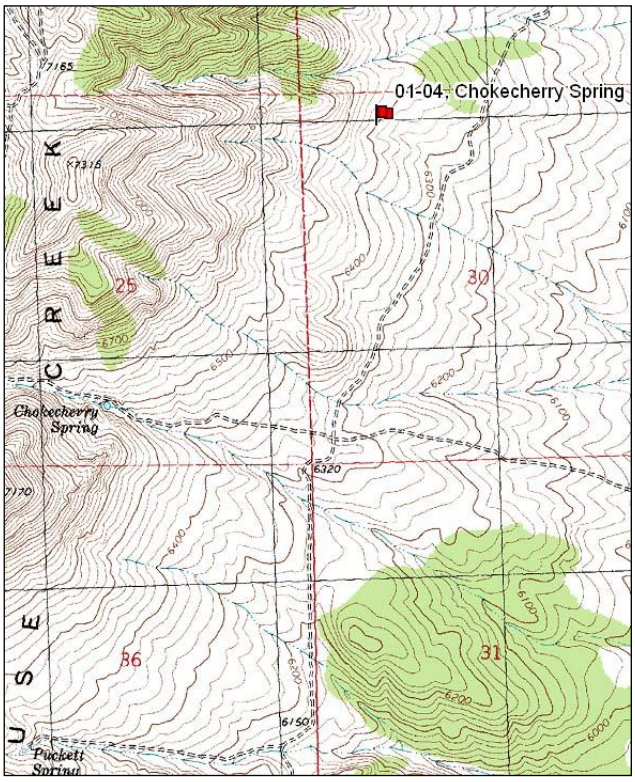
CHOKECHERRY SPRINGS - TREND STUDY NO. 1-4-11

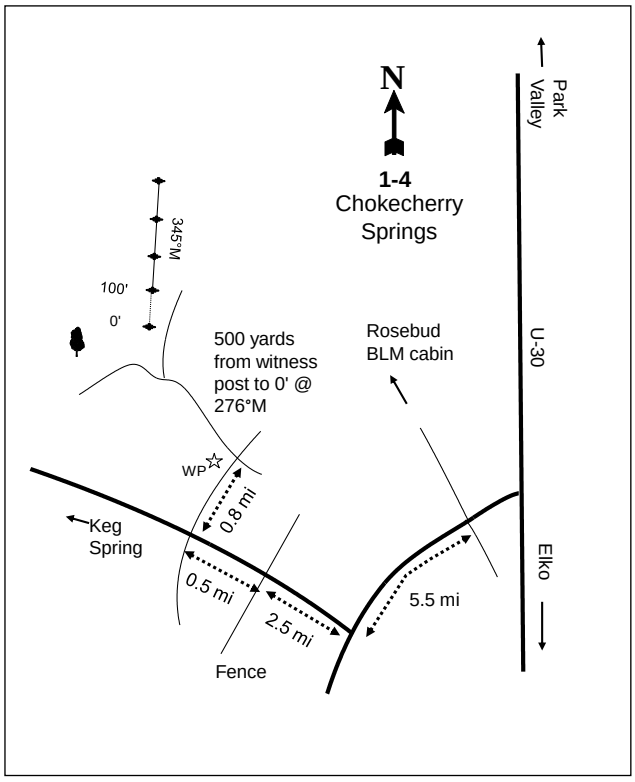
Vegetation Type: Mountain Brush
Range Type: Crucial Deer Winter
NRCS Ecological Site Description: Upland Loam (browse), R025XY312UT
Land Ownership: BLM
Elevation: 6,400 ft. (1,951 m)
Aspect: East
Slope: 15%
Transect bearing: 345° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
Proceed from U-30 towards the Rosebud BLM field station. Bear left at the fork to the BLM station. Travel 2.1 miles to a canal and intersection with a sign designating Emigrant Pass Road. Proceed southwest on Emigrant Pass Road 5.5 miles to a fork. Turn right and travel 2.5 miles to a gate. Pass through the gate, proceed 0.5 miles and turn right at a four-way junction. Travel 0.8 miles to a witness post on left side of road and stop. From the witness post, take a bearing of 276 degrees magnetic to a large juniper, just off the left side of the drainage with several young trees around it. This juniper is located on the slope above the split in the drainage. Walk about 500 yards from the witness post to the large juniper. From this tree, take a bearing of 9 degrees magnetic and walk 9 paces to the 0-foot stake of the baseline, which is marked with browse tag #197. The baseline runs at 345 degrees magnetic.

