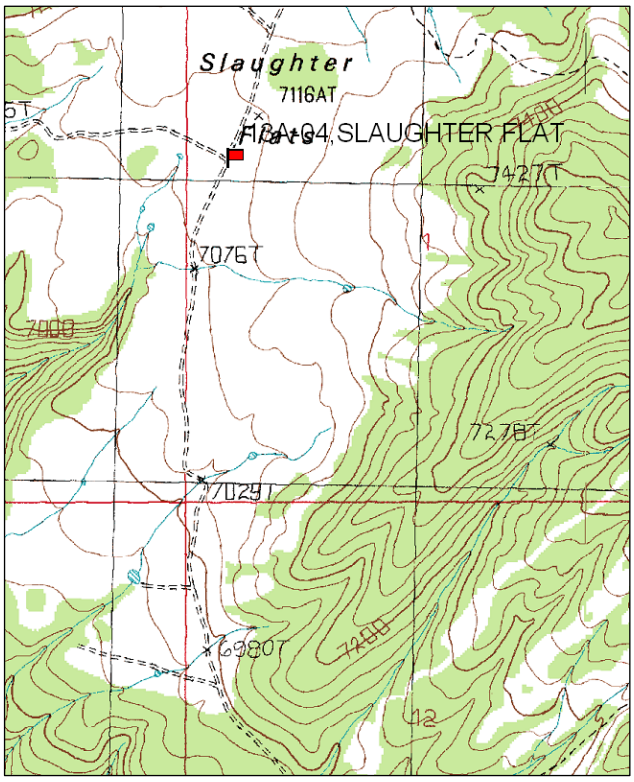
SLAUGHTER FLAT - TREND STUDY NO. 13A-4-09

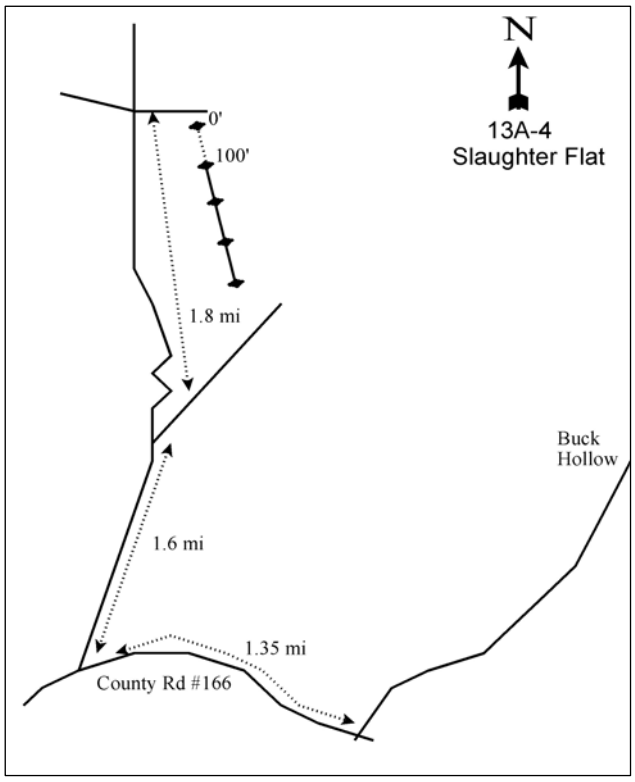
Vegetation Type: Chained, Seeded P-J
Range Type: Crucial Deer Winter, Crucial Elk Winter
NRCS Ecological Site Description: Upland Loam (Basin Big Sagebrush), R035XY306UT
Land Ownership: US Forest Service
Elevation: 7,100 ft (2,164 m)
Aspect: Flat
Slope: 0%-2%
Transect bearing: 165 degrees magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
Take SR 191 south from Moab, at mile marker 113, continue 0.15 miles south and turn left (east) on county road #166. Continue south on main road for 10.05 miles and turn left (east). Go 1.6 miles to a fork. Stay left at fork and drive 1.8 miles to a witness post on the right. The transect is located in the SE quarter, marked by short fence posts. The transect starts 90 feet away from the intersection at 157 degrees magnetic. The 0-foot baseline stake is tagged #7125.

