

HIGH CREEK - TREND STUDY NO. 2-1-11

Vegetation Type: Mountain Big Sagebrush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Upland Shallow Loam \(Black Sagebrush\), R047XA316UT](#)

Land Ownership: DWR

Elevation: 5,300 ft (1,615 m)

Aspect: South

Slope: 32%

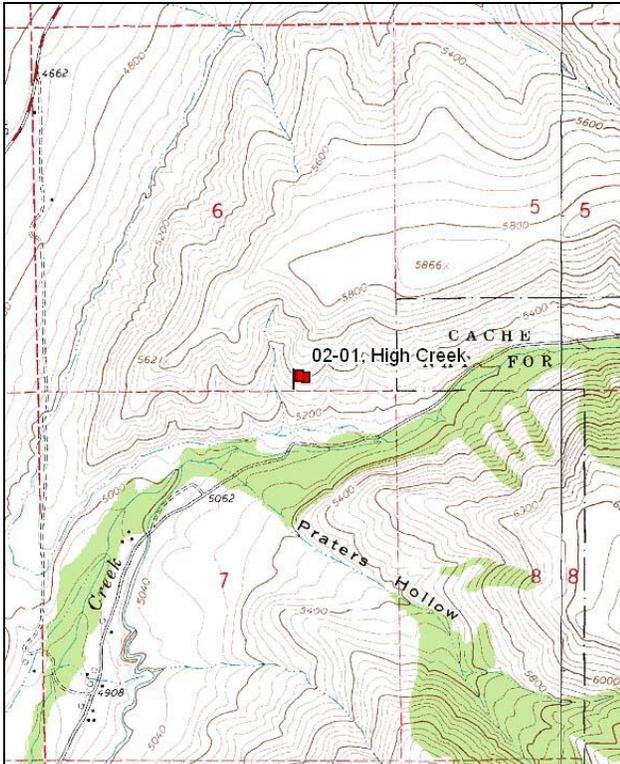
Transect bearing: 165° magnetic

Belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Rebar: belt 2 on 2ft, belt4 on 2ft, and belt 5 on 2ft.

Directions:

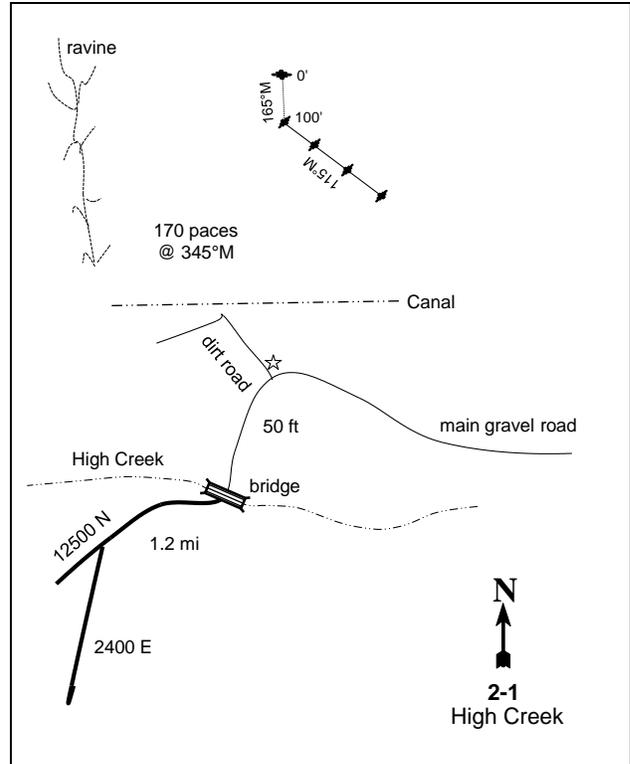
From 12500 North and 2400 East in Richmond, proceed northeast for 1.2 miles and cross High Creek. Just beyond this crossing (north) a dirt road heads off to the northeast. From this intersection, walk 170 paces at a bearing of 345 degrees magnetic to the 100-foot stake of the frequency baseline. Walk 100 feet beyond this stake to the 0-foot stake, marked with browse-tag #9150. The baseline runs at 165 degrees magnetic. The baseline doglegs after 100 feet and runs in a direction of 115 degrees magnetic.

