

WARRENS SPRING - TREND STUDY NO. 2-40-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: Not Available

Land Ownership: Private

Elevation: 6,350 ft (1,936 m)

Aspect: Southwest

Slope: 30%

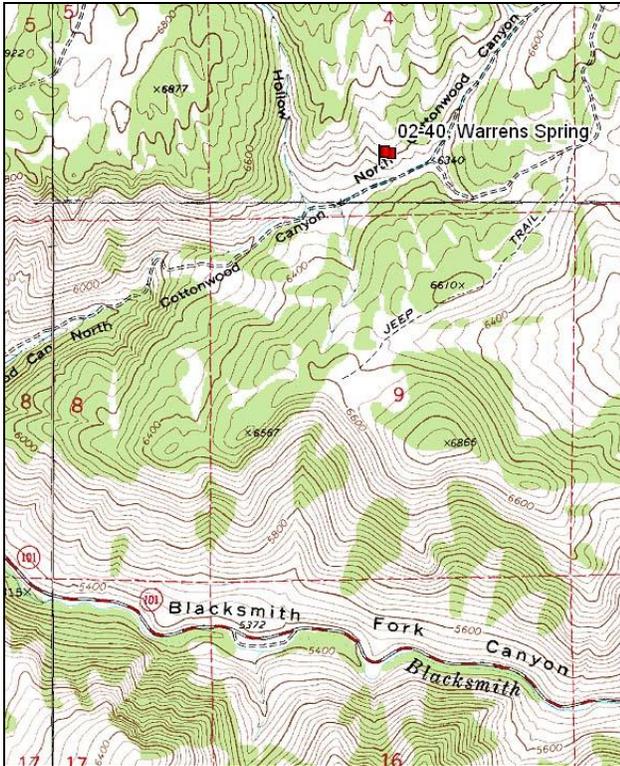
Transect bearing: 10° magnetic

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

Directions:

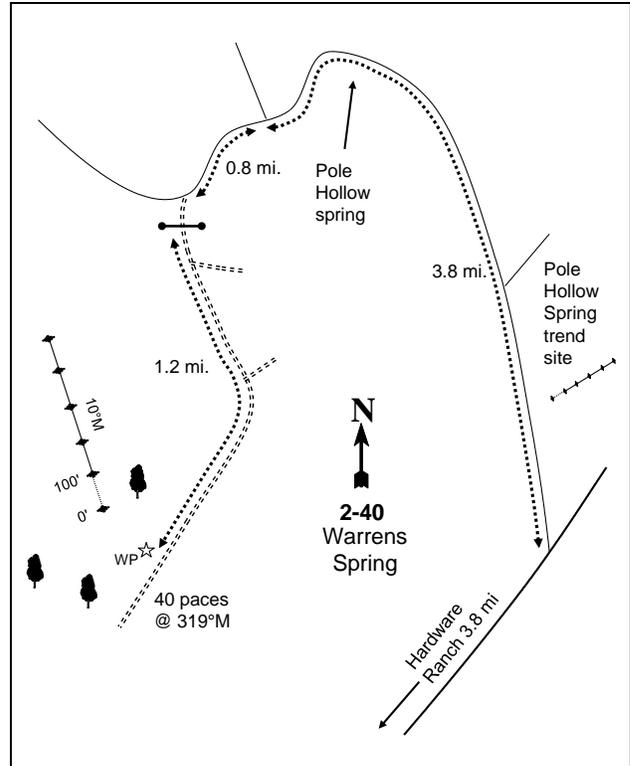
From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Take a left and travel up Pole Hollow 3.8 miles, passing the Pole Hollow trend site and Pole Hollow Spring. Continue on the main road 0.8 miles to a fork. Turn left and go over a cattleguard. Continue down the canyon 1.2 mile to a witness post on the right hand side of the road. From the witness post, walk 40 paces at 319 degrees magnetic to the 0-foot baseline stake. The baseline runs at a bearing of 10 degrees magnetic.

Map Name: Boulder Mountain



Township: 10N Range: 3E Section: 5

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 449315 E 4608473 N

WARRENS SPRING - TREND STUDY NO. 2-40

Site Information

Site Description: This study is located on private land in North Cottonwood Canyon, which is a side canyon of Blacksmith Fork Canyon. The study monitors winter range in a mountain brush community and water is available at Warren Spring about a third of a mile to the southwest. Numerous trails run through the area and off the hills down to the road in the bottom of the canyon, and south to the spring. The area is occupied by deer, elk, moose, and cattle. Deer pellet groups were sampled in high abundance in 2001 and 2006, but low abundance in 2011. Elk pellet groups have been sampled in low abundance since 2001. Sampled cattle sign has been minimal since 2001; however, cattle sign and use is highly abundant throughout the bottom of the canyon. Moose pellet groups were sampled in low abundance in 2001 (Table - Pellet Group Data).