Map Name: Mount Tukuhnikivatz



Diagrammatic Sketch:



Township: 28S, Range: 23E, Section: 1

GPS: NAD 83, UTM 12S 644300 E 4251252 N

SLAUGHTER FLAT - TREND STUDY NO. 13A-4

Site Information

Site Description: The study is located in an open flat valley between pinyon-juniper ridges to the east and west. In 1974, 940 acres were chained and seeded. The chaining extends to the north of the study. The study site is now a sagebrush-grass community. Pellet group data estimates that elk use this site more heavily than deer. Deer use showed a decrease from 2004 to 2009, while elk use showed an increase in the same years. Cattle use was estimated to be mostly moderate since 1999 (Table - Pellet Group Data). This Forest Service land is part of the Squaw Spring grazing allotment.

Browse: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the key browse species on the site. Identification of the sagebrush subspecies was difficult because of hybridization with other sagebrush subspecies and different varieties which may have been seeded onto the site after the chaining treatment. All of the sagebrush on this site is classified as Wyoming big sagebrush in this study. Sagebrush provides the majority of the browse cover on this site. Density of sagebrush has averaged around 2,600 plants/acre since 1994, but the proportion of young plants in the population has decreased over that time. The population of sagebrush shows moderate to heavy use (Table - Browse Characteristics).

Stickyleaf low rabbitbrush (*Chysothamnus viscidiflorus* ssp. *viscidiflorus*) is prominent because of its relatively high density and cover. Other more palatable browse species are uncommon, comprising only a minor percentage of the browse population (Table - Browse Characteristics). There are a few small pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees scattered across the site (Table - Point-Quarter Tree Data).

Herbaceous Understory: Grasses are an important vegetation component on this site with the most abundant perennial species being needle-and-thread (*Stipa comata*), mutton bluegrass (*Poa fendleriana*), crested wheatgrass (*Agropyron cristatum*), and Indian ricegrass (*Oryzopsis hymenoides*). The sum of nested frequency of perennial grasses has decreased steadily since the outset of the study. Cheatgrass (*Bromus tectorum*) has increased in nested frequency and cover since 1994, and is now a co-dominant grass species on the site (Table - Herbaceous Trends).

Forbs are relatively diverse on the site, but provide little cover. The sum of nested frequency and cover of perennial forbs have fluctuated dramatically between sample years. Cover of perennial forbs has ranged from a high of 3% to a low of less than 1% (Table - Herbaceous Trends).

Soil: The soil is an orange, sandy clay loam with an effective rooting depth of almost 14 inches, and a loose structure on the surface. The soil has a neutral pH (7.2). Phosphorus has limited availability for plant growth and development at 5.4 ppm (Tiedemann and Lopez 2004). There is soil loss from the bare interspaces and evidence of sheet and rill erosion, but no gullies are on the site. There is some pedestaling of the bunch grasses. The soil erosion condition class was rated to be stable in 2004 and 2009.

Trend Assessments

Browse:

- **1987 to 1994 - slightly down (-1):** Differences in density of browse species may be related to the larger sample area used in 1994; therefore, trend for browse was determined using other parameters. The proportion of sagebrush plants displaying poor vigor increased from 6% to 21%. Recruitment of young sagebrush plants decreased from 26% of the population to 13%.
- **1994 to 1999 - slightly down (-1):** Density of sagebrush decreased by 13% and decadence increased from 10% to 20%. However, the proportion of sagebrush plants displaying poor vigor decreased to 7% and recruitment of young plants increased slightly.

