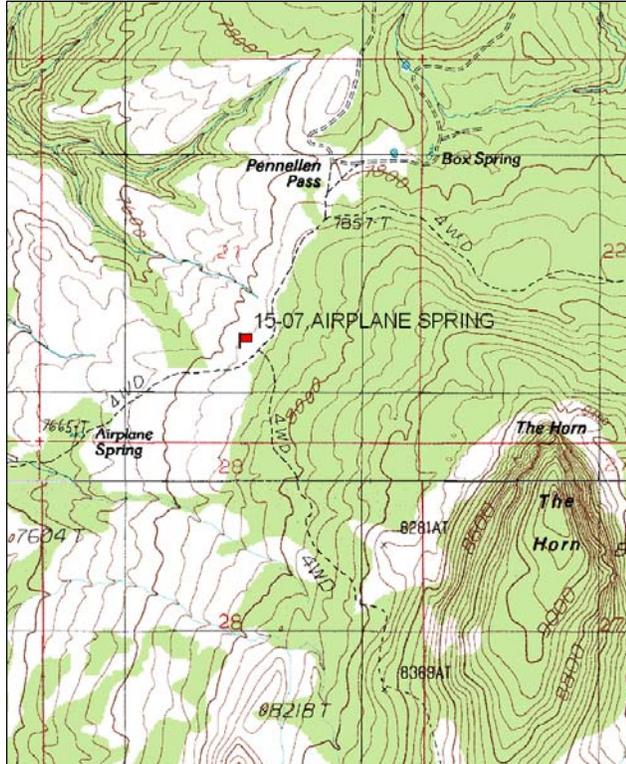
Transect bearing: 263 degrees magnetic.

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

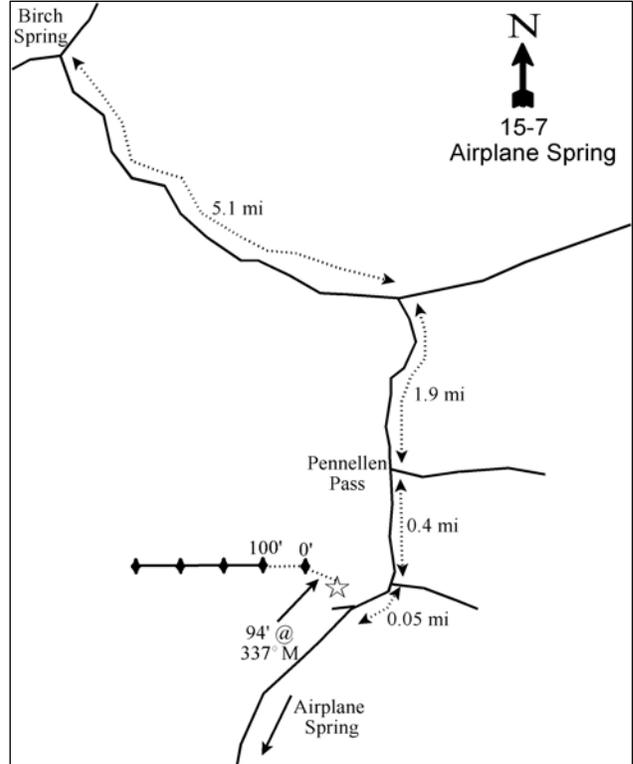
Directions:

From Birch Spring (T32S, R10E, Sec. 6), travel southeast for 5.1 miles. Turn right, go 1.9 miles past Box Springs to a major intersection at Pennellen Pass. Bear right, and go 0.4 miles to another intersection. Bear right towards Airplane Spring, but go only about 0.05 miles (200 feet) to a pullout on the right. A witness post is located 117 feet off the main road. The first baseline stake is 94 feet northwest (at 337° M) of the witness post. The transect stakes are 2-foot tall fence posts, the first one is marked with browse tag #7174.