Browse: The key browse species in this mountain brush community are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*). The mountain big sagebrush population is dense with the population centered within the mature age class, and has only fluctuated slightly. Decadence within the sagebrush population has been fairly moderate and peaked in 2006. Utilization of sagebrush has been light to moderate over the sample years. The sagebrush population has displayed good vigor over the course of the study; however chlorotic and diseased sagebrush have steadily increased over time. Poor vigor is still a minor component of the population. Recruitment of young sagebrush has fluctuated over the sample years, but was considered good in 1996 and 2011. Antelope bitterbrush has maintained a small, mature population for the duration of the study. Decadence within the bitterbrush population has been low and has slowly decreased over time. Decadence was absent in the population in 2011. Utilization of bitterbrush has been moderate to heavy over the sample years. Recruitment of young bitterbrush has been absent on the study site. The bitterbrush population near the bottom of the canyon is heavily utilized, and is likely used by cattle as well as wildlife. Serviceberry (*Amelanchier alnifolia*) is rare and moderately utilized. Other browse species include western common chokecherry (*Prunus virginiana*), Woods rose (*Rosa woodsii*), and snowberry (*Symphoricarpos oreophilus*). Chokecherry is usually found growing under the canopy of sagebrush and the few Rocky Mountain junipers (*Juniperus scopulorum*) on the site (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is not particularly abundant for a mountain brush community. The grass component is diverse, but bluebunch wheatgrass (*Agropyron spicatum*) is the only common perennial species. In 2001, 2006 and 2011 bluebunch wheatgrass and Great Basin wildrye (*Elymus cinereus*) both displayed moderate to heavy use. The weedy annual grass species cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) were abundant in 1996, and produced half of the total grass cover. These annual grasses have provided less cover in the other sample years. Forbs are very diverse and produce nearly as much cover as grasses. Annual forbs are abundant, as are weedy perennials which include weavyleaf thistle (*Cirsium undulatum*), common sunflower (*Helianthus annuus*), and the noxious weed dyer's woad (*Isatis tinctoria*). Perennial forb species have shown a consistent increase in sum of nested frequency for every year sampled (Table - Herbaceous Trends).

Soil: The study is part of the Agassiz-Goring association, and likely as part of the Goring component. These soils occur on mountain slopes. The parent material consists of colluvium and residuum weathered from limestone (Soil Survey Staff 2011). The soil texture is a clay loam with a neutral soil reaction (pH 6.8) (Table - Soil Analysis Data). Soils are moderately rocky on the surface and throughout the profile. Most of the bare ground is associated with livestock trails, and some compaction occurs due to livestock. Bare ground cover is moderately low, with a fair amount of vegetation, litter, and rock cover providing protective ground cover (Table - Basic Cover). Due to pedestalling, the soil erosion condition was classified as slight in 2001, but stable in 2006 and 2011.

Trend Assessments

Browse:

- **1996 to 2001 - stable (0):** The density for mountain big sagebrush remained similar, increasing from 2,460 plants/acre to 2,560 plants/acre. Decadence within the sagebrush population increased slightly from 13% to 15%. The sagebrush population modestly increased in poor vigor from 2% to 4%. Young sagebrush recruitment decreased from 14% to 4% of the population. The density for antelope bitterbrush displayed no change at 180 plants/acre. Decadence within the bitterbrush population decreased from 22% to 11%. The bitterbrush population decreased notably in poor vigor from 22% to 0%. Recruitment of young bitterbrush was not observed.
- **2001 to 2006 - stable (0):** The density for mountain big sagebrush remained similar at 2,700 plants/acre. Decadence within the sagebrush population increased to 20%. The poor vigor within the sagebrush population increased modestly to 10%. Recruitment of young sagebrush increased to 7% of the population. The density for antelope bitterbrush did not change and remained at 180 plants/acre. Decadence and poor vigor remained the same at 11% and 0%, respectively.
- **2006 to 2011 - slightly down (-1):** The density for mountain big sagebrush decreased 15% to 2,300 plants/acre. Decadence within the sagebrush population decreased to 11%. The sagebrush population increased in poor vigor to 15%. Recruitment of young sagebrush increased to 10% of the population. The density for antelope bitterbrush remained at 180 plants/acre. Decadence within the bitterbrush decreased to 0%. The bitterbrush population increased in poor vigor to 11%. Recruitment of young bitterbrush was not observed.