- **1999 to 2004 - slightly down (-1):** Density of sagebrush decreased by 9% and recruitment of young plants decreased to just 2% of the population. Cover of sagebrush decreased slightly.
- **2004 to 2009 - stable (0):** Sagebrush density, vigor, decadence, and recruitment of young remained similar. Cover of sagebrush increased to around 12%.

Grass:

- **1987 to 1994 - stable (0):** There was little change in the sum of nested frequency of perennial grasses. There was a significant increase in the nested frequency of western wheatgrass (*Agropyron smithii*), Indian ricegrass, and Sandberg bluegrass (*Poa secunda*). There was a significant decrease in the nested frequency of mutton bluegrass and needle-and-thread grass.
- **1994 to 1999 - down (-2):** The sum of nested frequency of perennial grasses decreased by 23%, though cover remained similar. There was a significant decrease in the nested frequency of Indian ricegrass, mutton bluegrass, Sandburg bluegrass, and needle-and-thread grass. There was a significant increase in nested frequency of crested wheatgrass. Cheatgrass increased significantly in nested frequency, and cover increased from less than 1% to 7%.
- **1999 to 2004 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 19%, but cover remained similar. There was a significant decrease in nested frequency of crested wheatgrass, western wheatgrass, and Sandburg bluegrass. There was a significant increase in the nested frequency of needle-and-thread grass.
- **2004 to 2009 - stable (0):** There was a slight decrease in the sum of nested frequency of perennial grasses, and cover decreased markedly. However, nested frequency of cheatgrass decreased significantly and cover of cheatgrass decreased. There was a significant increase in the nested frequency of crested wheatgrass.

Forb:

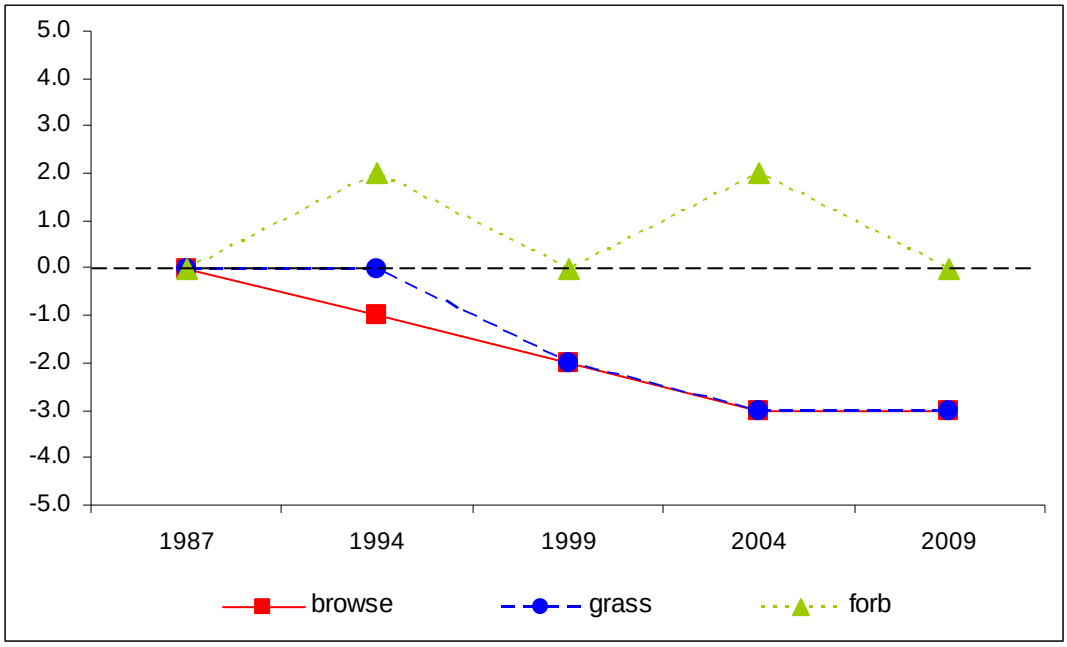
- **1987 to 1994 - up (+2):** The sum of nested frequency of perennial forbs increased 85%. There was a significant increase in the nested frequency of several desirable forbs including scarlet globemallow (*Sphlaeralcea coccinea*).
- **1994 to 1999 - down (-2):** There was a marked decrease in the sum of nested frequency of perennial forbs, and cover fell from about 3% to less than 1%. There was a significant decrease in the nested frequency of several desirable forbs including hollyleaf clover (*Trifolium gymnocarpon*).
- **1999 to 2004 - up (+2):** There was a large increase in the sum of nested frequency of perennial forbs, and cover increased to 3%.There was a significant increase in the nested frequency of hollyleaf clover, longleaf phlox (*Phlox longifolia*), and timber poisonvetch (*Astragalus convallarius*).
- **2004 to 2009 - down (-2):** There was again a dramatic decrease in the sum of nested frequency of perennial forbs, cover decreased to less than 1%. There was a significant decrease in longleaf phlox and timber poisonvetch.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 13A, study no: 4