Map Name: Richmond



Township: 14N Range: 2E Section: 6

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 436617 E 4647445 N

## HIGH CREEK - TREND STUDY NO. 2-1

### Site Information

Site Description: This study is located on the north side of High Creek and samples crucial winter range on the northernmost part of the herd unit, near the Idaho border. The hillside on which the study is located contains many open areas dominated by cheatgrass (*Bromus tectorum*) and the invasive perennial grass bulbous bluegrass (*Poa bulbosa*). The browse canopy is primarily made up of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Deer and cattle pellet groups have been sampled in low abundance since 2001 (Table - Pellet Group Data).

Browse: The key browse species found on this site are mountain big sagebrush and antelope bitterbrush (*Purshia tridentata*). Sagebrush provided over 80% of the total browse cover in each reading ranging from 6% to 12% cover since 1996 (Table - Browse Trends). Recruitment of young sagebrush plants was good in 1984, 1990, and 2006, but was poor in the other sample years. The rate of decadence increased through the initial sample years, but has remained near 20% since 1996. The utilization of sagebrush has been light and only received heavy use in 1984. Antelope bitterbrush is a small, healthy population on the site, with most plants having a clubbed, prostrate growth form. Bitterbrush was first sampled in 1996, most likely due to the larger sample area, and most of the plants are located higher on the hill. Utilization of bitterbrush has been moderate to heavy since 1996 (Table - Browse Characteristics). Both sagebrush and bitterbrush had better than usual leader growth in 2011, likely due to the wet winter and spring that year (Table - Key Browse Annual Leader Growth).

Herbaceous Understory: The grass component of the study is dominated by cheatgrass and two other annual brome species, Japanese chess (*Bromus japonicus*) and rattlesnake brome (*B. brizaeformis*). In the past, cheatgrass has had high, stable nested frequencies, but frequency decreased significantly in 2011. Bulbous bluegrass has increased substantially since 2001 and is also a co-dominant species on the site. The only other grass species are small populations of bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) (Table - Herbaceous Trends).

The forb understory is made up of annual and weedy species that typically act as invaders or increasers after disturbance. These winter annuals and weeds provide considerable competition to other more desirable species. Dominant species include western ragweed (*Ambrosia psilostachya*), annual willowherb (*Epilobium brachycarpum*), storksbill (*Erodium cicutarium*), common sunflower (*Helianthus annuus*), and yellow salsify (*Tragopogon dubius*). The perennial western ragweed had a high nested frequency in 1984, but decreased significantly in 1990, and since then has steadily increased in frequency and cover. The noxious weeds field bindweed (*Convolvulus arvensis*) and dyers woad (*Isatis tinctoria*) were sampled for the first time in 2006 at low nested frequency (Table - Herbaceous Trends).

Soil: Soil is part of the Richmond soil series, which occur on mountain slopes. Parent material consists of colluvium derived from limestone and/or residuum weathered from limestone. These soils are classified as shallow with excessive drainage (Soil Survey Staff 2011). Rocks are common on the surface and in the profile. Rocks consist of both large limestone cobble and smaller gravel sized rock. The soil is a clay loam with a neutral soil reaction (pH 7.2) (Table - Soil Analysis Data). Protective ground cover is abundant, but comes largely from weedy plant cover and litter (Table - Basic Cover). No active erosion has been observed on the site, and the soil erosion condition has been classified as stable since 2001.

### Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** The density of mountain big sagebrush decreased by 11% from 4,131 plants/acre to 3,664 plants/acre, yet the proportion of young plants increased from 19% to 35%.

Sagebrush decadence increased from 4% to 13%. The sagebrush population also showed signs of poor vigor increasing from 2% to 26%.

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Sagebrush decadence increased to 18%, but poor vigor decreased to 9%. Recruitment of young sagebrush plants decreased to 2% of the population.
- **1996 to 2001 - down (-2):** The density for sagebrush decreased 29% from 2,400 plants/acre to 1,700 plants/acre, though cover remained similar at 13%. The amount of decadent sagebrush increased to 22%, but plants displaying poor vigor continued to decrease to 5%. Recruitment of young sagebrush remained very low at 1% of the population.
- **2001 to 2006 - slightly down (-1):** The sagebrush density decreased by 7% to 1,580 plants/acre, and cover decreased to 6%. Recruitment of sagebrush plants was excellent at 56% of the population. However, mature sagebrush decreased by 67% from 1,300 mature plants/acre to 400 mature plants/acre. Decadence decreased slightly to 19%, but poor vigor increased slightly to 8%.
- **2006 to 2011 - stable (0):** The sagebrush density remained similar at 1,600 plants/acre, though cover increased to 8%. The amount of decadent sagebrush increased slightly to 23%, and poor vigor increased to 16%. Recruitment decreased markedly with no young sagebrush plants sampled in 2011.

