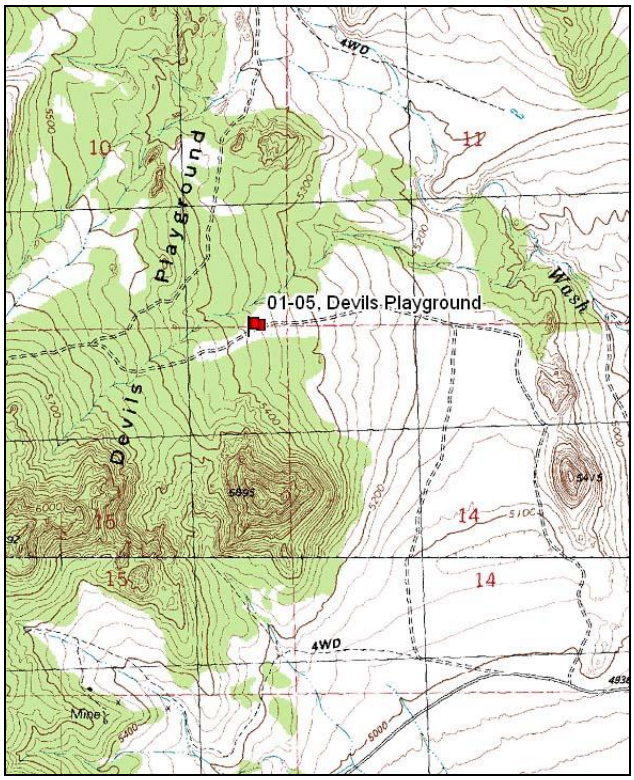
DEVIL'S PLAYGROUND - TREND STUDY NO. 1-5-11

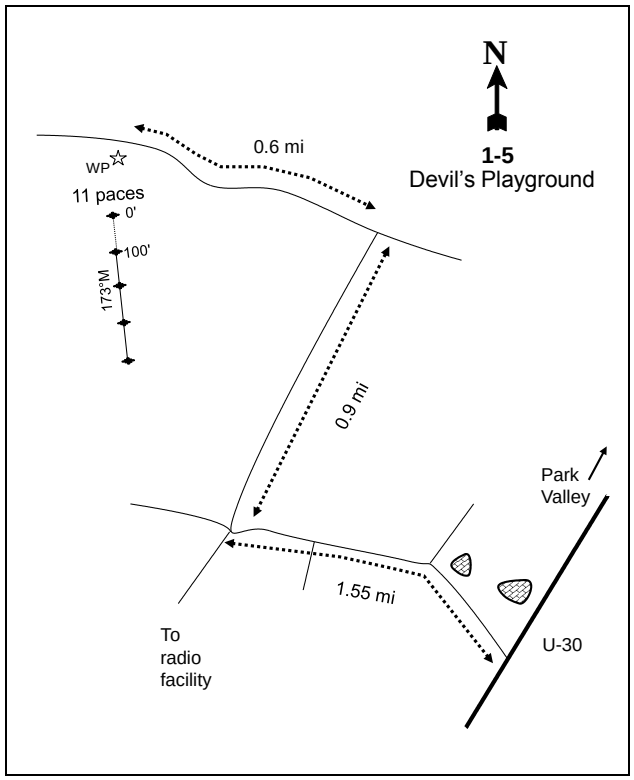
Vegetation Type: Black Sagebrush
Range Type: Crucial Deer Winter, Crucial Elk Year-long
NRCS Ecological Site Description: Semidesert Shallow Hardpan (Utah Juniper),
Land Ownership: BLM
Elevation: 5,390 ft. (1,643 m)
Aspect: Northeast
Slope: 8%
Transect bearing: 173° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
Proceed toward Elko, Nevada on U-30 to mile marker 24 and turn right (west). Travel 1.55 miles to a fork. Bear right and travel 0.9 miles to an intersection. Turn left (west) and travel 0.6 miles to rock pile and witness post on left side of road. Walk 11 paces southwest from the rock pile to the 0-foot stake of the frequency baseline. The baseline is marked by a red browse tag #708. The azimuth of the baseline is 173 degrees magnetic.