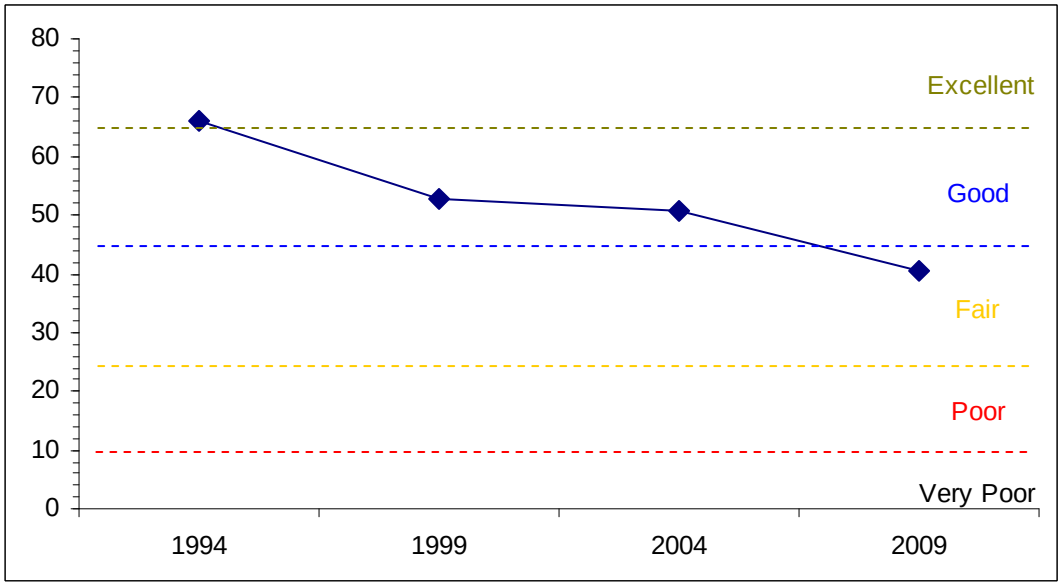
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
94	13	12	7	30	0	5	0	**66**	Good-Excellent
99	13	9	8	27	-6	1	0	**53**	Good
04	12	8	1	29	-4	6	0	**51**	Good
09	14	8	1	20	-4	1	0	**41**	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 13A, Study no: 4



DESIRABLE COMPONENTS INDEX TREND: LOW POTENTIAL SCALE
Management unit 13A, Study no: 4