Map Name: Emigrant Pass



Diagrammatic Sketch:



Township: 10N Range: 16W Section: 30

GPS: NAD 83, UTM 12S 272445 E 4605180 N

Site Information

Site Description: The study is located on the east side of the Grouse Creek Mountains, approximately one mile northeast of Chokecherry Spring. This area is a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community, which also contains a scattered population of antelope bitterbrush (*Purshia tridentata*). Immediately below and to the east of the study area, there are broad ridges occupied by black sagebrush (*Artemisia nova*), with intervening swales containing mostly basin big sagebrush (*A. tridentata* ssp. *tridentata*). Deer pellet groups have been sampled in moderate abundance, and cattle sign in light abundance since 2006 (Table - Pellet Group Data).

Browse: Mountain big sagebrush is the key browse species on the site, and has provided 40% to 50% of the browse cover since 1996 (Table - Browse Cover). The sagebrush stand is a moderately dense population that has displayed mostly light use over the sample years, but with more moderate use in 1984, 2006, and 2011. Decadence within the sagebrush population was moderate throughout the early sample years, but increased to higher rates in 2006 and 2011. In addition, sagebrush plants in the population displaying poor vigor were low throughout most of the early sample years, but increased markedly in 2011. Recruitment of young sagebrush plants has comprised less than 10% of the population in most sample years except for 1984 and 1996 (Table - Browse Characteristics). Competition with the annual grass cheatgrass (*Bromus tectorum*) may be limiting sagebrush recruitment. The winter feeding activities of voles (*Microtus spp.*) is also a serious threat to all of the browse species in the area. A large number of shrubs in the immediate area showed evidence of complete or near complete girdling damage during the 1984 reading. This appears to have commonly occurred during the severe winters of 1982-84 in many areas. Such damage is especially evident in swales, however, it has also occurred within the study area. Some winter injury was noted on some of the sagebrush in 1996, perhaps caused by the deep snows during the 1992-93 winter.

Antelope bitterbrush is another important preferred browses species. The bitterbrush occurs on the site in moderately low density with a semi-erect, layering growth form. This species showed evidence of moderate to heavy deer use as well as rodent damage in 1984 and 1990, but utilization has been light to moderate since 1996. The bitterbrush population is healthy with low decadence and good vigor in most of the sample years. Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), considered in this study to be a weedy increaser, occurs in moderately high numbers on the site (Table - Browse Characteristics). Utah juniper (*Juniperus osteosperma*) occurs on the site in a small, but increasing, population on the site (Table - Point-Quarter Tree Data).

Herbaceous Understory: The study has an abundant understory of perennial grasses, though the annual grass species cheatgrass is abundant on the site. Cheatgrass has fluctuated in frequency and cover over the sample years, and has at times dominated the grass component on the site. The perennial grass species Sandberg bluegrass (*Poa secunda*) has steadily increased throughout the course of the study years and was the dominant grass species in 2011. Other important perennial grass species include bluebunch wheatgrass (*Agropyron spicatum*), bottlebrush squirreltail (*Sitanion hystrix*), and subalpine needlegrass (*Stipa thurberiana*) (Table - Herbaceous Trends).

The forb component is fairly diverse and moderately productive. The most productive perennial forbs include arrowleaf balsamroot (*Balsamorhiza sagittata*), wayside gromwell (*Lithospermum ruderale*), silvery lupine (*Lupinus argenteus*), tapertip hawksbeard (*Crepis acuminata*), Beckwith milkvetch (*Astragalus beckwithii*), and longleaf phlox (*Phlox longifolia*). Annual species increased markedly in 2011 due to a large increase in cover of blue-eyed Mary (*Collinsia parviflora*) (Table - Herbaceous Trends).