Grass:

- **1996 to 2001 - slightly up (+1):** The sum of nested frequency for perennial grasses remained similar. However, the weedy annual grass species cheatgrass and Japanese chess had a significant decrease in nested frequency, and annual grass cover from 6% to 1%.
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial grasses increased 31%. Bluebunch wheatgrass had a significant increase in nested frequency, and increased in cover from 5% to 6%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses remained similar, though cover decreased from 8% to 5%. No significant changes were notable within the grass community.

Forb:

- **1996 to 2001 - stable (0):** The sum of nested frequency for perennial forbs remained similar. The noxious weed Dyer's woad decreased significantly in nested frequency, and decreased in cover from near 1% to less than 1%.
- **2001 to 2006 - up (+2):** The sum of nested frequency for perennial forbs increased 42%. Pacific aster (*Aster chilensis*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and hoary aster (*Machaeranthera canescens*) increased significantly in nested frequency. Arrowleaf balsamroot increased in cover from 1% to 4%.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 43%. The perennial forb species Lewis flax (*Linum lewisii*) and silvery lupine (*Lupinus argenteus*) increased in nested frequency. The weedy perennial forb species wild onion (*Allium sp.*), weavyleaf thistle, and cryptantha (*Cryptantha sp.*) also increased in nested frequency. Wild onion increased in cover from less than 1% to 1%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

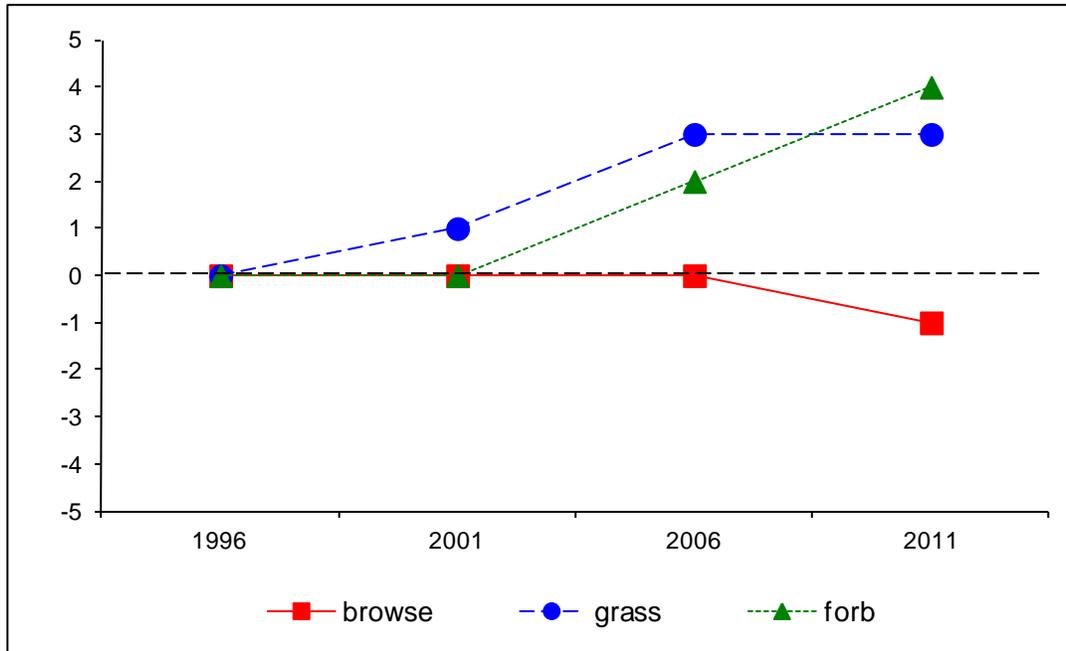
Management unit 2, study no: 40

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	21.7	11.1	6.6	11.0	-4.5	9.6	-2.0	53.5	Fair
01	29.9	10.7	2.5	10.1	-0.7	8.3	-2.0	58.8	Fair
06	22.8	9.5	3.3	14.9	-0.7	10.0	0.0	59.8	Fair
11	19.9	12.0	4.6	8.9	-1.3	10.0	-2.0	52.1	Fair

