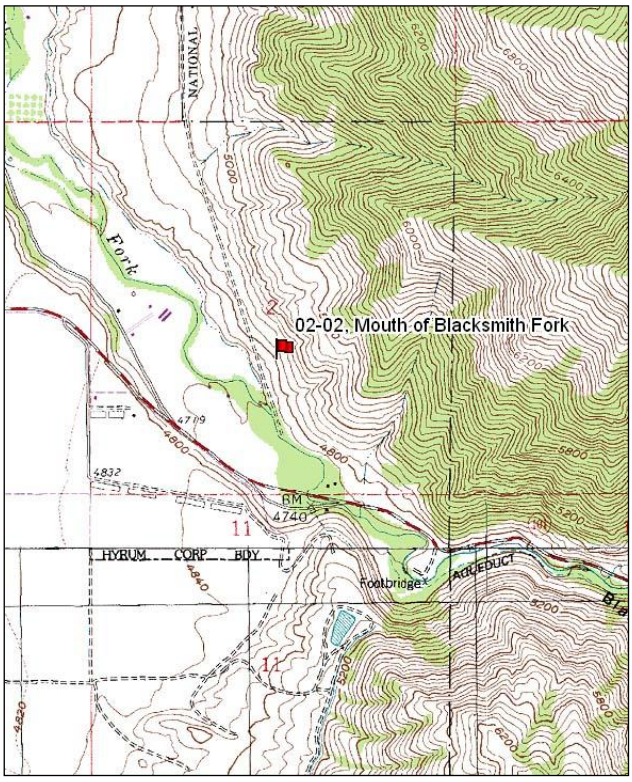
MOUTH OF BLACKSMITH FORK - TREND STUDY NO. 2-2-11

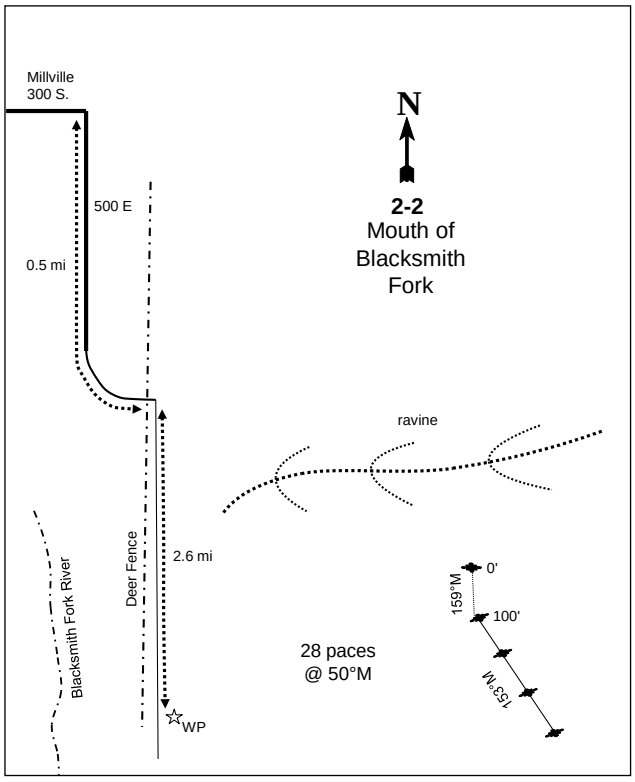
Vegetation Type: Basin Big Sagebrush
Range Type: Deer Winter
NRCS Ecological Site Description: Not Available
Land Ownership: DWR
Elevation: 4,800 ft (1,463 m)
Aspect: South
Slope: 20%
Transect bearing: 159° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 4 on 5ft.

Directions:
Proceed south 0.5 miles from the intersection of 300 South and 500 East in Millville. At the intersection just east of the deer fence, proceed south for 2.6 miles and stop at a witness post, which is at the top of the hill. From the witness post, walk 100 feet at 50 degrees magnetic to the 0-foot stake of the baseline marked by browse tag #90. The baseline runs at a bearing of 159 degrees magnetic. The baseline doglegs after 100 feet and runs 151 degrees magnetic.