Map Name: Emigrant Pass



Diagrammatic Sketch:



Township: 9W Range: 16W Section: 15

GPS: NAD 83, UTM 12S 278206 E 4598628 N

DEVILS PLAYGROUND - TREND STUDY NO. 1-5

Site Information

Site Description: The study samples an area considered to be crucial deer winter range. The vegetation is dominated by a Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon pine (*Pinus monophylla*) woodland, with numerous and various sized openings occupied by black sagebrush (*Artemisia nova*) and Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*). Farther to the east, the vegetation becomes increasingly dominated by black sagebrush in the more shallow soils. To the west and at a higher elevation, the juniper-pinyon woodland is associated with significant amounts of sagebrush and bitterbrush (*Purshia tridentata*). The area is managed by the Bureau of Land Management (BLM) as part of the White Lake allotment. Pellet groups have been sampled in low abundance for deer, elk, and cattle since 2001 (Table - Pellet Group Data).

Browse: Browse composition consists chiefly of black sagebrush, interspersed by smaller amounts of narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*), prickly phlox (*Leptodactylon pungens*), and Wyoming big sagebrush. Also present are scattered individuals of Nevada ephedra (*Ephedra nevadensis*) and spiny hopsage (*Grayia spinosa*). The black sagebrush is a moderately dense population that has displayed mostly light to moderate utilization over the sample years, though with heavy use in 1984. Health of the black sagebrush has been somewhat poor, with moderately high decadence and poor vigor over the sample years. Recruitment of young black sagebrush has been poor over the sample years, though seedlings were very abundant in 2006. Many of the plants classified as Wyoming big sagebrush appear to be hybrids of black sagebrush and Wyoming big sagebrush. The Wyoming big sagebrush is comprised of a small population of light to moderately used plants. Decadence and poor vigor of Wyoming big sagebrush have increased since 2001. Recruitment of young big sagebrush plants has been poor over the course of the study (Table - Browse Characteristics).

A few spiny hopsage occur on the site, but none have been sampled within the shrub density strips. These shrubs have shown heavy hedging in some sample years. Utah juniper and singleleaf pinyon pine trees occur in moderate density (Table - Point-Quarter Tree Data) and cover (Table - Canopy Cover) on the site.

Herbaceous Understory: Perennial grasses are not particularly diverse, and the annual grass species cheatgrass (*Bromus tectorum*) is prevalent and has dominated the grass component in cover during several years. The dominant perennial grass is Sandberg bluegrass (*Poa secunda*), with other prevalent perennial species including bluebunch wheatgrass (*Agropyron spicatum*) and bottlebrush squirreltail (*Sitanion hystrix*). Perennial forbs are diverse, but have not produced over 2% cover in any sample year. Most of these are low growing and of little forage value (Table - Herbaceous Trends).