Soil: The soil is part of the Bullump-Sonlet-Rodrof association, likely as part of the Bullump component which is a deep soil. This component is on drainageways, with parent materials comprised of colluviums and

alluvium derived from quartzite and mica schist (Soil Survey Staff 2011). The soil texture is a clay loam, but is quite rocky and has a slightly alkaline soil reaction (7.7 pH). Phosphorus may have limited availability for plant growth and development at 5.9 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Bare ground cover is low, with vegetation, litter, rock, and pavement all providing a good amount of protective ground cover (Table - Basic Cover). Low to moderate soil movement is occurring by trailing livestock and wildlife. The soil erosion condition was classified as slight in 2001 and 2011, but was stable in 2006.

Trend Assessments

Browse:

- **1984 to 1990 - slightly down (-1):** Mountain big sagebrush density decreased by 15% from 3,998 plants/acre to 3,398 plants/acre. Most of the decrease in density was due to a decrease in recruitment of young plants. Recruitment of young sagebrush plants decreased from 45% of the population to 8%. The density of bitterbrush decreased 60% from 333 plants/acre to 132 plants/acre. Again, this was primarily due to a large decrease in the recruitment of young bitterbrush plants. All of the plants sampled in 1984 were young plants with no young plants sampled in 1990.
- **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. There was little change in the decadence or vigor of the sagebrush population. Recruitment of young sagebrush plants increased slightly to 11% of the population. Decadence within the bitterbrush population decreased from 50% to 0%. Recruitment of young bitterbrush plants increased to 11% of the population.
- **1996 to 2001 - slightly down (-1):** Density of mountain big sagebrush decreased by 15% from 2,960 plants/acre to 2,520 plants/acre, though average cover increased from 13% to 17%. Recruitment of young sagebrush plants decreased to 4% of the population. Bitterbrush density remained similar, but cover also increased slightly from 4% to 6%. Recruitment of young bitterbrush plants decreased to 3% of the population.
- **2001 to 2006 - down (-2):** The mountain big sagebrush density decreased by 30% to 1,760 plants/acre, and cover decreased to 10%. Decadence increased from 21% to 36%, and poor vigor increased from 4% to 10% of the population. Recruitment of young plants remained poor at 2% of the population. The density of bitterbrush decreased by 25% from 800 plants/acre to 600 plants/acre, and cover decreased to 5%. Decadence of bitterbrush increased to 20%, though poor vigor remained low at 3% of the population. Recruitment of young bitterbrush plants increased slightly, but remained poor at 7% of the population.
- **2006 to 2011 - stable (0):** Despite a 19% increase in density of mountain big sagebrush to 2,100 plants/acre, cover decreased to 8%. Decadence of sagebrush also increased to 46%, and poor vigor increased to 39% of the population. Recruitment of young sagebrush plants remained poor at 3%. The bitterbrush population remained similar except for a decrease in decadence to 0%.

Grass:

- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial grasses increased by 37%.
- **1990 to 1996 - up (+2):** The sum of nested frequency of perennial grasses increased by 39%. Cheatgrass is abundant on the site, but no prior data was collected on this species to determine a trend.
- **1996 to 2001 - slightly up (+1):** There was a 43% increase in the sum of nested frequency of perennial grasses, but cheatgrass increased significantly in nested frequency as well. Much of the increase in frequency of perennial grasses was due to a significant increase in the nested frequency of Sandberg bluegrass. Cover of perennial grasses remained similar, but cover of cheatgrass increased from 6% to 23% providing the majority of the herbaceous cover on the site.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial grasses increased by 25%, and cover increased from 9% to 13%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 3%.

- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 14%, and cover increased to 15%. Again, most of the increase was due to a significant increase in the nested frequency of Sandberg bluegrass, though bottlebrush squirreltail and subalpine needlegrass have also increased significantly since the outset of the study.

Forb:

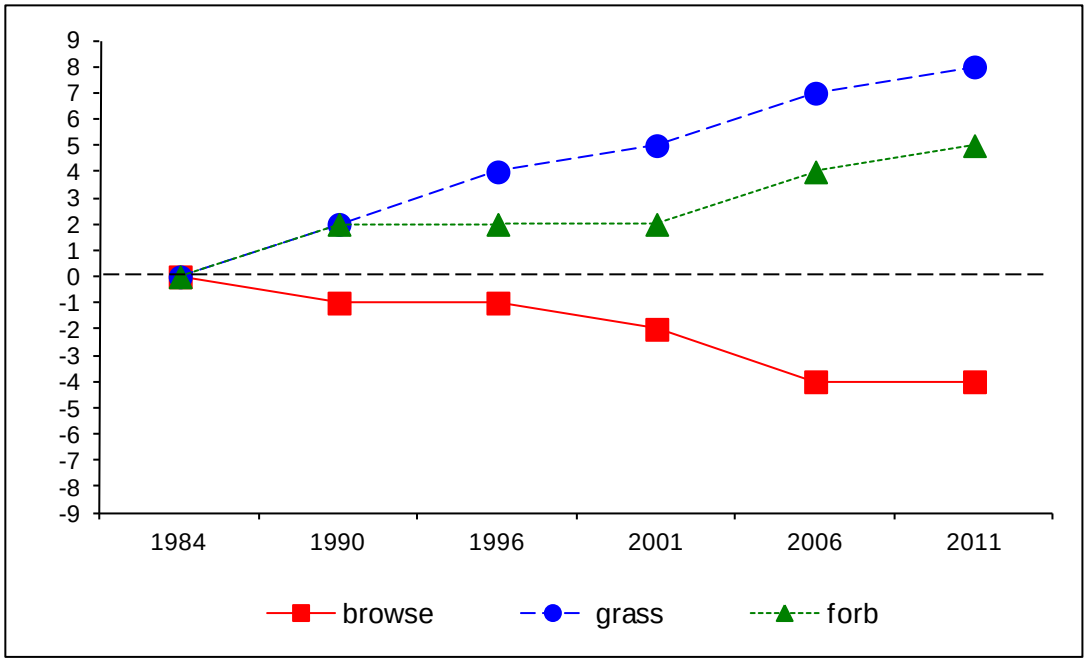
- **1984 to 1990 - up (+2):** The sum of nested frequency of perennial forbs increased by 25%.
- **1990 to 1996 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1996 to 2001 - stable (0):** Perennial forb sum of nested frequency and cover remained similar.
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased by 34%, and cover increased from 6% to 11%.
- **2006 to 2011 - slightly up (+1):** There was a 16% increase in the sum of nested frequency of perennial forbs, though cover decreased slightly to 8%. Annual forbs increased substantially due to a significant increase in the nested frequency of blue-eyed Mary. Blue-eyed Mary also provided the majority of the annual forb cover.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 1, study no: 4

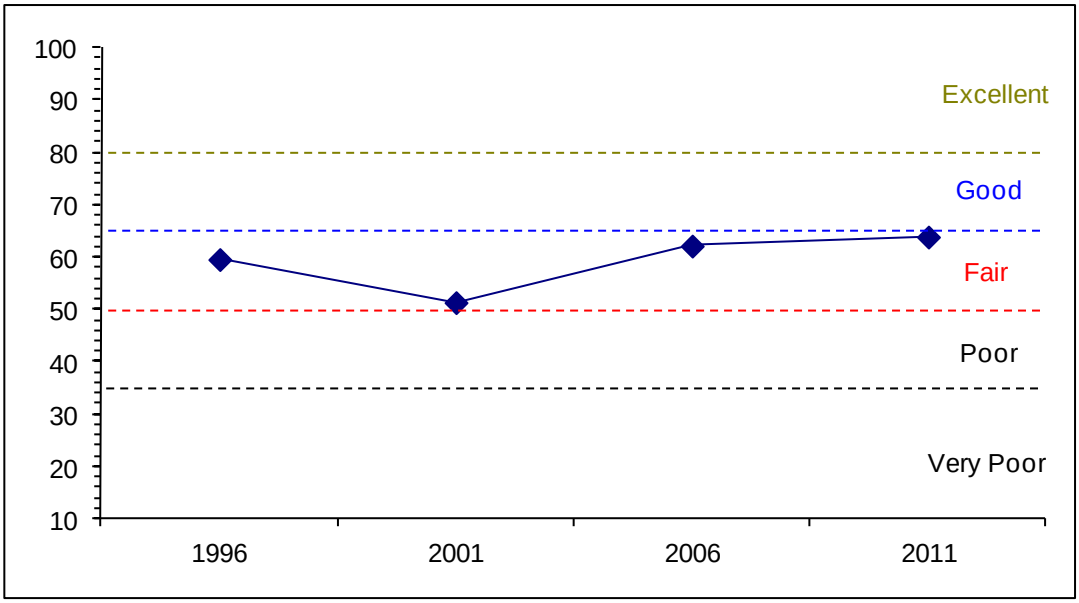
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
96	22.3	9.0	5.5	17.4	-4.7	10.0	0.0	**59.5**	Fair
01	30.0	10.0	1.9	17.0	-17.6	10.0	0.0	**51.3**	Poor-Fair
06	20.7	5.8	1.8	26.0	-2.3	10.0	0.0	**62.1**	Fair
11	18.3	6.9	0.9	29.8	-2.1	10.0	0.0	**63.8**	Fair-Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 1 Study no: 4