#### Grass:

- **1984 to 1990 - stable (0):** The sum of nested frequencies for perennial grasses remained low on the study.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial grasses increased more than two-fold, but perennial grasses remain rare on the site. Sandberg bluegrass was sampled for the first time at low frequency and cover. Perennial grasses were a minor component of the understory; however, annual grasses were included in the sample for the first time and were very abundant. Cheatgrass had the highest nested frequency and highest average cover for grasses at 23%.
- **1996 to 2001 - slightly down (-1):** The sum of nested frequencies for perennial grasses increased by 97%, and cover increased from 4% to 6%. However, the increase is mostly due to a significant increase in the nested frequency of bulbous bluegrass, with a subsequent increase in cover.
- **2001 to 2006 - slightly down (-1):** The sum nested frequency of perennial grasses increased by 34%, which is attributable to a significant increase in the nested frequency of bulbous bluegrass. Bulbous bluegrass comprised 28% of the total grass cover, increasing from 4% to 8% cover. Cheatgrass maintained a consistent nested frequency; however, cheatgrass decreased in cover from 25% to 18%.
- **2006 to 2011 - stable (0):** The sum nested frequency for perennial grasses increased by 12%. Despite the increase, desired perennial species remain rare on the site. Bulbous bluegrass maintained a similar nested frequency, though cover decreased slightly to 5%. Cheatgrass had a significant decrease in nested frequency, but the other annual brome species increased significantly. Cover of the annual bromes decreased from 19% to 12%.

#### Forb:

- **1984 to 1990 – slightly up (+1):** The sum of nested frequency for perennial forbs decreased by 73%, however, this is mostly due to the decrease of western ragweed which showed a significant decrease in nested frequency. Because there was a significant decrease in this undesirable species, the overall forb trend moved slightly up.
- **1990 to 1996 - down (-2):** Weedy forbs dominated the study site and provided the majority of the forb cover. Perennial forbs decreased by 71%. The sum of nested frequency of annual forbs increased markedly.
- **1996 to 2001 - slightly up (+1):** Although the forb community has been composed of weedy annual species, the sum of nested frequencies for perennials forbs increased nearly four-fold. The desirable species sego lily (*Calochortus nuttallii*) and silvery lupine (*Lupinus argenteus*) increased significantly in nested frequency.

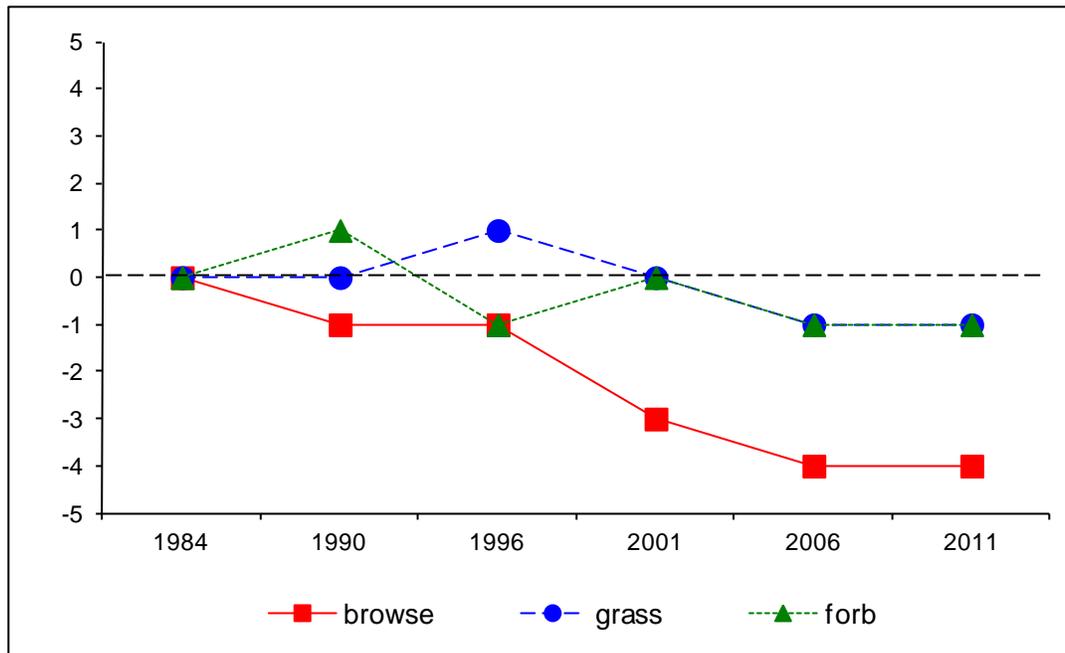
- **2001 to 2006 - slightly down (-1):** Perennial forbs decreased by 14% in nested frequency, though cover increased from 3% to 6%. The noxious weeds field bindweed and dyers woad were sampled at low frequency and cover.
- **2006 to 2011 - stable (0):** The sum of nested frequencies for perennial forbs increased by 88%, but much of that increase is due to a significant increase in the nested frequency of the weedy species western ragweed. The noxious weed, field bindweed, and the desirable species, sego lily, also increased significantly in nested frequency, though both species remained rare on the site. Annual forb species also increased substantially on the site.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --  
Management unit 2, study no: 1