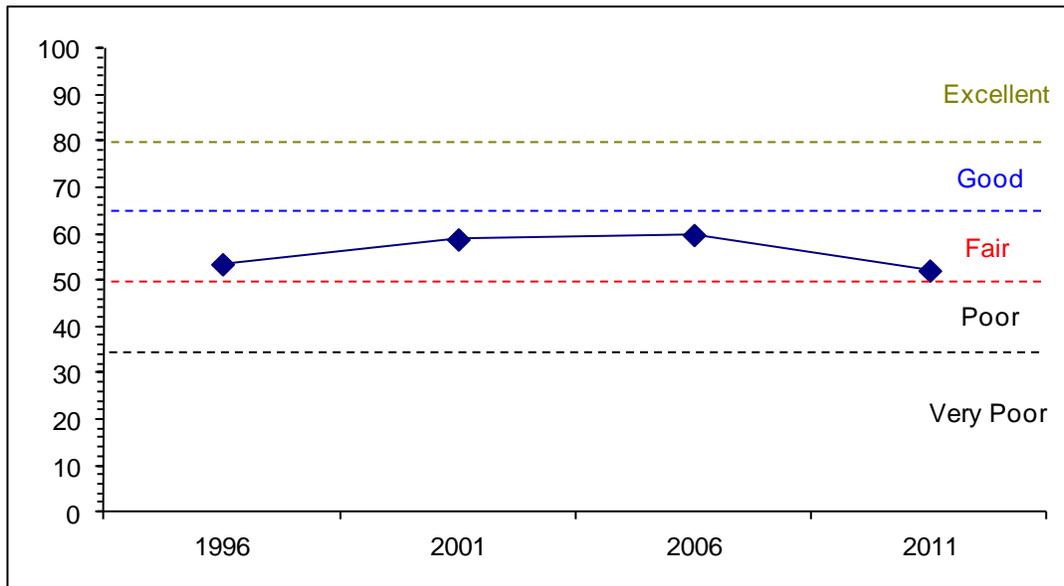
Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--

Management unit 2 Study no: 40



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 2, Study no: 40



HERBACEOUS TRENDS--
 Management unit 02, Study no: 40

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron spicatum	ab184	a161	b212	ab188	4.42	4.51	6.16	3.10
G	Agropyron trachycaulum	7	5	3	12	.18	.04	.02	.21
G	Bromus carinatus	a5	ab23	b32	ab25	.06	.17	.16	.09
G	Bromus inermis	-	-	-	2	-	-	-	.00
G	Bromus japonicus (a)	c142	a69	ab97	bc139	2.75	.65	.45	1.55
G	Bromus tectorum (a)	b156	a42	a59	a68	3.21	.28	.49	.12
G	Elymus cinereus	5	5	5	6	.38	.03	.41	.21
G	Melica bulbosa	-	-	-	-	-	-	.00	-
G	Poa bulbosa	16	23	26	21	.34	.53	.66	.70
G	Poa fendleriana	1	-	-	-	.00	-	-	-
G	Poa pratensis	12	14	21	20	.45	.19	.57	.54
G	Poa secunda	a4	ab14	ab22	b22	.01	.09	.11	.29
Total for Annual Grasses		298	111	156	207	5.96	0.93	0.94	1.68
Total for Perennial Grasses		234	245	321	296	5.85	5.58	8.10	5.14
Total for Grasses		532	356	477	503	11.82	6.52	9.05	6.82
F	Achillea millefolium	19	31	31	32	.16	.38	.36	.93
F	Agoseris glauca	-	3	5	6	-	.01	.03	.05
F	Allium sp.	a81	ab113	b129	c183	.25	.35	.41	1.35
F	Alyssum alyssoides (a)	c213	b129	a14	bc151	.96	.41	.04	.54
F	Arabis sp.	-	1	2	1	-	.00	.01	.00
F	Artemisia dracunculus	6	-	-	-	.03	-	-	-
F	Aster chilensis	a30	a32	b52	ab44	.66	.75	1.44	1.02
F	Astragalus sp.	14	4	-	8	.21	.06	-	.16
F	Astragalus utahensis	1	1	4	-	.03	.00	.01	-