Soil: The soil is in the Lembos-Jericho-Scalade complex, likely as part of the Jericho component. This component occurs on hillslopes with a shallow duripan, and the parent material is alluvium derived from limestone (Soil Survey Staff 2011). There are also many large granite outcrops in the area. The soil is a coarse textured sandy loam which is light colored on the surface, but much darker below. The soil has a moderately alkaline soil reaction (8.0 pH). Phosphorus may have limited availability for plant growth and development at 3.5 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Bare ground cover is moderately low, with good protective ground cover being provided by vegetation, litter, and pavement (Table - Basic Cover). There are extensive areas of pavement and bare ground cover in the interspaces between shrubs and trees. The soil erosion condition has been classified as slight since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - slightly up (+1):** Black sagebrush density increased by 23% from 4,264 plants/acre to 5,266 plants/acre, but decadence also increased from 56% to 82%. Recruitment of young black sagebrush plants decreased from 11% to 0% of the population.
- **1990 to 1996 - slightly up (+1):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of black sagebrush decreased to 26% and poor vigor decreased from 22% to 6% of the population.
- **1996 to 2001 - stable (0):** Density of black sagebrush increased by 8% from 5,960 plants/acre to 6,440 plants/acre, and cover increased from 12% to 14%. Decadence remained similar, but poor vigor increased slightly within the population. Recruitment of young black sagebrush plants remained poor.
- **2001 to 2006 - slightly down (-1):** The density of black sagebrush decreased by 28% to 4,620 plants/acre, though cover remained similar at 13%. Decadence increased slightly from 29% to 33%, and poor vigor increased to 22%. Recruitment of young black sagebrush plants remained poor. Wyoming big sagebrush density increased more than six-fold, and cover increased from less than 1% to 2%. However, decadence of Wyoming big sagebrush increased from 0% to 21%, and poor vigor increased from 0% to 12%.
- **2006 to 2011 - stable (0):** Densities of both black sagebrush and Wyoming big sagebrush remained similar on the study. Decadence remained similar within the black sagebrush population, but poor vigor increased to 32%. Decadence of Wyoming big sagebrush increased to 59%, and poor vigor increased to 31%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased by 70%, and is mostly due to a significant increase in the nested frequency of Sandberg bluegrass.
- **1990 to 1996 - down (-2):** There was a 25% decrease in the sum of nested frequency of perennial grasses, with a significant decrease in the nested frequency of bottlebrush squirreltail.
- **1996 to 2001 - slightly down (-1):** There was little change in the sum of nested frequency of perennial grasses, but cheatgrass increased significantly in nested frequency on the study. Despite increases in cover of several perennial species, cheatgrass became the dominant grass species on the site with an increase in cover from less than 1% to 5%.
- **2001 to 2006 - down (-2):** The perennial grass sum of nested frequency decreased by 20%, and cover decreased from 8% to 5%. Cheatgrass again increased significantly in nested frequency, and cover increased to 8%. Cheatgrass remained the dominant grass on the study.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial grasses increased by 29%, and cover increased to 11%. Most of the increase in perennial grasses was due to a significant increase in the nested frequency of Sandberg bluegrass, and subsequent increase in cover from 3% to 8%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 3%.

Forb:

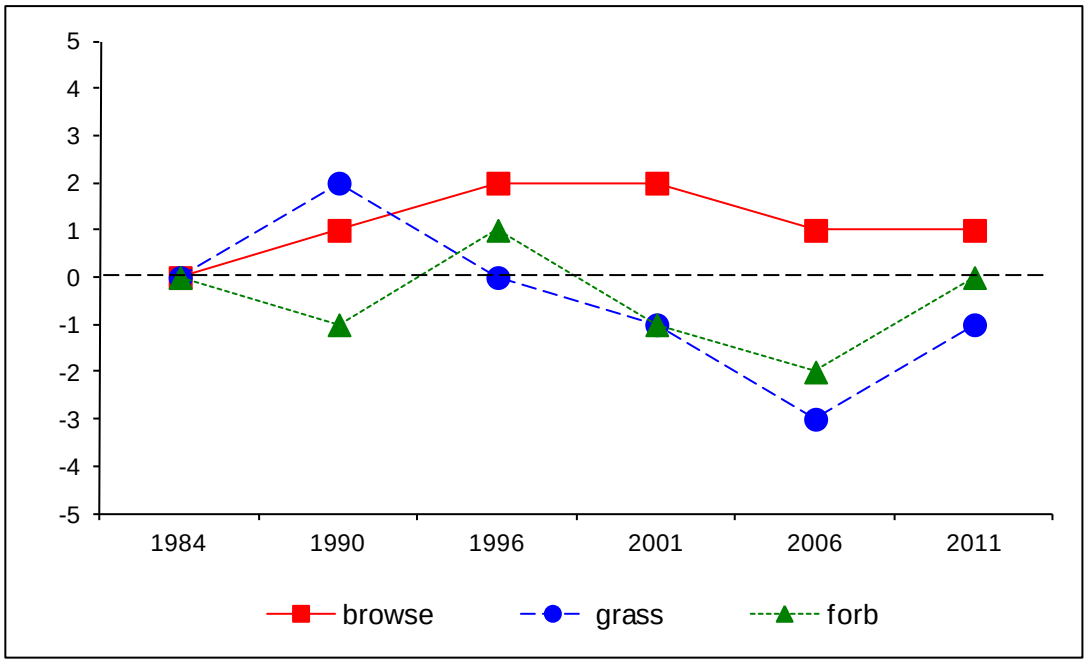
- **1984 to 1990 - slightly down (-1):** Perennial forb sum of nested frequency decreased by 21%, but forbs were already fairly rare on the site.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial forbs increased five-fold, though annual forbs also increased markedly.
- **1996 to 2001 - down (-2):** The perennial forb sum of nested frequency decreased to 1990 levels.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 32%, and forbs remained rare on the site. Cover of perennial forbs decreased from near 1% to near 0%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased four-fold, and cover increased to 2%. Annual forbs also increased substantially.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 1, study no: 5