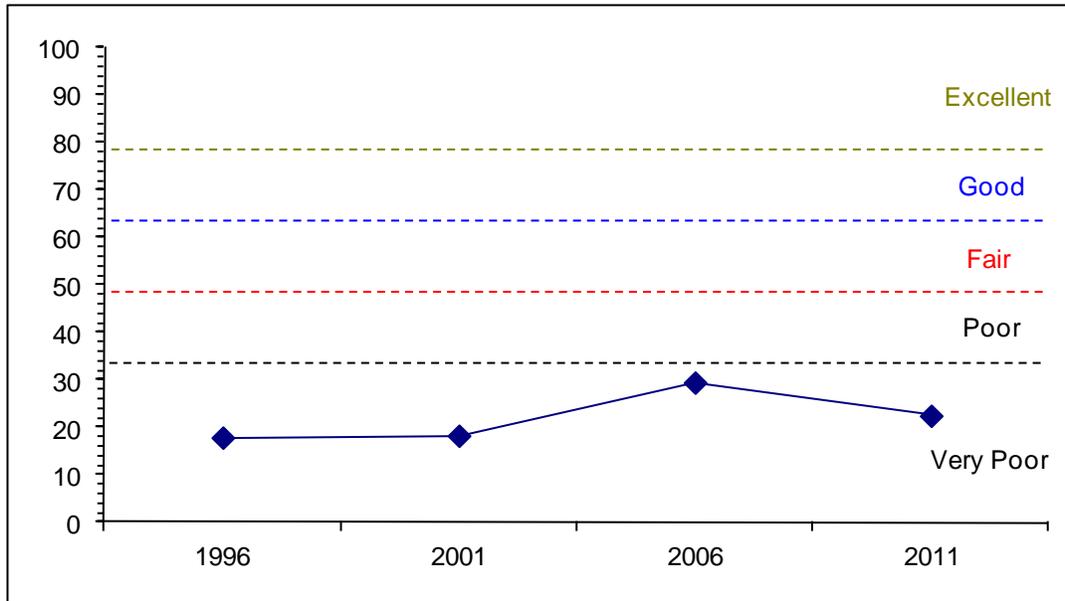
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	18.1	10.3	0.9	5.7	-20.0	2.9	0.0	<b>17.9</b>	Very Poor
01	18.2	9.0	0.5	3.2	-19.3	6.8	0.0	<b>18.3</b>	Very Poor
06	9.8	10.3	15.0	2.4	-14.0	10.0	-4.0	<b>29.5</b>	Very Poor
11	11.7	9.0	0.0	2.6	-8.7	10.0	-2.0	<b>22.5</b>	Very Poor

### Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--  
Management unit 2 Study no: 1



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--  
 Management unit 2, Study no: 1