Map Name: Logan



Diagrammatic Sketch:



Township: 10N Range: 1E Section: 2

GPS: NAD 83, UTM 12S 433072 E 4609266 N

MOUTH OF BLACKSMITH FORK - TREND STUDY NO. 2-2

Site Information

Site Description: This study is located slightly north of where the Blacksmith Fork river enters the Cache Valley. The study sits on a narrow bench about 200 feet above a big game fence, which runs along the east edge of the valley. At the outset of the study, the vegetation type was basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) with a remnant stand of perennial grass, and an abundance of annual grasses, annual forbs, and perennial weeds. The weedy annual grass species jointed goatgrass (*Aegilops cylindrica*) and winter rye (*Secale cereale*) are both found on the site (Table - Herbaceous Trends). The site burned as part of the Sleepy Hollow wild fire in 2007, which burned 900 acres in the area. The fire removed nearly all the browse from the site. The site was part of the Millville WMA Fire Rehabilitation project (WRI Project #972). The rehabilitation project was accomplished by aerially applying Plateau (Imazapic) herbicide in September of 2007. In December of 2007, 792 acres were aerially seeded (Table - Seed Mix). In the spring of 2008, the treatment area was planted with 4,000 antelope bitterbrush plants (*Purshia tridentata*) to restore browse cover in order to benefit wintering mule deer; however, no bitterbrush plants were observed within the study site. In 2006, deer pellet groups were sampled in moderate abundance; however, deer pellet groups were sampled in low abundance in all other sample years. Elk pellet groups have been sampled in low abundance since 2001 (Table - Pellet Group Data).

Browse: The browse composition once consisted of a fairly dense stand of basin big sagebrush with a few antelope bitterbrush (*Purshia tridentata*); however, the recent fire has removed the browse component. The sagebrush population is sparse and the surviving younger, mature plants are overgrown by surrounding annual grasses. A more mature stand of unburned sagebrush is found just south of the study site. Historically, the sagebrush population consisted of mostly mature plants, with recruitment of young plants being good at the outset of the study and becoming poor over the course of the study. Sagebrush has received mostly light, but occasional moderate use by wildlife over the course of the study. Broom snakeweed (*Gutierrezia sarothrae*) and the seeded species forage kochia (*Kochia prostrata*) make up a minor browse component. Shrubs such as antelope bitterbrush and Utah juniper (*Juniperus osteosperma*) occurred occasionally in the past, but were not sampled following the fire (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is abundant, and is dominated by annual grasses and weedy forbs. Jointed goatgrass and winter rye are the most abundant species found on the site, and have both increased, following the fire. The annual grasses Japanese chess (*Bromus japonicus*), rattlesnake brome (*B. brizaeformis*), and cheatgrass (*B. tectorum)* have all decreased; however, cheatgrass in the past was the dominant annual grass species and was likely the fuel for the recent fire. The weedy perennial grass species bulbous bluegrass (*Poa bulbosa*) has also decreased in abundance. The preferred perennial grass bluebunch wheatgrass (*Agropyron spicatum*) has increased in abundance, but not significantly. However, Sandberg bluegrass (*Poa secunda*) has decreased significantly since 2006. The forb composition is dominated by annual and weedy species that typically act as invaders or increasers on disturbed areas. The weedy species western ragweed (*Ambrosia psilostachya*) is the dominant forb on the site. Alfalfa (*Medicago sativa*) also dominates the site as a preferred forb species. Since 1984, the weedy species Willowherb (*Epilobium brachycarpum*), storksbill (*Erodium cicutarium*), curlycup gumweed (*Grindelia squarrosa*) and the noxious weed Dyer's woad (*Isatis tinctoria*) have all been sampled on the site.

