

Trend Study 2-40-06

Study site name: Warrens Spring .

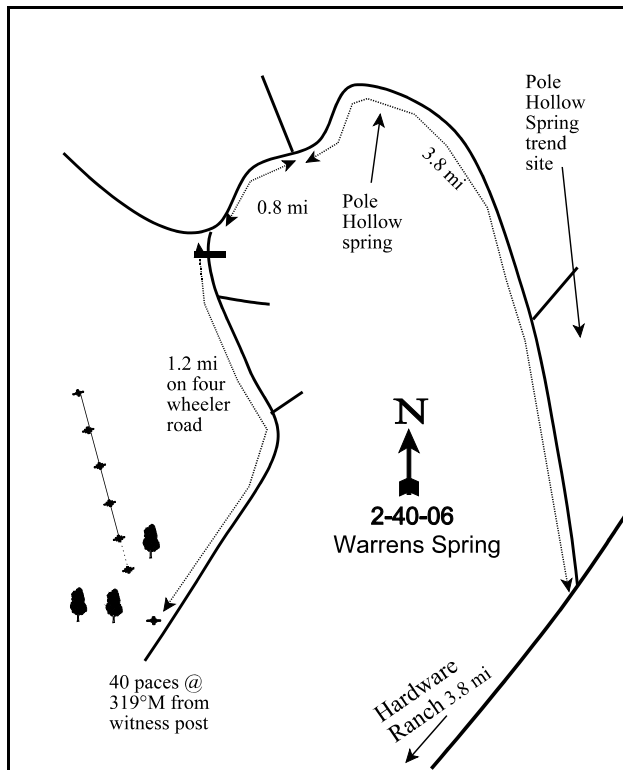
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 10 degrees magnetic.

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

LOCATION DESCRIPTION

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

Diagrammatic Sketch

Township 10N, Range 3E, Section 5

UTM NAD 27, UTM 12T 4608266 N, 449379 E

## DISCUSSION

### Warren Spring - Trend Study No. 2-40

#### Study Information

This study is located in North Cottonwood Canyon, which is a side canyon of Blacksmith Fork Canyon (elevation: 6,350 feet, slope: 28-30%, aspect: south). The study monitors winter range in a mountain brush community and water is available at Warren Spring, which is about 1/3 of a mile to the southwest. The area is used by deer, elk, and cattle. Pellet group transect data collected in 2001 estimated 43 deer, 11 elk, and 9 cow days use/acre (107 ddu/ha, 28 edu/ha, and 23 cdu/ha). 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. Livestock use on the actual study is fairly light, but use is heavy in the bottoms throughout the canyon. Pellet group data in 2006 was estimated at 52 deer, 1 elk, and 7 cow days use/acre (127 ddu/ha, 2 edu/ha, and 18 cdu/ha).

#### Soil

Soil is classified in the Goring series, which formed from sandstone and quartzite (USDA-NRCS 2006). The soil is moderately deep with an estimated effective rooting depth of 15 inches. Texture is a clay loam with a neutral pH of 6.8. Phosphorus is low at only 3.9 ppm and values less than 6 ppm may limit normal plant growth and development (Tiedemann and Lopez 2004). Rock and pavement account for less than 10% of the ground cover. Some compaction occurs due to numerous livestock trails, as most of the bare ground is associated with these trails. Bare ground has increased slightly as litter cover decreased, but the ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was fair in 2006 at 2.6. Pedestalling provides the most evidence of past erosion. An erosion condition class completed in 2001 determined erosion to be slight, but was stable in 2006.

#### Browse

The key browse species in this mountain brush community are mountain big sagebrush and bitterbrush. Mountain big sagebrush density has averaged about 2,500 plants/acre since 1996. Sagebrush cover averaged about 14-15% in both 1996 and 2006, but spiked in 2001 to 20%. Utilization on sagebrush was mostly light with a few shrubs displaying moderate use. In 1996, many of the sagebrush were beginning to drop leaves due to the dry conditions. Vigor has been normal and percent decadence moderately low at 20% or less during all sampling years. Annual leader growth averaged 1.5 inches in 2001 and 1.9 inches in 2006.