Map Name: Mount Ellen



Diagrammatic Sketch:



Township: 32S, Range: 10E, Section: 21

GPS: NAD 83, UTM 12S 516424 E 4206393 N

AIRPLANE SPRING - TREND STUDY NO. 15-7

Site Information

Site Description: The study site is located within a chaining project that was completed during the mid-1960's. The Bulldog fire, which burned in 2003, burned the area just west of this site, but not directly on the study area. A lop and scatter retreatment was done in 2008 to remove pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees that had reestablished on the site ([WRI project# 1123](#)). This portion of the chaining is in the Pennell Allotment and is a key area for bison and deer. The nearest water source is Airplane Spring which is one-half mile downslope from the site. The study site is within a few hundred feet of the road that links Airplane Springs with Box Springs. Pellet group data for bison and cattle were combined due to difficulties in differentiating between these species. Bison/cattle use was estimated to be moderate to light since 1999. Deer use was estimated to be light in 1999 and 2004, but increased to moderately heavy use in 2009 (Table - Pellet Group Data).

Browse: Preferred browse species are diverse in this area. The dominant preferred browse species is black sagebrush (*Artemisia nova*) which has provided an average cover of 6% since 1999 (Table - Browse Trends). Vigor, decadence, and recruitment of young black sagebrush plants have been good over the study years. Use of black sagebrush has been mostly light (Table - Browse Characteristics). Other more highly preferred browse species that occur in limited numbers on the site include true mountain mahogany (*Cercocarpus montanus*), Utah serviceberry (*Amelanchier utahensis*), and antelope bitterbrush (*Purshia tridentata*). Utilization of these species has been very high with some moderate use over the course of the study (Table - Browse Characteristics).

In 2004, prior to the lop and scatter treatment, pinyon and juniper were the dominant browse species on the site. Tree density was reduced from 57 juniper/acre in 2004 to 14 juniper/acre in 2009 and 78 pinyon/acre in 2004 to 8 pinyon/acre in 2009 (Table- Point-Quarter Tree Data), though they are still common surrounding the site. Tree cover was reduced from nearly 16% in 2004 to nearly 0% in 2009.

Herbaceous Understory: Grasses are abundant on the site, but diversity is low. The most common grasses on the site have been the seeded species, crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*A. intermedium*). The nested frequency and cover of intermediate wheatgrass decreased steadily over the years and is now rare on the site. Crested wheatgrass remains the dominant species. Grass cover has varied between 11% and 20% (Table - Herbaceous Trends).

Forbs are rare on the site. Cover of forbs has steadily decreased since 1994. Alfalfa (*Medicago sativa*) was the dominant forb at the outset of the study, but is now sampled only rarely (Table - Herbaceous Trends).

Soil: The soil is a reddish brown, clay loam with an effective rooting depth estimated at just over 11 inches and a neutral pH (7.0) (Table - Soil Analysis Data). The site is very rocky both on the soil surface and throughout the profile. Bare ground cover has been low on the site with protective soil cover being provided primarily from rock and litter cover (Table - Basic Cover). The soil erosion condition classification was rated as stable in 2004 and slight in 2009 due primarily to pedestaling of plants and flow patterns.

Trend Assessments

Browse:

- **1987 to 1994 - stable (0):** Differences in density may be related to the larger sample area used in 1994; therefore, trend was determined using other parameters. Vigor and decadence of black sagebrush and true mountain mahogany remained good. Recruitment of young black sagebrush plants remained good.
- **1994 to 1999 - up (+2):** Density of the dominant preferred browse species black sagebrush increased 45% to 5,100 plants/acre, and cover increased from 4% to 7%. Decadence and vigor of black

sagebrush improved slightly and recruitment of young plants increased. Density of true mountain mahogany increased by 89% to 340 plants/acre, while cover has remained stable.

- **1999 to 2004 - slightly up (+1):** Density of black sagebrush increased by 16% to 5,940 plants/acre. Recruitment of young black sagebrush plants decreased, but remained good. There was a slight decrease in the density of true mountain mahogany and Utah serviceberry.
- **2004 to 2009 – stable (0):** Density of black sagebrush decreased by 12% to 5,220 plants/acre, but cover remained stable. Density of true mountain mahogany and serviceberry increased slightly. Preferred browse cover remained similar at 10%.