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	Balsamorhiza macrophylla	-	-	3	8	-	-	.18	.09
F	Balsamorhiza sagittata	_a 15	_a 13	_b 35	_b 46	1.33	1.28	3.58	4.06
F	Calochortus nuttallii	-	-	2	-	-	-	.00	-
F	Camelina microcarpa (a)	-	3	-	3	-	.01	-	.03
F	Castilleja linariaefolia	1	-	-	-	.00	-	-	-
F	Chaenactis douglasii	10	-	4	4	.04	-	.18	.03
F	Cirsium undulatum	_a 6	_a 5	_a 5	_b 22	.27	.06	.33	.25
F	Collinsia parviflora (a)	_a 44	_a 46	_b 137	_a 16	.41	.15	.22	.20
F	Collomia linearis (a)	_a 40	_b 107	_b 92	_b 77	.12	.52	.25	.30
F	Comandra pallida	5	2	-	1	.01	.01	-	.00
F	Crepis acuminata	5	1	3	2	.04	.15	.15	.00
F	Cryptantha sp.	_a -	_a 5	_a 13	_b 33	-	.01	.07	.16
F	Cymopterus sp.	2	3	4	1	.00	.06	.09	.03
F	Descurainia pinnata (a)	-	2	-	-	-	.01	-	-
F	Epilobium brachycarpum (a)	_{ab} 65	_a 54	_b 78	_{ab} 46	.61	.26	.20	.28
F	Galium aparine (a)	_a 5	_a -	_a 3	_b 40	.15	-	.00	.25
F	Hackelia patens	-	4	-	1	-	.03	-	.00
F	Helianthella uniflora	_a -	_a 2	_a 10	_b 21	.00	.21	.15	.21
F	Helianthus annuus (a)	2	-	-	-	.63	-	-	-
F	Holosteum umbellatum (a)	1	2	4	6	.00	.00	.00	.01
F	Isatis tinctoria	_b 36	_a 8	_a -	_a 15	.45	.06	-	.24
F	Lactuca serriola (a)	_a 1	_{ab} 8	_a 4	_b 28	.03	.02	.01	.10
F	Linum lewisii	_a 15	_a 22	_a 28	_b 69	.14	.14	.23	.23
F	Lithospermum ruderales	-	5	10	3	.00	.01	.18	.03
F	Lupinus argenteus	_{ab} 11	_{ab} 5	_a 2	_b 20	.85	.21	.15	.43
F	Machaeranthera canescens	_a 1	_a 1	_b 34	_a 6	.02	.03	.43	.04
F	Machaeranthera grindelioides	-	2	-	-	-	.00	-	-
F	Microsteris gracilis (a)	_a 33	_b 60	_a 16	_a 32	.10	.14	.04	.06
F	Penstemon humilis	-	5	3	5	.00	.06	.03	.01
F	Penstemon sp.	-	-	1	-	-	-	.03	-
F	Phlox longifolia	-	-	3	-	-	-	.03	-
F	Polygonum douglasii (a)	_a 50	_a 28	_b 96	_a 50	.13	.06	.25	.17
F	Senecio multilobatus	-	3	-	-	-	.03	-	-
F	Taraxacum officinale	1	3	-	-	.00	.01	-	-
F	Tragopogon dubius (a)	_a 21	_a 18	_a 17	_b 77	.40	.23	.19	.97
F	Veronica biloba (a)	_b 166	_a 121	_b 202	_c 306	.42	.33	1.20	6.44
F	Viguiera multiflora	5	-	5	8	.04	-	.18	.02
F	Viola sp.	-	-	-	5	-	-	-	.02
F	Wyethia amplexicaulis	1	1	1	11	.18	.15	.18	.24
Total for Annual Forbs		641	578	663	832	4.00	2.17	2.43	9.39
Total for Perennial Forbs		265	275	389	555	4.79	4.14	8.48	9.68
Total for Forbs		906	853	1052	1387	8.79	6.31	10.91	19.07

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

BROWSE TRENDS--

Management unit 02, Study no: 40

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	3	1	1	4	.15	-	.03	.03
B	Artemisia tridentata vaseyana	76	74	73	66	14.11	20.20	15.32	14.20
B	Chrysothamnus nauseosus consimilis	2	1	1	2	-	-	.00	.03
B	Chrysothamnus viscidiflorus viscidiflorus	24	24	24	27	1.19	1.91	1.70	1.68
B	Eriogonum heracleoides	1	0	0	2	.63	-	-	.03
B	Juniperus scopulorum	0	0	0	0	-	-	-	.03
B	Mahonia repens	5	3	6	9	.09	.24	.24	.10
B	Prunus virginiana	4	6	6	5	.38	.36	.36	.68
B	Purshia tridentata	9	9	8	8	1.69	2.79	2.11	.83
B	Rosa woodsii	2	1	1	1	.63	.03	.03	-
B	Symphoricarpos oreophilus	26	25	25	29	2.10	3.73	4.36	3.76
Total for Browse		152	144	145	153	20.98	29.29	24.18	21.39