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 1, Study no: 4



HERBACEOUS TRENDS--
Management unit 01, Study no: 4

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	a-	a-	ab12	ab17	b30	b30	.59	.51	.83	.52
G	Agropyron spicatum	ab58	b72	ab50	ab52	ab58	a45	2.91	2.30	3.46	1.60
G	Bromus tectorum (a)	-	-	c318	d360	b271	a210	6.21	23.46	3.01	2.75
G	Festuca ovina	-	1	5	-	-	-	.19	-	-	-
G	Melica bulbosa	-	-	-	-	-	5	-	-	-	.15
G	Oryzopsis hymenoides	4	14	11	10	17	23	.37	.07	1.00	.39
G	Poa secunda	a22	a35	a58	b140	b170	c209	.99	3.95	5.61	9.60
G	Sitanion hystrix	ab17	a10	abc30	bc41	c50	c52	1.18	.81	1.42	1.39
G	Stipa thurberiana	a-	ab6	b26	b15	b19	b29	2.45	.84	.68	1.24
Total for Annual Grasses		0	0	318	360	271	210	6.21	23.46	3.01	2.75
Total for Perennial Grasses		101	138	192	275	344	393	8.69	8.51	13.02	14.92
Total for Grasses		101	138	510	635	615	603	14.90	31.97	16.04	17.68
F	Agoseris glauca	a28	a32	a5	a2	b66	c117	.01	.01	.42	1.89
F	Allium sp.	b40	a4	ab14	cd92	c71	d112	.04	.67	.30	.46
F	Androsace septentrionalis (a)	-	-	-	-	3	-	-	-	.15	-
F	Astragalus beckwithii	a4	ab15	bc37	bc28	a7	c43	.53	.80	.25	1.50
F	Astragalus cibarius	b34	b24	a-	a-	b38	a3	-	-	1.76	.00
F	Balsamorhiza hookeri	a	a-	a-	a-	a-	b9	-	-	-	.08
F	Balsamorhiza sagittata	4	6	11	6	14	11	1.29	.68	2.49	.79
F	Calochortus nuttallii	-	2	-	5	2	-	-	.01	.00	-
F	Camelina microcarpa (a)	-	-	b76	b74	a23	a19	.19	.81	.07	.06
F	Castilleja linariaefolia	-	-	-	-	3	-	-	-	.00	-
F	Chaenactis douglasii	4	2	7	-	-	-	.01	-	-	.00