Soil: According to the soil map, the soil is located on the Rough Broken Land component, but is likely part of the Sterling series. The soils within this classification are characterized as deep and somewhat excessively drained with a permeable restrictively layer. (Soil Survey Staff 2011). The soil texture is a loam with a moderately alkaline soil reaction (pH 7.9). Protective ground cover is abundant, but comes largely from weedy plant cover and litter (Table - Basic Cover). There has been evidence of past soil movement, but no active erosion has been observed on the site and the soil erosion condition has been classified as stable since 2001.

SEED MIX--
Management unit 02, Study no: 2

Project Name: Millville WMA WRI Database #: 972			
Application: Aerial Seed		Acres:	900
Seed Type		lbs in mix	lbs/acre
G	Canby Bluegrass 'Canbar'	450	0.50
G	Crested Wheatgrass 'Hycrest'	1200	1.33
G	Idaho Fescue 'Joseph'	450	0.50
G	Orchardgrass 'Paiute'	600	0.67
G	Slender Wheatgrass 'San Luis'	1500	1.67
G	Snake River Wheatgrass 'Secar'	550	0.61
F	Alfalfa 'Ladak'	450	0.50
F	Alfalfa 'Ranger'	450	0.50
F	Sainfoin 'Eski'	810	0.90
F	Small Burnet 'Delar'	1000	1.11
F	Western Yarrow	100	0.11
F	Yellow Sweetclover	600	0.67
B	Forage Kochia	450	0.50
B	Sagebrush, Mountain	218	0.24
B	Sagebrush, Wyoming	225	0.25
Total Pounds:		9053	10.06
PLS Pounds:			8.45

Trend Assessments

Browse:

- **1984 to 1990 - up (+2):** The density of basin big sagebrush increased 21% from 799 plants/acre to 964 plants/acre. The percent of decadent plants in the population decreased from 92% to 31% of the population. Poor vigor increased from 13% to 24% of the sagebrush population.
- **1990 to 1996 - up (+2):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Sagebrush decadence decreased to 8%, and poor vigor decreased to 1%. Recruitment in young sagebrush plants decreased from 31% to 26% of the population, but is still considered to be very good.
- **1996 to 2001 - slightly up (+1):** The density for sagebrush increased 11% from 1,680 plants/ acre to 1,860 plants per acre. Decadence in sagebrush increased to 13%, and poor vigor increased to 5%. Recruitment of young sagebrush decreased to 1% of the population.
- **2001 to 2006 - down (-2):** Sagebrush density decreased by 23% to 1,440 plants/ acre. Decadence in sagebrush increased to 17%, but poor vigor decreased to 3%. Recruitment of young sagebrush was absent.
- **2006 to 2011 - down (-2):** The wildfire effectively removed sagebrush from the site. No sagebrush was sampled within the sample area, though a few plants occurred scattered across the site. The seeded species forage kochia was sampled for the first time at 20 plants/acre.

Grass:

- **1984 to 1990 - down (-2):** All perennial grasses were a minor component of the herbaceous understory, and the sum of nested frequency for perennial grasses decreased by 26%. Bluebunch wheatgrass decreased significantly. Annual grasses were not measured. However, jointed goatgrass was measured and increased significantly in nested frequency.