CANOPY COVER, LINE INTERCEPT--

Management unit 02, Study no: 40

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.08	.30
Artemisia tridentata vaseyana	19.36	21.89
Chrysothamnus nauseosus consimilis	.01	-
Chrysothamnus viscidiflorus viscidiflorus	2.83	2.36
Juniperus scopulorum	-	1.39
Mahonia repens	.16	.18
Prunus virginiana	.75	1.06
Purshia tridentata	2.36	2.66
Rosa woodsii	-	.10
Symphoricarpos oreophilus	6.53	4.96

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 02, Study no: 40

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata vaseyana	1.5	1.9	0.7
Purshia tridentata	1.8	3.9	0.5

BASIC COVER--

Management unit 02, Study no: 40

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	38.24	41.59	40.48	49.59
Rock	5.32	7.12	7.66	7.83
Pavement	2.70	2.44	2.95	3.08
Litter	48.71	46.20	36.77	42.50
Cryptogams	.10	.00	0	.03
Bare Ground	19.22	28.33	30.67	11.97

SOIL ANALYSIS DATA --

Management unit 02, Study no: 40, Study Name: Warrens Spring

Effective rooting depth (in)	pH	Clay Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
15.1	6.8	29.9	35.7	34.4	4.7	12.9	279.4	0.7

PELLET GROUP DATA--

Management unit 02, Study no: 40

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	2	1	1	1	-	-	-
Elk	4	1	3	2	11 (28)	1 (2)	7 (17)
Deer	22	14	14	7	44 (107)	52 (127)	17 (43)
Cattle	1	3	-	-	9 (23)	7 (18)	1 (2)
Moose	-	-	-	-	1 (1)	-	-

BROWSE CHARACTERISTICS--

Management unit 02, Study no: 40

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
96	60	0	100	-	-	100	0	0	36/29
01	20	0	100	-	-	100	0	0	38/41
06	20	0	100	-	-	0	100	0	34/39
11	80	50	50	-	-	25	0	0	36/38
Artemisia tridentata vaseyana									
96	2460	14	73	13	60	24	0	2	23/38
01	2560	4	81	15	20	5	0	4	23/35
06	2700	7	73	20	80	7	0	10	26/38
11	2300	10	79	11	20	25	0	15	22/37
Chrysothamnus nauseosus consimilis									
96	40	0	100	-	-	50	0	0	33/58
01	20	0	100	-	-	0	0	0	22/18
06	20	0	100	-	-	0	0	0	24/30
11	40	50	50	-	-	50	0	0	27/43

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Chrysothamnus viscidiflorus viscidiflorus</i>									
96	880	5	93	2	-	0	0	5	16/23
01	840	5	93	2	-	0	0	0	13/22
06	800	13	88	0	60	0	0	0	15/24
11	720	0	97	3	-	6	0	3	14/20
<i>Eriogonum heracleoides</i>									
96	20	0	100	-	-	0	0	0	2/4
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	40	0	100	-	-	0	0	0	3/3
<i>Juniperus scopulorum</i>									
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	-	20	0	0	0	-/-
<i>Mahonia repens</i>									
96	520	12	88	-	-	0	0	0	5/8
01	660	6	94	-	-	0	0	0	3/5
06	1040	0	100	-	60	0	0	0	3/5
11	1080	0	100	-	-	0	0	0	4/3
<i>Prunus virginiana</i>									
96	120	67	33	-	-	0	0	0	30/28
01	320	88	13	-	20	6	0	0	32/31
06	360	28	72	-	-	11	17	0	23/14
11	140	0	100	-	-	57	0	0	25/20
<i>Purshia tridentata</i>									
96	180	0	78	22	-	22	22	22	24/52
01	180	0	89	11	-	22	67	0	23/49
06	180	0	89	11	-	22	67	0	20/49
11	180	0	100	0	-	67	22	11	21/47
<i>Rosa woodsii</i>									
96	40	0	100	-	-	0	0	0	14/4
01	20	100	0	-	-	0	0	0	22/11
06	40	0	100	-	-	0	0	0	-/-
11	40	0	100	-	-	0	0	0	9/8
<i>Symphoricarpos oreophilus</i>									
96	760	5	79	16	-	0	0	8	21/35
01	840	5	83	12	20	0	0	7	22/36
06	960	8	92	0	-	0	0	0	18/34
11	1100	4	96	0	40	13	0	0	18/34