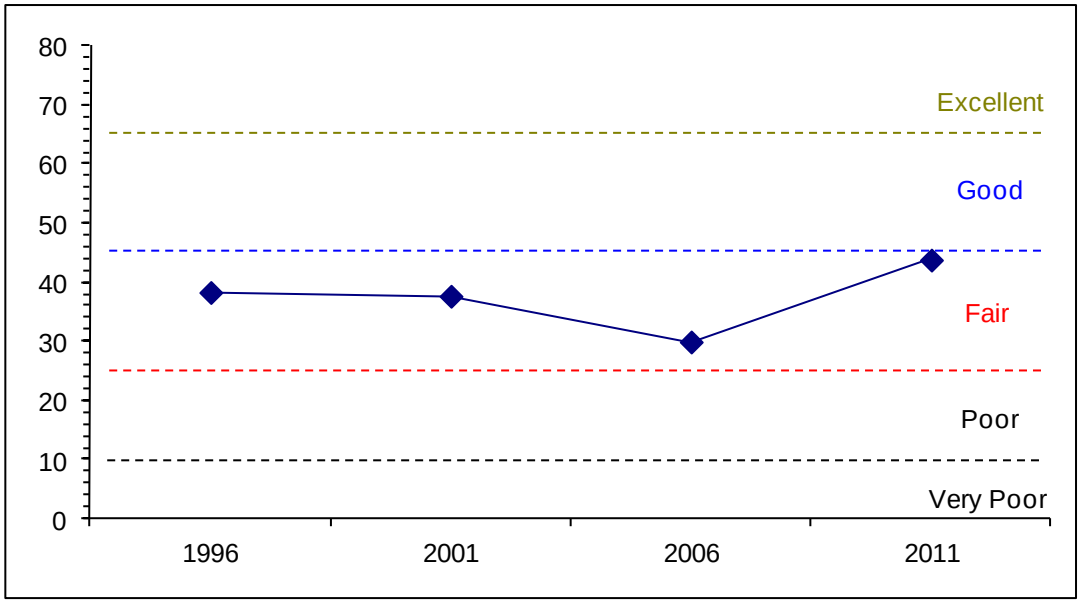
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
96	15.2	7.4	3.3	10.5	-0.4	2.3	0.0	**38.3**	Fair
01	17.1	6.4	1.0	15.8	-4.3	1.7	0.0	**37.6**	Fair
06	18.3	5.5	0.9	10.9	-6.0	0.3	0.0	**29.9**	Fair
11	14.0	3.6	2.8	21.3	-2.2	4.3	0.0	**43.8**	Fair-Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 1 Study no: 5