Grass:

- **1987 to 1994 - down (-2):** The sum of nested frequency for perennial grasses decreased 32%. There was a significant decrease in the nested frequency of crested wheatgrass, intermediate wheatgrass, and bottlebrush squirreltail (*Sitanion hystrix*).
- **1994 to 1999 - stable (0):** The sum of nested frequency for perennial grasses decreased slightly, however, perennial grass cover increased from 13% to 20% with crested wheatgrass being the predominant species.
- **1999 to 2004 – slightly down (-1):** The sum of nested frequency of perennial grasses declined 19% and cover decreased from 20% to 15%.
- **2004 to 2009 – slightly up (+1):** The sum of nested frequency of perennial grasses increased 11%, although it is only about half of nested frequency value from 1987. Perennial grass cover dipped from 15% to 11%. There was a significant increase in nested frequency of bottlebrush squirreltail.

Forb:

- **1987 to 1994 - down (-2):** Forbs are rare on this site. The sum of nested frequency for perennial forbs decreased 22%. Forbs provide less than 2% cover. There was a significant decrease in the nested frequency of alfalfa.
- **1994 to 1999 – slightly up (+1):** The sum of nested frequency for perennial forbs increased 15% while annual species declined slightly. Forbs provide just over 1% cover.
- **1999 to 2004 - down (-2):** The sum of nested frequency for perennial forbs declined 54%. Forbs provide less than 1% cover.
- **2004 to 2009 – stable (0):** The increase in the sum of nested frequency of perennial forbs is 75%, but forbs occur so infrequently that any improvement provides a large percent increase. Total forb cover is still less than 1%

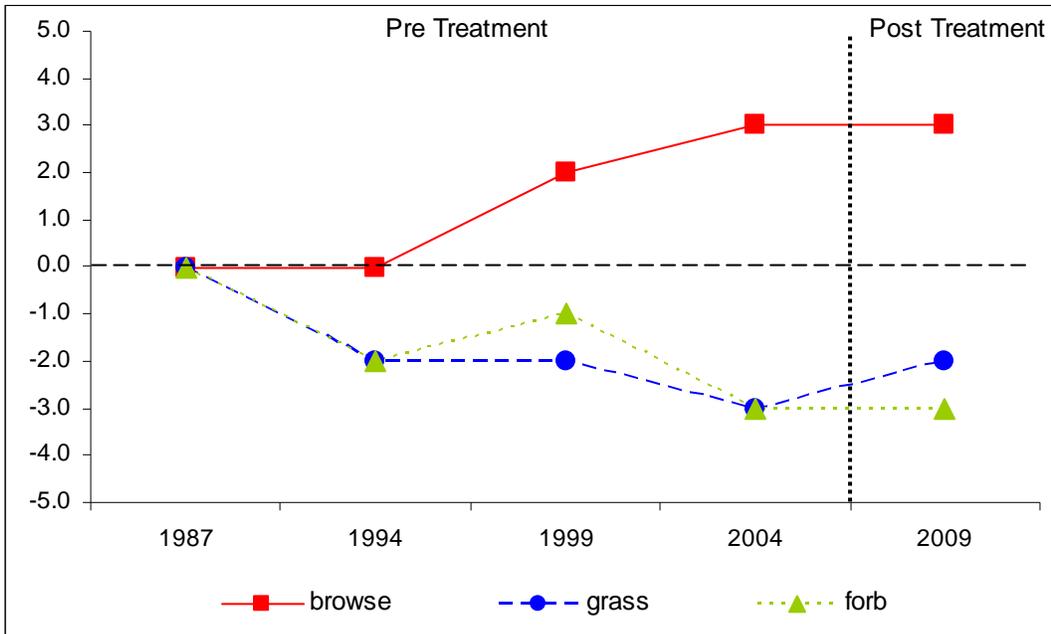
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 15, study no: 7