- **1990 to 1996 - down (-2):** Perennial grasses remained a minor component of the herbaceous understory despite a 90% increase in the sum of nested frequency of perennial grasses. This increase is primarily due to the weedy species bulbous bluegrass, which had a significant increase in nested frequency. Annual grasses provided the major component of grass and vegetation cover. Both jointed goatgrass and winter rye increased significantly and provided 8% and 3% cover, respectively. Japanese chess, rattlesnake brome, and cheatgrass were measured for the first time and provided 17%, less than 1%, and 8% cover, respectively.
- **1996 to 2001 - down (-2):** The sum of nested frequency for perennial grasses increased two-fold, but this increase is due to the increase in abundance of the weedy species bulbous bluegrass. Bulbous bluegrass had a significant increase in nested frequency, and increased in cover to 8%. Sandberg bluegrass increased significantly in nested frequency and provided 1% cover. Annual grasses make up the majority of grass cover. Jointed goatgrass and cheatgrass both had significant increases in nested frequency, and both increased in cover to 15%.
- **2001 to 2006 - stable (0):** The sum of nested frequency for perennial grasses remained similar. Bulbous bluegrass did not show a significant increase in nested frequency, but cover increased to 11%. Annual grasses maintained dominance of the herbaceous understory. Jointed goatgrass increased significantly in nested frequency and cover increased to 26%. Conversely, cheatgrass decreased significantly in nested frequency and cover decreased to 5%.
- **2006 to 2011 - down (-2):** Perennial grasses decreased in the sum of nested frequency by 80%. Bulbous and Sandberg bluegrasses had significant decreases in nested frequency, and cover decreased to less than 1%. Annual grasses had no significant change in trend, except for winter rye, which increased significantly in nested frequency and cover increased from 5% to 29%.

Forb:

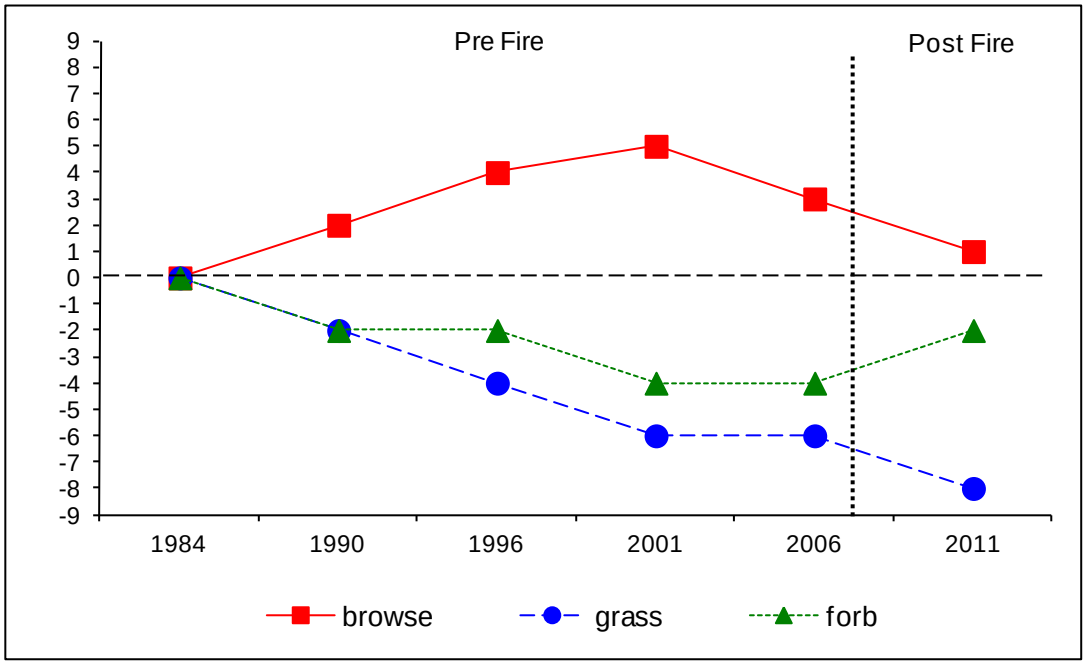
- **1984 to 1990 - down (-2):** The sum of nested frequency for perennial forbs decreased by 44%. Dyer's woad increased significantly in nested frequency. Western ragweed decreased significantly in nested frequency.
- **1990 to 1996 - stable (0):** The sum of nested frequency for perennial forbs remained similar. Dyer's woad decreased significantly in nested frequency.
- **1996 to 2001 - down (-2):** The sum of nested frequency for perennial forbs decreased by 48%. The most abundant forbs consist of pale alyssum, ragweed, and storksbill. The only positive aspects of the forb composition are the significant decline in the nested frequency of dyer's woad and the stable frequency of alfalfa.
- **2001 to 2006 - stable (0):** The sum of nested frequency and cover for perennial forbs remained similar. The weedy species western ragweed remained similar in nested frequency, and provided nearly half of the cover within the forb community at 2% in 2006.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased just over two-fold. Alfalfa increased significantly in nested frequency, and cover increased from 1% to 6%. However, the weedy species western ragweed also increased significantly in nested frequency, and cover increased to 7%