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
Management unit 1, Study no: 5



HERBACEOUS TRENDS--
Management unit 01, Study no: 5

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	ab28	b56	b46	ab35	a19	ab33	1.00	2.26	1.11	1.82
G	Bromus tectorum (a)	-	-	a97	c284	d318	b256	.37	5.21	7.93	2.90
G	Oryzopsis hymenoides	a4	b17	ab18	ab5	ab10	a4	.66	.09	.33	.06
G	Poa secunda	a53	cd162	bcd148	bc142	b127	d183	2.90	3.42	2.58	7.56
G	Sitanion hystrix	b114	b100	a56	a43	a37	a46	.66	.40	.72	1.18
G	Stipa comata	-	-	-	-	-	-	-	-	.00	-
G	Stipa thurberiana	a11	ab22	a-	b34	a14	a-	-	1.71	.66	-
G	Vulpia octoflora (a)	-	-	b78	c145	a17	a8	.16	.52	.04	.01
Total for Annual Grasses		0	0	175	429	335	264	0.53	5.74	7.97	2.92
Total for Perennial Grasses		210	357	268	259	207	266	5.23	7.89	5.43	10.64
Total for Grasses		210	357	443	688	542	530	5.76	13.63	13.40	13.56
F	Agoseris glauca	-	-	17	-	9	17	.03	-	.05	.22
F	Arabis sp.	-	-	-	-	3	-	-	-	.00	-
F	Aster sp.	-	-	76	-	-	-	.16	-	-	-
F	Astragalus beckwithii	2	7	3	4	-	5	.04	.15	-	.18
F	Astragalus utahensis	10	14	11	2	4	4	.08	.06	.01	.01
F	Calochortus nuttallii	-	-	-	-	-	4	-	-	-	.01
F	Castilleja chromosa	11	1	7	-	-	-	.06	-	-	-
F	Chaenactis douglasii	b22	ab4	b28	a3	a6	ab12	.08	.00	.01	.02
F	Collinsia parviflora (a)	-	-	-	3	7	6	-	.00	.01	.01
F	Crepis acuminata	-	-	3	-	1	3	.03	-	.03	.21
F	Cruciferae	-	-	31	-	-	-	.07	-	-	-
F	Cryptantha sp.	a-	a4	b93	a-	a-	a10	.36	-	-	.04

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Cryptantha sp.(a)	-	-	$_{b}$102	$_{a}$31	$_{a}$21	$_{b}$94	.43	.08	.04	.42
F	Delphinium nuttallianum	$_{a}$-	$_{a}$-	$_{a}$3	$_{a}$2	$_{a}$-	$_{b}$20	.00	.03	-	.65
F	Descurainia pinnata (a)	-	-	$_{a}$4	$_{a}$11	$_{a}$-	$_{b}$73	.01	.03	-	.28
F	Eriastrum sparsiflorum (a)	-	-	$_{c}$78	$_{a}$-	$_{b}$25	$_{a}$-	.17	-	.05	-
F	Eriogonum cernuum (a)	$_{a}$1	$_{ab}$6	$_{b}$10	$_{a}$-	$_{a}$-	$_{a}$-	.02	-	-	-
F	Eriogonum ovalifolium	-	-	13	-	-	-	.05	-	-	-
F	Galium aparine (a)	-	-	-	3	-	-	-	.00	-	-
F	Gayophytum ramosissimum(a)	-	-	35	18	17	27	.09	.04	.03	.05
F	Gilia sp. (a)	-	-	$_{b}$21	$_{b}$30	$_{a}$-	$_{c}$101	.04	.08	-	.28
F	Lappula occidentalis (a)	-	-	$_{a}$-	$_{b}$8	$_{ab}$10	$_{ab}$6	-	.02	.02	.01
F	Layia glandulosa	-	-	-	-	-	66	-	-	-	.46
F	Lomatium sp.	-	-	4	4	-	-	.00	.16	-	-
F	Lygodesmia spinosa	-	-	-	-	-	-	.00	-	-	-
F	Monoptylon belliodies (a)	-	-	-	-	3	-	-	-	.01	-
F	Phlox hoodii	-	8	4	1	-	-	.03	.03	-	-
F	Phlox longifolia	$_{b}$35	$_{ab}$23	$_{ab}$35	$_{b}$49	$_{a}$21	$_{ab}$36	.10	.40	.05	.30
F	Ranunculus testiculatus (a)	-	-	-	-	-	3	-	-	-	.00
F	Townsendia sp.	-	2	-	-	-	-	-	-	-	-
F	Tragopogon dubius (a)	$_{b}$13	$_{a}$-	$_{a}$2	$_{a}$-	$_{a}$-	$_{a}$-	.03	-	-	-
Total for Annual Forbs		14	6	252	104	83	310	0.80	0.27	0.17	1.07
Total for Perennial Forbs		80	63	328	65	44	177	1.14	0.83	0.16	2.13
Total for Forbs		94	69	580	169	127	487	1.94	1.10	0.33	3.21