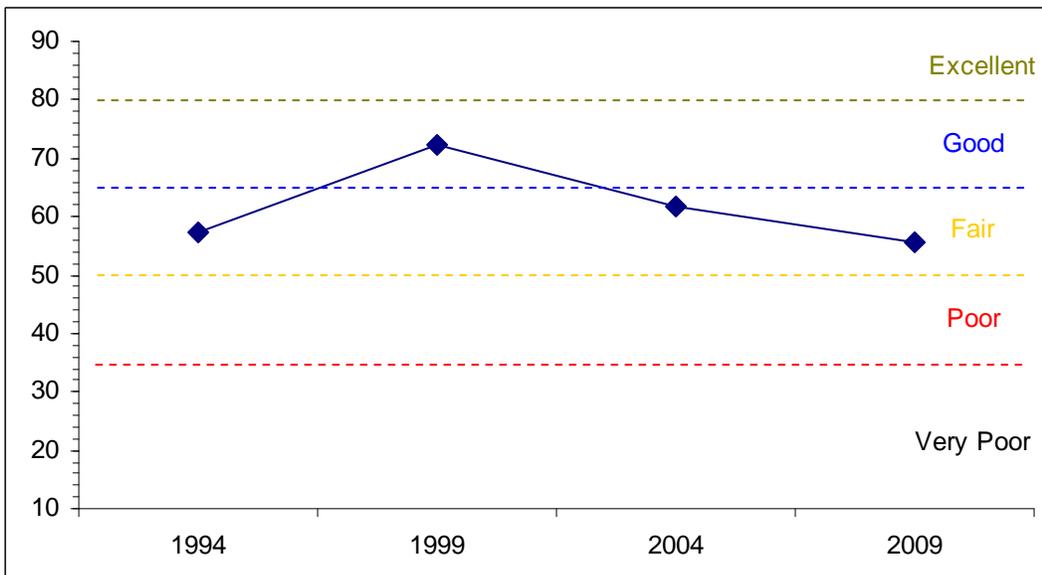
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
94	9.4	11.9	6.6	26.1	0.0	3.4	0.0	57.3	Fair
99	11.8	12.5	15.0	30.0	0.0	2.9	0.0	72.2	Good
04	12.3	13.0	4.7	30.0	0.0	1.6	0.0	61.7	Fair
09	13.4	12.7	5.4	22.8	0.0	1.2	0.0	55.5	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 15 Study no: 7



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL
 Management unit 15, Study no: 7