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 2, study no: 2

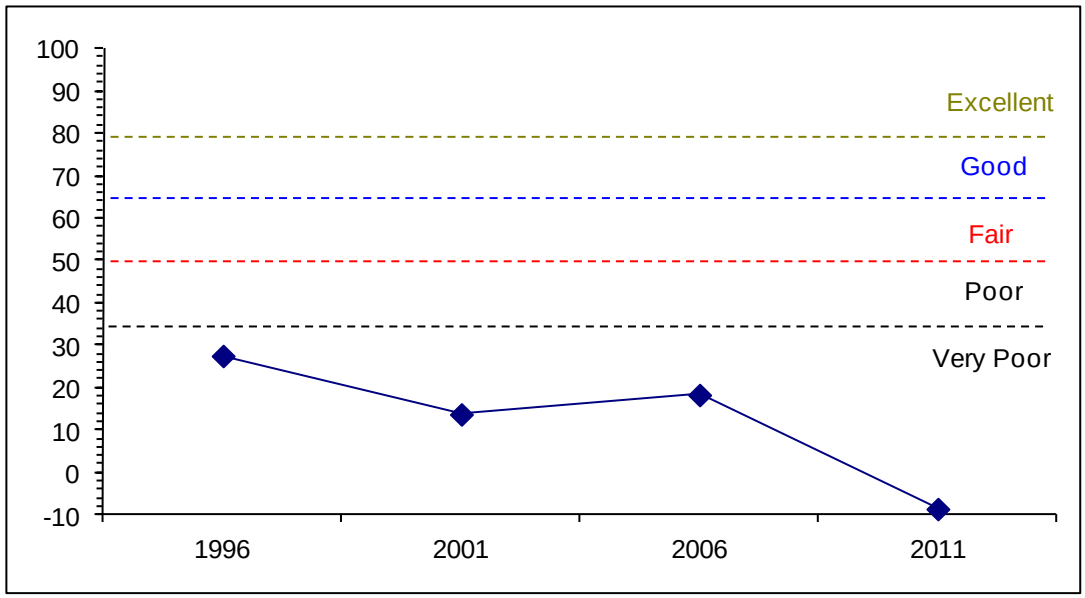
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
96	12.3	12.6	13.0	1.6	-20.0	10.0	-2.0	**27.5**	Very Poor
01	13.7	11.1	0.5	3.5	-20.0	6.9	-2.0	**13.7**	Very Poor
06	19.7	9.9	0.0	2.6	-20.0	8.1	-2.0	**18.3**	Very Poor
11	0.0	0.0	0.0	3.4	-20.0	10.0	-2.0	**-8.6**	Very Poor