HERBACEOUS TRENDS--  
 Management unit 02, Study no: 1

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	a9	ab25	abc31	bc34	bc37	c58	2.02	1.15	1.12	1.30
G	Bromus brizaeformis (a)	-	-	b85	a38	a10	c146	.77	.12	.05	2.37
G	Bromus japonicus (a)	-	-	b158	a68	b111	c215	4.85	.72	1.04	4.75
G	Bromus tectorum (a)	-	-	b306	b371	b361	a251	23.27	24.90	17.63	4.49
G	Poa bulbosa	a-	a3	a26	b88	c141	c146	.83	4.37	7.85	5.37
G	Poa secunda	a-	a-	b13	b16	ab7	a3	.84	.43	.07	.00
Total for Annual Grasses		0	0	549	477	482	612	28.90	25.74	18.72	11.61
Total for Perennial Grasses		9	28	70	138	185	207	3.69	5.96	9.05	6.68
Total for Grasses		9	28	619	615	667	819	32.60	31.70	27.77	18.30
F	Agoseris glauca	17	16	-	-	4	22	-	-	.06	.31
F	Allium acuminatum	6	-	-	-	-	3	-	-	-	.00
F	Alyssum alyssoides (a)	-	-	a95	b194	a92	b158	.22	1.63	.22	1.06
F	Ambrosia psilostachya	c284	a15	a16	a35	a45	b77	.69	.64	1.48	2.42
F	Artemisia ludoviciana	7	6	4	14	7	9	.15	.74	.47	.62
F	Astragalus sp.	-	4	-	-	-	-	-	-	-	-
F	Balsamorhiza sagittata	-	-	-	-	-	-	-	.15	.00	-
F	Boraginaceae (a)	-	-	a-	a-	a12	a-	-	-	.03	-
F	Calochortus nuttallii	bc24	a-	a-	bc30	b7	c43	-	.19	.02	.32
F	Camelina microcarpa (a)	-	-	-	-	3	9	-	-	.00	.05
F	Cirsium undulatum	-	4	-	-	-	3	-	-	-	.15
F	Collinsia parviflora (a)	-	-	a-	a1	b56	a-	-	.00	.21	-
F	Convolvulus arvensis	a-	a-	a-	a-	a6	b13	-	-	1.00	.51
F	Crepis acuminata	-	5	7	3	8	5	.27	.04	.21	.03

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Epilobium brachycarpum</i> (a)	-	b127	b119	a63	c179	b148	1.78	.25	4.28	2.02
F	<i>Erodium cicutarium</i> (a)	-	-	a30	bc193	b158	c223	.35	6.77	3.65	6.39
F	<i>Galium aparine</i> (a)	-	-	a6	a7	a3	b28	.18	.04	.00	.61
F	<i>Grindelia squarrosa</i>	a-	a-	a5	ab17	b26	b36	.21	.87	1.82	.82
F	<i>Hackelia patens</i>	a2	a12	a1	a-	a-	a-	.03	-	-	-
F	<i>Helianthus annuus</i> (a)	a-	b30	a-	a6	a6	c124	.00	.06	.18	2.46
F	<i>Holosteum umbellatum</i> (a)	-	-	-	-	7	6	-	-	.04	.01
F	<i>Isatis tinctoria</i>	-	-	-	-	1	-	-	-	.01	-
F	<i>Lactuca serriola</i> (a)	a-	bc7	ab28	a4	c61	d98	.72	.02	.59	1.37
F	<i>Lappula occidentalis</i> (a)	-	-	10	-	-	-	.02	-	-	-
F	<i>Lithospermum arvense</i> (a)	-	-	a-	a-	a-	b98	-	-	-	1.56
F	<i>Lomatium grayi</i>	bc27	c30	ab4	ab6	a-	a3	.04	.03	-	.03
F	<i>Lupinus argenteus</i>	a2	a-	a-	b12	a2	ab4	-	.43	.83	.77
F	<i>Machaeranthera</i> spp	b92	a-	a-	a-	a-	a-	-	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	a-	a4	b37	a4	-	.01	.12	.01
F	<i>Oenothera caespitosa</i>	b15	b16	a-	a-	a-	a-	.00	-	.00	-
F	<i>Phacelia hastata</i>	a7	b24	a-	a-	a-	a2	-	-	-	.03
F	<i>Phlox longifolia</i>	3	-	-	9	1	-	-	.01	.00	-
F	<i>Polygonum douglasii</i> (a)	-	-	8	20	8	7	.02	.06	.01	.04
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	5	1	1	-	.01	.00	.00
F	<i>Rumex crispus</i>	-	-	-	-	-	-	-	-	.00	-
F	<i>Tragopogon dubius</i> (a)	a16	b58	ab37	a31	a26	c152	.76	.41	.68	1.38
F	<i>Veronica biloba</i> (a)	-	-	a12	c169	b73	a22	.04	1.68	.45	.17
F	<i>Zigadenus paniculatus</i>	a1	a-	a1	b20	b19	ab17	.03	.26	.25	.11
Total for Annual Forbs		16	262	345	697	722	1078	4.11	10.97	10.53	17.17
Total for Perennial Forbs		487	132	38	146	126	237	1.44	3.39	6.18	6.17
Total for Forbs		503	394	383	843	848	1315	5.56	14.36	16.72	23.35