HERBACEOUS TRENDS--
Management unit 15, Study no: 7

Type	Species	Nested Frequency					Average Cover %			
		'87	'94	'99	'04	'09	'94	'99	'04	'09
G	Agropyron cristatum	c306	ab238	bc264	a233	ab245	11.67	19.07	14.83	10.69
G	Agropyron intermedium	c122	b58	ab28	a7	a-	1.04	.64	.04	-
G	Bouteloua gracilis	1	5	-	1	-	.01	-	.03	-
G	Bromus tectorum (a)	-	6	-	3	6	.01	-	.01	.04
G	Festuca ovina	2	-	8	4	-	-	.24	.04	-
G	Oryzopsis hymenoides	-	-	2	-	-	-	.03	-	-
G	Poa fendleriana	a-	b19	ab10	a3	b26	.15	.10	.03	.44
G	Sitanion hystrix	c73	b28	a1	ab7	ab11	.15	.01	.07	.27
Total for Annual Grasses		0	6	0	3	6	0.00	0	0.01	0.03
Total for Perennial Grasses		504	348	313	255	282	13.03	20.11	15.05	11.41
Total for Grasses		504	354	313	258	288	13.05	20.11	15.07	11.45
F	Arabis sp.	-	-	11	-	-	-	.02	-	-
F	Aster sp.	-	4	-	-	4	.01	-	-	.15
F	Astragalus sp.	a3	a-	a2	a3	b11	-	.03	.00	.13
F	Astragalus utahensis	-	-	-	1	-	-	-	.00	-
F	Castilleja sp.	-	-	4	-	5	-	.03	.00	.03
F	Chenopodium fremontii (a)	-	-	-	5	1	-	-	.04	.00
F	Cymopterus sp.	-	3	-	-	1	.01	-	-	.00
F	Erigeron eatonii	b27	b29	ab15	a6	a5	.29	.09	.01	.01
F	Eriogonum umbellatum	a-	a3	a2	ab9	b10	.03	.03	.06	.05
F	Gayophytum ramosissimum(a)	-	ab12	a-	b19	a5	.02	-	.04	.03
F	Hedysarum boreale	-	2	-	-	-	.03	-	-	-
F	Hymenoxys acaulis	14	8	10	5	8	.02	.05	.01	.04
F	Hymenoxys richardsonii	-	-	6	2	-	-	.01	.03	.00
F	Lappula occidentalis (a)	-	b19	a5	ab18	a3	.05	.02	.06	.01
F	Lesquerella kingii	a2	ab4	b19	a-	ab13	.01	.06	-	.05
F	Lomatium sp.	a-	a-	a-	a-	b12	-	-	-	.05
F	Machaeranthera canescens	-	-	-	-	2	-	-	-	.01
F	Machaeranthera grindelioides	-	-	-	-	1	-	-	-	.00
F	Medicago sativa	b49	a9	a19	a6	a2	.90	.96	.45	.03
F	Orthocarpus sp. (a)	3	-	-	-	-	-	-	-	-
F	Penstemon sp.	-	9	1	9	3	.01	.00	.13	.03
F	Phlox longifolia	-	10	9	3	5	.02	.05	.00	.01
F	Polygonum douglasii (a)	-	7	1	12	5	.01	.00	.03	.01
F	Schoenocrambe linifolia	b15	a3	a-	a-	a2	.00	-	-	.00
F	Sphaeralcea coccinea	3	7	7	4	-	.33	.07	.07	-
F	Tragopogon dubius	3	-	-	-	-	-	-	-	-
F	Unknown forb-perennial	1	-	-	-	-	-	-	-	-
Total for Annual Forbs		3	38	6	54	14	0.08	0.02	0.18	0.06
Total for Perennial Forbs		117	91	105	48	84	1.68	1.44	0.79	0.62
Total for Forbs		120	129	111	102	98	1.77	1.46	0.97	0.69

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

BROWSE TRENDS--

Management unit 15, Study no: 7

Type	Species	Strip Frequency				Average Cover %			
		'94	'99	'04	'09	'94	'99	'04	'09
B	Amelanchier utahensis	9	6	4	6	1.11	1.01	.06	.68
B	Artemisia nova	41	54	55	49	3.51	6.68	6.87	7.08
B	Artemisia tridentata vaseyana	3	0	0	1	.38	-	.15	.00
B	Cercocarpus montanus	9	11	12	11	1.62	1.25	2.03	1.50
B	Chrysothamnus depressus	4	10	4	5	.15	.03	.03	.00
B	Chrysothamnus nauseosus graveolens	2	3	2	2	.00	.00	.00	.00
B	Chrysothamnus viscidiflorus viscidiflorus	4	5	2	0	.03	.00	.03	-
B	Gutierrezia sarothrae	14	12	13	18	.38	.21	.41	.15
B	Juniperus osteosperma	0	5	4	0	1.25	2.00	2.36	.03
B	Opuntia sp.	2	1	1	2	.00	.00	.00	.00
B	Pinus edulis	0	6	7	1	4.11	6.48	8.69	.00
B	Purshia tridentata	1	1	0	1	.15	.00	-	.00
B	Quercus gambelii	0	1	0	1	-	.00	-	.00
B	Ribes leptanthum	0	1	1	0	-	.03	.30	1.00
B	Sclerocactus sp.	0	1	1	0	-	.03	.00	-
B	Symphoricarpos oreophilus	2	2	2	2	.16	.03	.03	.00
Total for Browse		91	119	108	99	12.90	17.80	20.98	10.48