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

BROWSE TRENDS--
Management unit 01, Study no: 5

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Artemisia nova	86	85	79	78	11.55	13.55	12.93	9.78
B	Artemisia tridentata wyomingensis	7	5	16	18	.60	.15	1.71	1.45
B	Chrysothamnus viscidiflorus stenophyllus	50	45	38	43	1.50	2.54	1.97	2.84
B	Juniperus osteosperma	3	7	6	6	4.88	3.77	11.05	10.64
B	Leptodactylon pungens	10	12	12	10	.16	.03	.05	.06
B	Opuntia polyacantha	1	3	3	1	-	.01	.03	.01
B	Pinus monophylla	2	1	3	2	.00	.38	.63	.88
B	Symphoricarpos oreophilus	1	1	0	1	-	-	-	-
Total for Browse		160	159	157	159	18.70	20.45	28.38	25.67

CANOPY COVER, LINE INTERCEPT--
Management unit 01, Study no: 5

Species	Percent Cover		
	'01	'06	'11
Artemisia nova	-	13.21	11.71
Artemisia tridentata wyomingensis	-	1.96	2.34
Chrysothamnus viscidiflorus stenophyllus	-	2.61	3.23
Juniperus osteosperma	13.19	11.21	12.35
Leptodactylon pungens	-	.10	.21
Pinus monophylla	-	.20	1.18

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 01, Study no: 05

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia nova	1.4	0.6	0.5

POINT-QUARTER TREE DATA--
Management unit 01, Study no: 5

Species	Trees per Acre			
	'96	'01	'06	'11
Juniperus osteosperma	39	76	43	48
Pinus monophylla	9	49	35	43

Average diameter (in)			
'96	'01	'06	'11
14.4	7.0	8.6	4.5
5.0	2.1	2.4	1.4

BASIC COVER--
Management unit 01, Study no: 5

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.50	8.25	25.64	38.59	38.29	39.20
Rock	.25	.50	1.48	.38	.12	.15
Pavement	20.75	25.00	27.95	32.52	28.31	26.18
Litter	39.75	33.00	27.04	29.48	26.11	26.09
Cryptogams	1.25	1.50	.72	1.59	.53	2.41
Bare Ground	35.50	31.75	19.56	16.53	22.20	17.97

SOIL ANALYSIS DATA --
Management unit 01, Study no: 5, Study Name: Devil's Playground

Effective rooting depth (in)	pH	Sandy-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
26.2	8.0	65.7	17.0	17.3	1.0	3.5	92.8	0.5

PELLET GROUP DATA--
Management unit 01, Study no: 5

Type	Quadrat Frequency			
	'96	'01	'06	'11
Sheep	-	1	-	-
Rabbit	32	7	65	9
Elk	2	-	-	3
Deer	44	24	24	32
Cattle	-	-	-	-