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 2, Study no: 2



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 2, Study no: 2



HERBACEOUS TRENDS--
Management unit 02, Study no: 2

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Aegilops cylindrica (a)	a3	b81	c148	d229	e274	e275	7.88	15.26	26.07	28.22
G	Agropyron cristatum	-	-	-	-	-	4	-	-	-	.03
G	Agropyron spicatum	b46	a15	ab21	a17	a17	ab29	.73	.28	.16	1.49
G	Aristida purpurea	3	-	-	-	-	-	-	-	-	-
G	Bromus brizaeformis (a)	-	-	b48	b45	a11	a-	.19	.18	.04	-
G	Bromus japonicus (a)	-	-	c338	b73	a12	a6	16.71	.32	.02	.16
G	Bromus tectorum (a)	-	-	b262	c313	a183	a160	8.07	14.82	4.94	2.39
G	Carex sp.	-	-	-	4	-	-	-	.38	-	-
G	Elymus cinereus	-	-	-	8	3	-	-	.27	.03	-
G	Koeleria cristata	5	-	-	-	-	-	-	-	-	-
G	Poa bulbosa	-	-	a58	b171	b193	a12	1.49	7.62	10.55	.09
G	Poa pratensis	-	-	-	3	-	-	-	.03	-	-
G	Poa secunda	a12	ab34	a14	b62	b50	a10	.03	.78	1.10	.09
G	Secale cereale (a)	a-	a8	bc114	b89	c135	d289	2.77	2.48	5.12	29.38
Total for Annual Grasses		3	89	910	749	615	730	35.64	33.08	36.20	60.16
Total for Perennial Grasses		66	49	93	265	263	55	2.25	9.36	11.84	1.71
Total for Grasses		69	138	1003	1014	878	785	37.90	42.44	48.05	61.88
F	Agoseris glauca	1	5	3	-	4	4	.00	-	.01	.30
F	Allium acuminatum	22	-	-	-	-	-	-	-	-	-
F	Alyssum alyssoides (a)	-	-	b47	c106	ab21	a9	.21	.33	.04	.04
F	Ambrosia psilostachya	d261	bc94	c114	ab57	a44	c124	3.92	2.25	1.77	7.26
F	Artemisia ludoviciana	1	3	-	-	-	-	-	-	-	-
F	Asclepias asperula	-	8	5	11	6	10	.54	.23	.98	1.24
F	Astragalus utahensis	6	8	-	-	-	-	-	-	-	-
F	Balsamorhiza sagittata	1	-	-	-	-	-	-	-	-	-
F	Calochortus nuttallii	1	-	3	3	8	10	.01	.03	.02	.03
F	Cirsium undulatum	b22	a1	a1	a2	a-	a-	.00	.15	-	-
F	Collinsia parviflora (a)	-	-	-	-	4	4	-	-	.01	.03
F	Comandra pallida	3	-	-	-	-	-	-	-	-	-
F	Crepis acuminata	5	7	-	2	1	-	-	.00	.03	-
F	Cryptantha sp.	-	-	-	-	2	-	-	-	.03	-
F	Epilobium brachycarpum (a)	-	-	b70	a6	a-	a2	.29	.01	-	.00
F	Erodium cicutarium (a)	-	-	a8	b141	a19	a9	.07	4.19	.43	.03
F	Gilia sp. (a)	-	-	3	8	-	-	.00	.01	-	-
F	Grindelia squarrosa	-	-	3	-	-	-	.03	-	-	-
F	Helianthus annuus (a)	-	-	a-	a-	a-	a9	-	-	-	.05
F	Holosteum umbellatum (a)	-	-	a-	c101	b60	b25	-	.29	.14	.78
F	Isatis tinctoria	a1	c46	b27	ab6	ab6	a1	.19	.01	.09	.00
F	Lactuca serriola (a)	a-	a6	a2	a6	a2	b93	.00	.02	.03	1.44
F	Linum lewisii	1	-	-	-	-	-	-	-	-	-
F	Lithospermum ruderale	a-	b6	a-	a-	a-	a-	.03	-	-	-
F	Lomatium grayi	5	-	-	-	-	5	-	-	-	.06
F	Medicago sativa	a15	a19	a16	a22	a26	b66	.45	.74	.96	6.36