HERBACEOUS TRENDS--
Management unit 13A, Study no: 4

Type	Species	Nested Frequency					Average Cover %			
		'87	'94	'99	'04	'09	'94	'99	'04	'09
G	Agropyron cristatum	$_{a}$57	$_{a}$79	$_{c}$211	$_{a}$94	$_{b}$153	2.23	8.42	6.65	4.74
G	Agropyron smithii	$_{a}$8	$_{b}$42	$_{b}$64	$_{a}$13	$_{a}$6	.31	.49	.09	.03
G	Bromus inermis	-	1	1	-	-	.00	.00	-	-
G	Bromus tectorum (a)	-	$_{a}$83	$_{c}$237	$_{c}$212	$_{b}$173	.32	7.39	5.36	4.69
G	Oryzopsis hymenoides	$_{a}$24	$_{b}$66	$_{a}$25	$_{a}$35	$_{a}$7	1.71	.83	1.22	.10
G	Poa fendleriana	$_{d}$232	$_{c}$146	$_{b}$97	$_{ab}$75	$_{a}$42	3.84	2.91	1.77	1.40
G	Poa secunda	$_{b}$20	$_{c}$47	$_{b}$14	$_{a}$-	$_{a}$-	.53	.07	-	-
G	Sitanion hystrix	$_{b}$24	$_{b}$18	$_{a}$1	$_{a}$4	$_{a}$1	.13	.03	.03	.03
G	Stipa comata	$_{c}$221	$_{b}$168	$_{a}$26	$_{b}$135	$_{b}$130	6.00	.63	4.50	3.59
G	Vulpia octoflora (a)	-	$_{a}$1	$_{a}$1	$_{a}$5	$_{b}$22	.00	.00	.15	.07
Total for Annual Grasses		0	84	238	217	195	0.32	7.39	5.51	4.76
Total for Perennial Grasses		586	567	439	356	339	14.77	13.41	14.28	9.90
Total for Grasses		586	651	677	573	534	15.10	20.81	19.80	14.66
F	Agoseris glauca	-	-	-	1	-	-	-	.00	-
F	Antennaria rosea	-	3	-	-	-	.00	-	.03	-
F	Arabis sp.	$_{a}$-	$_{b}$17	$_{a}$-	$_{a}$-	$_{a}$-	.04	-	-	-
F	Astragalus convallarius	$_{ab}$11	$_{c}$35	$_{a}$3	$_{bc}$28	$_{a}$1	1.37	.00	1.37	.01
F	Castilleja chromosa	6	4	-	-	-	.04	-	-	-
F	Cirsium sp.	-	3	-	-	-	.00	-	-	-
F	Cordylanthus wrightii (a)	$_{ab}$16	$_{ab}$17	$_{a}$2	$_{b}$21	$_{a}$-	.04	.03	.15	-
F	Crepis acuminata	$_{b}$9	$_{ab}$5	$_{a}$-	$_{a}$2	$_{a}$-	.01	-	.00	-
F	Cryptantha sp.	12	8	-	3	-	.02	-	.00	-
F	Draba reptans (a)	-	$_{b}$39	$_{a}$4	$_{a}$-	$_{a}$-	.09	.00	-	-
F	Erigeron pumilus	8	3	1	4	4	.00	.00	.03	.01
F	Gayophytum ramosissimum(a)	-	13	-	-	-	.02	-	-	-
F	Lappula occidentalis (a)	-	5	-	11	-	.01	-	.05	-
F	Microsteris gracilis (a)	-	$_{b}$73	$_{a}$15	$_{a}$7	$_{a}$3	.38	.03	.04	.00
F	Petradoria pumila	-	3	-	-	-	.03	-	-	-
F	Phlox longifolia	$_{a}$-	$_{c}$98	$_{a}$-	$_{b}$37	$_{a}$6	.27	-	.17	.01
F	Polygonum douglasii (a)	-	$_{b}$49	$_{a}$-	$_{a}$8	$_{a}$6	.10	-	.03	.01
F	Ranunculus testiculatus (a)	-	$_{a}$12	$_{a}$-	$_{a}$-	$_{b}$52	.02	-	-	.56
F	Sphaeralcea coccinea	$_{a}$17	$_{b}$78	$_{b}$64	$_{b}$78	$_{b}$57	.57	.71	1.21	.39
F	Taraxacum officinale	$_{a}$1	$_{b}$12	$_{a}$-	$_{a}$2	$_{a}$-	.04	-	.00	-
F	Tragopogon dubius	1	-	-	-	-	-	-	-	-
F	Trifolium gymnocarpon	$_{c}$118	$_{c}$102	$_{a}$3	$_{b}$47	$_{b}$41	.32	.00	.21	.22
F	Unknown forb-perennial	3	-	-	-	-	-	-	-	-
F	Zigadenus paniculatus	$_{b}$15	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-	-
Total for Annual Forbs		16	208	21	47	61	0.68	0.06	0.27	0.58
Total for Perennial Forbs		201	371	71	202	109	2.74	0.72	3.05	0.65
Total for Forbs		217	579	92	249	170	3.43	0.79	3.33	1.24