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Cirsium arvense	5	4	4	-	-	2	.01	-	-	.03
F	Collinsia parviflora (a)	-	-	$_{a}$179	$_{a}$156	$_{a}$159	$_{b}$309	.93	1.30	.72	9.38
F	Collomia linearis (a)	-	-	$_{b}$46	$_{a}$8	$_{a}$-	$_{b}$39	.15	.01	-	.10
F	Comandra pallida	$_{a}$7	$_{a}$6	$_{ab}$29	$_{b}$36	$_{b}$34	$_{b}$31	.55	.50	.24	.29
F	Crepis acuminata	$_{a}$2	$_{b}$33	$_{ab}$17	$_{ab}$11	$_{ab}$18	$_{b}$26	.35	.31	.62	.60
F	Cryptantha sp.	$_{a}$-	$_{a}$-	$_{b}$13	$_{a}$-	$_{ab}$15	$_{a}$1	.04	-	.05	.00
F	Descurainia pinnata (a)	-	-	-	-	4	-	-	-	.01	-
F	Draba sp. (a)	-	-	-	2	-	1	-	.00	-	.00
F	Epilobium brachycarpum (a)	-	-	-	-	11	8	-	-	.04	.01
F	Galium aparine (a)	-	-	8	-	-	2	.04	-	-	.03
F	Gayophytum ramosissimum(a)	-	-	$_{a}$1	$_{b}$51	$_{a}$2	$_{a}$4	.03	.67	.00	.00
F	Gilia sp. (a)	-	-	-	11	-	-	-	.01	-	-
F	Hackelia patens	$_{ab}$19	$_{b}$27	$_{a}$8	$_{a}$1	$_{a}$9	$_{a}$4	.04	.00	.11	.04
F	Haplopappus acaulis	-	-	-	-	-	2	-	-	-	.15
F	Lactuca serriola (a)	2	-	-	-	3	-	-	-	.01	-
F	Lappula occidentalis (a)	-	-	-	2	5	1	-	.01	.01	.00
F	Lithospermum ruderale	1	15	15	7	15	5	1.20	.29	1.00	.28
F	Lomatium triternatum	9	13	8	4	8	17	.04	.01	.04	.28
F	Lupinus argenteus	$_{ab}$13	$_{a}$3	$_{b}$23	$_{ab}$17	$_{ab}$21	$_{ab}$13	1.33	1.46	1.84	.83
F	Lygodesmia spinosa	$_{bc}$29	$_{c}$47	$_{bc}$37	$_{ab}$19	$_{ab}$24	$_{a}$11	.66	.55	.75	.22
F	Machaeranthera spp	$_{a}$	$_{a}$-	$_{b}$13	$_{a}$-	$_{a}$-	$_{ab}$3	.02	-	-	.03
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{c}$32	$_{b}$11	$_{c}$61	-	.47	.02	.28
F	Oenothera caespitosa	2	2	2	-	-	-	.03	-	-	-
F	Penstemon speciosus	-	1	-	-	-	9	-	-	-	.07
F	Phlox hoodii	-	-	-	-	-	10	-	-	-	.01
F	Phlox longifolia	$_{a}$60	$_{ab}$89	$_{b}$100	$_{b}$103	$_{b}$97	$_{ab}$88	.51	.80	.69	.52
F	Ranunculus testiculatus (a)	-	-	$_{a}$7	$_{a}$13	$_{a}$-	$_{b}$33	.01	.02	-	.35
F	Tragopogon dubius (a)	1	5	5	2	6	4	.04	.01	.07	.01
F	Veronica biloba (a)	-	-	$_{a}$21	$_{a}$20	$_{b}$44	$_{b}$49	.06	.05	.44	.96
F	Viola sp.	-	-	-	-	3	-	-	-	.00	-
Total for Annual Forbs		3	5	343	371	271	530	1.47	3.40	1.56	11.22
Total for Perennial Forbs		261	325	343	331	445	517	6.71	6.11	10.59	8.13
Total for Forbs		264	330	686	702	716	1047	8.19	9.51	12.16	19.36

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

BROWSE TRENDS--
Management unit 01, Study no: 4

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	70	65	47	48	13.18	16.61	10.38	7.96
B	Chrysothamnus nauseosus consimilis	7	7	3	2	.79	.96	.81	.53
B	Chrysothamnus viscidiflorus viscidiflorus	77	72	65	61	10.39	5.98	5.88	4.26
B	Juniperus osteosperma	3	6	8	8	.01	.33	1.06	1.16
B	Opuntia sp.	12	8	8	5	.03	.56	.30	.15
B	Purshia tridentata	28	25	24	23	3.91	6.42	5.16	5.57
B	Symphoricarpos oreophilus	5	10	10	12	.07	1.43	1.70	1.31
Total for Browse		202	193	165	159	28.41	32.32	25.29	20.97

CANOPY COVER, LINE INTERCEPT--
Management unit 01, Study no: 4

Species	Percent Cover		
	'01	'06	'11
Artemisia tridentata vaseyana	-	13.11	8.50
Chrysothamnus nauseosus consimilis	-	.03	.28
Chrysothamnus viscidiflorus viscidiflorus	-	7.84	4.15
Juniperus osteosperma	1.00	2.73	3.38
Opuntia sp.	-	.08	.08
Purshia tridentata	-	10.89	12.35
Symphoricarpos oreophilus	-	2.96	2.01

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 01, Study no: 4

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	2.7	2.1	1.5
Purshia tridentata	1.6	1.1	0.4