CANOPY COVER, LINE INTERCEPT--

Management unit 15, Study no: 7

Species	Percent Cover		
	'99	'04	'09
Amelanchier utahensis	.20	1.14	1.66
Artemisia nova	-	7.13	8.26
Artemisia tridentata vaseyana	-	.23	-
Cercocarpus montanus	.40	2.54	2.81
Chrysothamnus viscidiflorus viscidiflorus	-	.21	-
Gutierrezia sarothrae	-	.71	-
Juniperus osteosperma	1.00	2.26	-
Opuntia sp.	-	-	.05
Pinus edulis	7.19	13.26	.33
Purshia tridentata	-	-	.78
Ribes leptanthum	-	1.39	1.54
Symphoricarpos oreophilus	-	.85	.36

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 15, Study no: 7

Species	Average leader growth (in)	
	'04	'09
Amelanchier utahensis	2.2	1.4
Artemisia nova	1.7	1.1
Cercocarpus montanus	3.1	1.5

POINT-QUARTER TREE DATA--

Management unit 15, Study no: 7

Species	Trees per Acre			Average diameter (in)		
	'99	'04	'09	'99	'04	'09
Juniperus osteosperma	60	57	14	3.9	4.5	1.8
Pinus edulis	80	78	8	3.9	4.2	2.2

BASIC COVER--

Management unit 15, Study no: 7

Cover Type	Average Cover %				
	'87	'94	'99	'04	'09
Vegetation	6.50	28.12	37.69	36.76	24.17
Rock	19.50	22.58	28.07	25.61	22.22
Pavement	4.25	2.94	9.41	7.90	7.46
Litter	57.50	33.31	28.98	32.45	46.80
Cryptogams	.50	.18	.25	.12	.06
Bare Ground	11.75	11.27	12.93	14.67	11.31

SOIL ANALYSIS DATA --

Management unit 15, Study no: 7, Study Name: Airplane Spring

Effective rooting depth (in)	pH	clay loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
11.2	7	44	27.4	28.6	5.2	17.7	156.8	0.7

PELLET GROUP DATA--

Management unit 15, Study no: 7

Type	Quadrat Frequency				Days use per acre (ha)		
	'94	'99	'04	'09	'99	'04	'09
Rabbit	18	61	14	43	-	-	-
Deer	8	12	19	25	4 (10)	13 (33)	40 (99)
Bison/Cattle	-	6	1	3	21 (51)	26 (62)	14 (34)

BROWSE CHARACTERISTICS--

Management unit 15, Study no: 7

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Amelanchier utahensis</i>									
87	166	20	80	0	-	0	100	0	33/22
94	220	9	82	9	-	27	9	9	46/58
99	220	9	91	0	20	36	9	0	57/56
04	100	0	100	0	-	0	100	0	59/57
09	200	10	80	10	-	30	0	0	63/52
<i>Artemisia nova</i>									
87	1665	64	34	2	4033	8	2	2	14/21
94	3520	20	68	13	3400	0	0	18	11/17
99	5100	35	55	10	5440	15	9	.39	12/24
04	5940	13	78	9	100	0	0	3	10/17
09	5220	13	77	10	380	12	0	7	9/18
<i>Artemisia tridentata vaseyana</i>									
87	132	75	25	-	133	0	0	0	17/13
94	60	33	67	-	300	0	0	0	16/26
99	0	0	0	-	-	0	0	0	-/-
04	0	0	0	-	-	0	0	0	21/34
09	60	100	0	-	40	0	0	0	20/46
<i>Cercocarpus montanus</i>									
87	66	0	100	0	-	50	50	0	21/30
94	180	0	100	0	-	22	44	0	31/28
99	340	24	71	6	-	6	47	0	42/38
04	240	0	100	0	100	17	83	0	35/41
09	260	8	92	0	-	31	54	0	43/45
<i>Chrysothamnus depressus</i>									
87	432	85	8	8	33	85	0	0	4/10
94	100	0	100	0	-	0	0	0	6/14
99	280	0	71	29	-	36	50	7	3/6
04	140	0	100	0	-	57	29	0	6/8
09	140	14	86	0	-	29	0	0	2/4
<i>Chrysothamnus nauseosus graveolens</i>									
87	0	0	0	-	-	0	0	0	-/-
94	40	0	100	-	40	50	50	50	20/28
99	60	0	100	-	-	0	0	0	26/30
04	40	50	50	-	-	0	0	0	35/42
09	40	0	100	-	-	0	0	0	32/40