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

BROWSE TRENDS--
Management unit 13A, Study no: 4

Type	Species	Strip Frequency				Average Cover %			
		'94	'99	'04	'09	'94	'99	'04	'09
B	Artemisia tridentata wyomingensis	68	69	66	70	10.17	10.57	9.43	11.55
B	Chrysothamnus nauseosus albicaulis	1	1	0	0	.00	.00	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	83	86	84	82	4.55	5.58	5.60	5.90
B	Coryphantha vivipara arizonica	0	2	1	0	-	.00	.03	.03
B	Eriogonum microthecum	0	1	1	0	-	.00	.00	-
B	Gutierrezia sarothrae	6	2	1	4	.02	.15	.00	.06
B	Juniperus osteosperma	0	1	1	1	.15	.38	.38	.38
B	Opuntia polyacantha	42	44	45	41	.89	1.16	1.41	1.57
B	Pediocactus simpsonii	0	1	0	0	-	.00	-	-
B	Pinus edulis	0	1	1	1	1.16	.93	1.00	1.97
Total for Browse		200	208	200	199	16.95	18.79	17.86	21.49

CANOPY COVER, LINE INTERCEPT--
Management unit 13A, Study no: 4

Species	Percent Cover	
	'04	'09
Artemisia tridentata wyomingensis	9.68	11.16
Chrysothamnus viscidiflorus viscidiflorus	5.76	4.63
Eriogonum microthecum	.01	-
Gutierrezia sarothrae	-	.06
Juniperus osteosperma	-	.15
Opuntia polyacantha	1.96	1.16
Pinus edulis	1.29	1.63

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 13A, Study no: 4

Species	Average leader growth (in)	
	'04	'09
Artemisia tridentata wyomingensis	2.4	1.1

POINT-QUARTER TREE DATA--
Management unit 13A, Study no: 4

Species	Trees per Acre		
	'99	'04	'09
Juniperus osteosperma	16	24	25
Pinus edulis	18	22	22

Average diameter (in)		
'99	'04	'09
2.9	3.5	2.4
2.7	3.8	2.6

BASIC COVER--
Management unit 13A, Study no: 4

Cover Type	Average Cover %				
	'87	'94	'99	'04	'09
Vegetation	12.75	35.90	38.68	42.65	37.47
Rock	0	.27	.06	.07	.01
Pavement	0	.24	.52	.29	.06
Litter	53.25	39.65	41.77	34.25	42.13
Cryptogams	.75	.36	.52	.65	.07
Bare Ground	33.25	35.01	37.35	37.05	34.38

SOIL ANALYSIS DATA --
Management unit 13A, Study no: 4, Study Name: Saughter Flat

Effective rooting depth (in)	pH	sandy clay loam			%0M	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
13.5	7.2	52.9	19.8	27.3	1.9	50.4	89.6	0.4

PELLET GROUP DATA--
Management unit 13A, Study no: 4

Type	Quadrat Frequency			
	'94	'99	'04	'09
Rabbit	11	19	11	39
Elk	41	34	33	16
Deer	14	36	28	15
Cattle	1	1	1	9