POINT-QUARTER TREE DATA--
Management unit 01, Study no: 4

Species	Trees per Acre			
	'96	'01	'06	'11
Juniperus osteosperma	30	76	86	104

Average diameter (in)			
'96	'01	'06	'11
3.9	2.6	4.1	3.5

BASIC COVER--
Management unit 01, Study no: 4

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	1.75	11.50	46.40	62.06	50.70	56.79
Rock	8.25	9.75	6.39	4.69	2.79	3.85
Pavement	14.75	16.50	6.14	4.69	6.46	6.26
Litter	58.50	45.25	55.46	44.56	45.93	36.65
Cryptogams	0	0	.05	.06	.21	.10
Bare Ground	16.75	17.00	7.03	7.97	12.13	8.30

SOIL ANALYSIS DATA --
Management unit 1, Study no: 4, Study Name: Chokecherry Springs

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.8	7.7	41.7	29.0	29.3	2.5	5.9	201.6	0.5

PELLET GROUP DATA--
Management unit 01, Study no: 4

Type	Quadrat Frequency			
	'96	'01	'06	'11
Rabbit	5	1	18	1
Deer	11	14	7	2
Cattle	3	1	3	1

Days use per acre (ha)		
'01	'06	'11
-	-	-
36 (88)	21 (53)	21 (53)
3 (7)	9 (22)	4 (11)

BROWSE CHARACTERISTICS--
Management unit 01, 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)
Artemisia nova									
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	7/23
Artemisia tridentata vaseyana									
84	**3998**	45	33	22	333	30	18	5	34/36
90	**3398**	8	71	22	-	8	2	14	19/25
96	**2960**	11	62	26	180	9	1	16	20/32
01	**2520**	4	75	21	-	2	0	4	22/33
06	**1760**	2	61	36	280	22	2	10	24/36
11	**2100**	3	51	46	-	30	0	39	25/36

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus consimilis									
84	**0**	0	0	0	-	0	0	0	-/-
90	**0**	0	0	0	-	0	0	0	-/-
96	**200**	50	30	20	-	0	0	0	26/36
01	**160**	25	63	13	80	25	0	0	26/26
06	**80**	0	100	0	-	0	0	0	25/33
11	**40**	0	50	50	-	0	0	50	26/27
Chrysothamnus viscidiflorus viscidiflorus									
84	**3931**	17	63	20	-	20	0	0	28/32
90	**3331**	16	48	36	-	6	0	6	15/16
96	**3660**	5	91	3	-	7	.54	2	14/24
01	**3000**	3	84	13	-	3	0	3	11/18
06	**2460**	7	81	12	100	0	0	2	13/22
11	**2640**	21	78	1	20	.75	0	.75	12/19
Juniperus osteosperma									
84	**66**	100	0	-	-	0	0	0	-/-
90	**66**	100	0	-	66	0	0	0	-/-
96	**60**	67	33	-	40	0	0	0	-/-
01	**120**	100	0	-	20	0	0	0	-/-
06	**160**	100	0	-	20	0	0	0	-/-
11	**180**	89	11	-	20	0	0	0	-/-
Opuntia sp.									
84	**199**	0	100	0	-	0	0	0	6/5
90	**199**	0	100	0	-	0	0	0	8/17
96	**300**	7	87	7	-	0	0	0	5/15
01	**180**	0	100	0	-	0	0	0	5/10
06	**160**	0	100	0	-	0	13	0	5/12
11	**120**	0	100	0	-	0	0	0	4/10
Purshia tridentata									
84	**333**	100	0	0	-	20	40	20	-/-
90	**132**	0	50	50	-	50	50	0	15/35
96	**740**	11	89	0	-	35	3	0	27/54
01	**800**	3	93	5	-	45	8	0	33/57
06	**600**	7	73	20	460	43	13	3	32/58
11	**580**	0	100	0	-	52	10	0	31/53
Symphoricarpos oreophilus									
84	**266**	50	50	0	-	25	0	0	26/65
90	**331**	20	60	20	-	0	0	20	17/52
96	**120**	33	67	0	-	33	17	0	21/47
01	**260**	0	100	0	-	0	0	0	21/49
06	**360**	11	83	6	-	0	0	0	19/45
11	**420**	10	90	0	-	0	0	0	20/40