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

#### BROWSE TRENDS--

Management unit 02, Study no: 1

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	<i>Artemisia tridentata vaseyana</i>	62	54	40	52	12.29	13.07	6.26	7.99
B	<i>Purshia tridentata</i>	8	6	7	9	1.85	1.24	1.33	1.13
Total for Browse		70	60	47	61	14.14	14.32	7.60	9.13

#### CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 1

Species	Percent Cover	
	'06	'11
<i>Artemisia tridentata vaseyana</i>	4.41	10.63
<i>Purshia tridentata</i>	2.58	2.16

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 1

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.5	2.2	3.7
Purshia tridentata	1.1	3.3	5.3

BASIC COVER--

Management unit 02, Study no: 1

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	2.25	6.50	56.92	57.89	49.27	49.02
Rock	37.00	49.25	19.50	19.99	22.76	24.64
Pavement	21.00	11.50	6.28	3.97	11.58	10.53
Litter	30.25	21.00	56.94	34.85	29.68	26.14
Cryptogams	1.50	0	.07	.04	.00	.06
Bare Ground	8.00	11.75	.72	3.32	3.17	4.38

SOIL ANALYSIS DATA --

Management unit 02, Study no: 1, High Creek

Effective rooting depth (in)	pH	Clay loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
9.7	7.2	42.9	29.1	28.0	2.2	16.3	150.4	0.5

PELLET GROUP DATA--

Management unit 02, Study no: 1

Type	Quadrat Frequency		
	'01	'06	'11
Rabbit	-	2	1
Deer	2	5	1
Cattle	2	-	-

Days use per acre (ha)		
'01	'06	'11
-	-	-
10 (25)	3 (7)	1 (2)
2 (5)	2 (5)	4 (9)

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 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>										
84	<b>4131</b>	19	77	4	33	23	76	2	25/30	
90	<b>3664</b>	35	52	13	-	4	0	26	24/36	
96	<b>2400</b>	2	80	18	40	21	4	9	26/38	
01	<b>1700</b>	1	76	22	20	15	5	5	29/44	
06	<b>1580</b>	56	25	19	580	3	0	8	28/47	
11	<b>1600</b>	0	78	23	200	24	4	16	23/33	
<i>Gutierrezia sarothrae</i>										
84	<b>0</b>	0	0	-	-	0	0	0	-/-	
90	<b>0</b>	0	0	-	-	0	0	0	-/-	
96	<b>0</b>	0	0	-	-	0	0	0	-/-	
01	<b>0</b>	0	0	-	-	0	0	0	11/19	
06	<b>0</b>	0	0	-	-	0	0	0	-/-	
11	<b>0</b>	0	0	-	-	0	0	0	-/-	
<i>Purshia tridentata</i>										
84	<b>0</b>	0	0	0	-	0	0	0	-/-	
90	<b>0</b>	0	0	0	-	0	0	0	-/-	
96	<b>220</b>	0	100	0	-	73	0	0	31/72	
01	<b>140</b>	0	100	0	-	29	71	0	26/66	
06	<b>220</b>	0	100	0	-	45	55	0	25/43	
11	<b>260</b>	0	92	8	-	15	46	8	24/43	
<i>Rosa woodsii</i>										
84	<b>0</b>	0	0	-	-	0	0	0	-/-	
90	<b>0</b>	0	0	-	-	0	0	0	-/-	
96	<b>0</b>	0	0	-	-	0	0	0	-/-	
01	<b>0</b>	0	0	-	-	0	0	0	-/-	
06	<b>0</b>	0	0	-	-	0	0	0	-/-	
11	<b>0</b>	0	0	-	-	0	0	0	58/80	