Days use per acre (ha)		
'99	'04	'09
-	-	-
53 (131)	37 (91)	67 (165)
25 (62)	27 (68)	7 (17)
22 (53)	1 (2)	18 (45)

BROWSE CHARACTERISTICS--
Management unit 13A, Study no: 4

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Amelanchier utahensis									
87	**33**	100	0	-	-	0	100	0	-/-
94	**0**	0	0	-	-	0	0	0	44/54
99	**0**	0	0	-	-	0	0	0	37/51
04	**0**	0	0	-	-	0	0	0	52/67
09	**0**	0	0	-	-	0	0	0	48/53
Artemisia tridentata wyomingensis									
87	**3298**	26	66	8	-	40	22	6	23/22
94	**2940**	13	77	10	440	14	2	21	19/28
99	**2560**	16	64	20	60	34	20	7	20/28
04	**2340**	2	74	25	440	58	29	12	19/29
09	**2480**	1	76	23	20	27	44	17	19/28
Chrysothamnus nauseosus albicaulis									
87	**33**	0	100	0	-	0	100	0	31/28
94	**20**	0	0	100	-	0	0	0	32/27
99	**20**	0	0	100	-	100	0	0	-/-
04	**0**	0	0	0	-	0	0	0	-/-
09	**0**	0	0	0	-	0	0	0	-/-
Chrysothamnus viscidiflorus viscidiflorus									
87	**4131**	30	58	12	99	3	0	0	5/10
94	**6960**	8	91	1	1380	.28	0	.28	5/12
99	**7340**	15	83	1	220	10	0	0	5/12
04	**7380**	9	88	3	20	0	0	3	7/13
09	**7020**	1	97	2	60	5	2	3	5/12
Coryphantha vivipara arizonica									
87	**0**	0	0	-	-	0	0	0	-/-
94	**0**	0	0	-	-	0	0	0	-/-
99	**40**	0	100	-	-	0	0	0	3/3
04	**20**	0	100	-	-	0	0	0	4/4
09	**0**	0	0	-	-	0	0	0	4/4
Eriogonum microthecum									
87	**33**	0	100	-	-	0	100	0	12/7
94	**0**	0	0	-	-	0	0	0	-/-
99	**20**	0	100	-	-	0	0	0	6/9
04	**20**	0	100	-	-	0	0	0	-/-
09	**0**	0	0	-	-	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)
Gutierrezia sarothrae									
87	**232**	28	72	-	33	0	0	0	7/6
94	**200**	50	50	-	120	0	0	0	1/2
99	**40**	0	100	-	-	0	0	0	8/10
04	**120**	0	100	-	-	0	0	0	5/9
09	**120**	0	100	-	-	0	0	0	6/9
Juniperus osteosperma									
87	**33**	100	0	-	-	0	0	0	-/-
94	**0**	0	0	-	-	0	0	0	-/-
99	**20**	0	100	-	-	0	0	0	-/-
04	**20**	0	100	-	-	0	0	0	-/-
09	**20**	0	100	-	-	0	0	0	-/-
Opuntia polyacantha									
87	**1165**	37	51	11	133	0	0	26	5/7
94	**2200**	25	67	7	200	0	2	13	4/16
99	**2420**	14	74	12	40	0	2	6	4/10
04	**2300**	11	81	8	-	0	0	.86	5/11
09	**1600**	0	90	10	60	0	0	16	4/11
Pediocactus simpsonii									
87	**0**	0	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	**0**	0	0	-	-	0	0	0	2/4
Pinus edulis									
87	**0**	0	0	-	-	0	0	0	-/-
94	**0**	0	0	-	-	0	0	0	-/-
99	**20**	100	0	-	20	0	0	0	-/-
04	**20**	100	0	-	-	0	0	0	-/-
09	**20**	0	100	-	-	0	0	0	-/-
Sarcobatus vermiculatus									
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	3/10