Days use per acre (ha)		
'01	'06	'11
	1 (3)	1 (2)
15 (36)	27 (68)	31 (76)
	5 (13)	7 (16)

BROWSE CHARACTERISTICS--
Management unit 01, Study no: 5

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia nova									
84	**4264**	11	33	56	-	17	80	20	9/16
90	**5266**	0	18	82	66	1	0	22	10/15
96	**5960**	7	66	26	100	72	14	6	9/23
01	**6440**	2	70	29	60	35	17	11	10/21
06	**4620**	2	65	33	3040	6	3	22	10/22
11	**4480**	6	59	35	160	33	2	32	9/21
Artemisia tridentata wyomingensis									
84	**331**	20	20	60	66	80	20	0	20/25
90	**331**	20	20	60	-	40	0	0	21/29
96	**260**	0	85	15	-	62	0	0	21/39
01	**100**	0	100	0	-	0	0	0	35/41
06	**660**	0	79	21	340	12	3	12	20/32
11	**580**	3	38	59	-	48	0	31	21/38
Chrysothamnus viscidiflorus stenophyllus									
84	**1932**	28	55	17	133	31	38	3	10/11
90	**2331**	51	46	3	-	3	0	0	15/19
96	**1680**	8	92	0	-	6	0	0	9/13
01	**1560**	6	73	21	-	4	0	4	9/14
06	**1460**	8	89	3	-	4	3	0	10/16
11	**1560**	4	64	32	-	0	0	14	11/17
Ephedra nevadensis									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**0**	0	0	-	-	0	0	0	16/17
01	**0**	0	0	-	-	0	0	0	15/10
06	**0**	0	0	-	-	0	0	0	18/23
11	**0**	0	0	-	-	0	0	0	17/28

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Grayia spinosa									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**0**	0	0	-	-	0	0	0	31/35
01	**0**	0	0	-	-	0	0	0	-/-
06	**0**	0	0	-	-	0	0	0	27/31
11	**0**	0	0	-	-	0	0	0	31/44
Juniperus osteosperma									
84	**0**	0	0	-	66	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**60**	0	100	-	-	0	0	0	-/-
01	**160**	25	75	-	-	0	0	0	-/-
06	**120**	17	83	-	-	0	0	0	-/-
11	**120**	33	67	-	-	0	0	0	-/-
Leptodactylon pungens									
84	**532**	88	12	0	-	0	0	0	4/4
90	**0**	0	0	0	-	0	0	0	-/-
96	**360**	22	67	11	-	0	0	0	9/11
01	**520**	0	81	19	-	0	0	0	9/12
06	**260**	0	92	8	80	0	0	0	6/9
11	**280**	7	86	7	-	0	0	7	6/8
Opuntia polyacnatha									
84	**0**	0	0	-	-	0	0	0	-/-
90	**66**	100	0	-	-	0	0	0	-/-
96	**20**	0	100	-	-	0	0	0	5/7
01	**120**	0	100	-	-	0	0	0	7/9
06	**60**	33	67	-	-	0	0	0	4/9
11	**20**	0	100	-	-	0	0	0	4/9
Pinus monophylla									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**40**	50	50	-	20	0	0	0	-/-
01	**20**	100	0	-	100	0	0	0	10/10
06	**60**	67	33	-	60	0	0	0	-/-
11	**40**	100	0	-	60	0	0	0	-/-
Symphoricarpos oreophilus									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**20**	0	100	-	-	100	0	0	16/23
01	**40**	0	100	-	-	0	0	0	-/-
06	**0**	0	0	-	-	0	0	0	-/-
11	**20**	0	100	-	-	100	0	0	16/22

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Tetradymia nuttallii									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**0**	0	0	-	-	0	0	0	-/-
01	**0**	0	0	-	-	0	0	0	-/-
06	**0**	0	0	-	-	0	0	0	-/-
11	**0**	0	0	-	-	0	0	0	22/41