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Melilotus alba	$_{a}$9	$_{a}$1	$_{b}$28	$_{a}$-	$_{a}$-	$_{a}$-	.30	-	-	-
F	Melilotus officinalis	-	-	-	-	-	10	-	-	-	.15
F	Petradoria pumila	2	-	-	-	-	-	-	-	-	-
F	Phlox longifolia	-	-	5	-	-	-	.01	-	-	-
F	Ranunculus testiculatus (a)	-	-	-	6	6	2	-	.01	.01	.00
F	Tragopogon dubius (a)	$_{c}$191	$_{ab}$35	$_{b}$60	$_{a}$8	$_{a}$15	$_{c}$175	.71	.16	.06	3.62
F	Unknown forb-perennial	-	-	-	-	3	-	-	-	.15	-
F	Veronica biloba (a)	-	-	-	-	6	-	-	-	.01	-
F	Zigadenus paniculatus	-	-	-	4	-	-	-	.00	-	-
Total for Annual Forbs		191	41	190	382	133	328	1.29	5.05	0.75	6.03
Total for Perennial Forbs		356	198	205	107	100	230	5.50	3.44	4.07	15.42
Total for Forbs		547	239	395	489	233	558	6.80	8.50	4.82	21.46

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

BROWSE TRENDS--
Management unit 02, Study no: 2

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Artemisia tridentata tridentata	50	52	46	-	9.85	10.98	15.73	-
B	Gutierrezia sarothrae	7	9	6	4	.03	.69	.03	.03
B	Kochia prostrata	-	-	-	1	-	-	-	-
B	Rosa woodsii	-	-	-	1	-	-	-	-
Total for Browse		57	61	52	6	9.89	11.67	15.76	0.03

CANOPY COVER, LINE INTERCEPT--
Management unit 02, Study no: 2

Species	Percent Cover	
	'06	'11
Artemisia tridentata tridentata	17.25	-
Gutierrezia sarothrae	.55	.16

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 02, Study no: 2

Species	Average leader growth (in)		
	‘01	'06	'11
Artemisia tridentata tridentata	2.1	2.0	4.0

BASIC COVER--
Management unit 02, Study no: 2

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.00	11.00	59.50	69.97	64.77	82.46
Rock	16.00	20.75	6.88	3.52	4.32	2.25
Pavement	14.00	3.50	2.87	4.34	5.37	.79
Litter	58.00	51.75	71.15	55.77	45.77	79.78
Cryptogams	1.00	0	0	0	0	0
Bare Ground	9.00	13.00	.41	.26	.55	.10

SOIL ANALYSIS DATA --
Management unit 02, Study no: 2, Study Name: Mouth of Blacksmith Fork

Effective rooting depth (in)	pH	Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.9	7.9	33.3	40.7	26.0	2.7	7.3	188.8	0.8

PELLET GROUP DATA--
Management unit 02, Study no: 2

Type	Quadrat Frequency			
	'96	'01	'06	'11
Rabbit	-	-	-	-
Elk	1	-	1	-
Deer	1	2	16	-
Cattle	1	1	-	-

Days use per acre (ha)		
'01	'06	'11
-	-	-
-	1 (2)	1 (3)
2 (5)	32 (79)	1 (3)
2 (4)	1 (2)	-

BROWSE CHARACTERISTICS--
Management unit 02, Study no: 2

		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 tridentata tridentata									
84	**799**	0	8	92	-	0	100	13	32/40
90	**964**	31	38	31	-	24	3	24	25/27
96	**1680**	26	65	8	220	6	0	1	32/52
01	**1860**	1	86	13	-	16	0	5	31/41
06	**1440**	0	83	17	-	36	10	3	34/51
11	**0**	0	0	0	-	0	0	0	27/28
Chrysothamnus nauseosus									
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	39/67

		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									
84	**99**	0	67	33	-	67	0	0	19/22
90	**899**	7	93	0	-	0	0	0	18/16
96	**620**	45	55	0	-	0	0	0	14/19
01	**560**	0	100	0	-	4	0	0	12/18
06	**140**	0	100	0	-	0	0	0	13/17
11	**120**	17	83	0	-	0	0	0	14/15
Kochia prostrata									
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	**20**	0	100	-	-	0	0	0	18/18
Opuntia sp.									
84	**0**	0	0	-	-	0	0	0	-/-
90	**33**	0	100	-	-	0	0	0	6/8
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	-/-
Rosa woodsii									
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	**20**	100	0	-	-	0	0	0	-/-