		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>Chrysothamnus viscidiflorus viscidiflorus</i>										
87	0	0	0	0	-	0	0	0	-/-	
94	180	0	78	22	-	0	0	0	3/6	
99	140	29	57	14	-	0	0	0	9/12	
04	40	0	100	0	-	0	0	0	11/16	
09	0	0	0	0	-	0	0	0	-/-	
<i>Eriogonum microthecum</i>										
87	0	0	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	0	0	0	-	-	0	0	0	5/13	
04	0	0	0	-	-	0	0	0	-/-	
09	0	0	0	-	-	0	0	0	-/-	
<i>Gutierrezia sarothrae</i>										
87	1399	60	40	0	-	0	0	0	10/8	
94	740	27	65	8	100	0	0	8	6/7	
99	1000	48	48	4	260	0	0	2	6/8	
04	780	5	95	0	-	0	0	0	7/8	
09	660	12	82	6	-	0	0	6	5/5	
<i>Juniperus osteosperma</i>										
87	99	100	0	-	33	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	100	80	20	-	-	0	0	0	-/-	
04	80	25	75	-	-	0	0	0	-/-	
09	0	0	0	-	-	0	0	0	-/-	
<i>Opuntia sp.</i>										
87	0	0	0	-	-	0	0	0	-/-	
94	40	50	50	-	-	0	0	0	0/1	
99	20	0	100	-	-	0	0	0	4/4	
04	20	0	100	-	-	0	0	0	-/-	
09	60	0	100	-	-	0	0	0	5/6	
<i>Pinus edulis</i>										
87	99	100	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	160	13	88	-	-	0	0	0	-/-	
04	160	25	75	-	-	0	0	0	-/-	
09	20	100	0	-	-	0	0	0	-/-	
<i>Purshia tridentata</i>										
87	0	0	0	0	-	0	0	0	-/-	
94	20	0	0	100	-	0	100	0	6/24	
99	20	0	100	0	-	0	100	0	74/76	
04	0	0	0	0	-	0	0	0	12/28	
09	60	0	100	0	-	0	100	0	17/101	

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Quercus gambelii										
87	0	0	0	0	-	0	0	0	-/-	
94	0	0	0	0	-	0	0	0	-/-	
99	160	50	38	13	120	0	0	0	18/22	
04	0	0	0	0	-	0	0	0	12/24	
09	40	0	100	0	-	0	0	0	10/12	
Ribes leptanthum										
87	0	0	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	60/96	
99	20	0	100	-	-	0	0	0	64/67	
04	20	0	100	-	-	0	0	0	56/66	
09	0	0	0	-	-	0	0	0	42/31	
Sclerocactus sp.										
87	0	0	0	-	-	0	0	0	-/-	
94	0	0	0	-	-	0	0	0	-/-	
99	20	0	100	-	-	0	0	0	3/3	
04	20	0	100	-	-	0	0	0	-/-	
09	0	0	0	-	-	0	0	0	-/-	
Symphoricarpos oreophilus										
87	565	53	41	6	66	24	47	0	21/20	
94	40	50	50	0	40	50	0	0	10/21	
99	40	50	50	0	-	0	0	0	28/66	
04	40	0	100	0	-	50	0	0	21/50	
09	80	75	0	25	-	0	0	25	25/63	