Bitterbrush has maintained a mature population of 180 plants/acre since 1996. Utilization is moderate to heavy and decadence decreased from 22% in 1996 to only 11% in 2001 and 2006. Annual leader growth was relatively low at 2 inches in 2001 and 4 inches in 2006. In 1996, elderberry plants were observed to have no leaves left and bitterbrush near the bottom of the canyon were heavily utilized. Serviceberry is rare and moderately utilized. Other browse species include: chokecherry, Woods rose, and snowberry. Chokecherry is usually found growing under the canopy of sagebrush and juniper.

#### Herbaceous Understory

The herbaceous understory is not particularly abundant for a mountain brush community. The grass component is diverse, but bluebunch wheatgrass is the only common perennial species. Cheatgrass and Japanese brome were abundant in 1996, producing 6% cover, which was half of the total grass cover. Due to drought conditions in 2001, these species provided less than 1% cover and remained low in 2006. In 2001 and 2006, bluebunch wheatgrass and Great Basin wildrye both displayed moderate to heavy use. Forbs are very diverse and produce nearly as much cover as grasses. Composition is not good however. Annual forbs are abundant as are weedy perennials that include: thistle, common sunflower, and dyer's woad. Perennial herbaceous species have shown a slight increase in sum of nested frequency from 1996 to 2006. Annual forbs decreased in sum of nested frequency in 2001 due to the extremely dry conditions, but rebounded in 2006 with good precipitation.

2001 TREND ASSESSMENT

Trend for browse is stable. The key species, mountain big sagebrush, has a stable density, low decadence, normal vigor, and mostly light use. Young plants are currently adequate to maintain the population. Bitterbrush also have a stable population with moderate to heavy use. Trend for grasses is slightly up. Perennial grass sum of nested frequency remained similar to 1996. A positive factor is that annual grasses decreased from 6% cover to less than 1%. Trend for forbs is also stable. Perennial forbs remained similar, although annuals also decreased in sum of nested frequency. The composition of forbs remains less than ideal with a large number of weeds and increasers. Dyers woad is not abundant, but decreased significantly. The Desirable Components Index rated this study as fair due to good browse cover, but only moderate perennial grass cover.

1996 winter range condition (DC Index) - fair (57) Mid-level potential scale  
2001 winter range condition (DC Index) - fair (61) Mid-level potential scale  
browse - stable (0)                      grasses - slightly up (+1)                      forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush and bitterbrush, is stable. Sagebrush density has remained close to 2,500 mature plant/acre and the recruitment from young plants increased to 7% of the population. Bitterbrush population are low and have remained at 180 plants/acre. Trend for grasses is up, due to a significant increase in bluebunch wheatgrass nested frequency. Cheatgrass and Japanese brome both remained less than 1% cover. Trend for forbs is up. Arrowleaf balsmroot, hoary aster, and pacific aster all increased significantly in nested frequency. The composition is still less than ideal with weeds and increasers, although dyer’s woad density was low enough that it was not sampled in 2006.. The Desirable Components Index rated this study as fair-good due to good browse cover, but only moderate perennial grass cover.

winter range condition (DC Index) - fair-good (64) Mid-level potential scale  
browse - stable (0)                      grasses - up (+2)                      forbs - up (+2)

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

T y p e	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	<sub>ab</sub> 184	<sub>a</sub> 161	<sub>b</sub> 212	4.42	4.51	6.16
G	Agropyron trachycaulum	7	5	3	.18	.04	.02
G	Bromus carinatus	<sub>a</sub> 5	<sub>b</sub> 23	<sub>b</sub> 32	.06	.17	.16
G	Bromus japonicus (a)	<sub>b</sub> 142	<sub>a</sub> 69	<sub>a</sub> 97	2.75	.65	.45
G	Bromus tectorum (a)	<sub>b</sub> 156	<sub>a</sub> 42	<sub>a</sub> 59	3.21	.28	.49
G	Elymus cinereus	5	5	5	.38	.03	.41
G	Melica bulbosa	-	-	-	-	-	.00
G	Poa bulbosa	16	23	26	.34	.53	.66
G	Poa fendleriana	1	-	-	.00	-	-
G	Poa pratensis	12	14	21	.45	.19	.57
G	Poa secunda	4	14	22	.01	.09	.11
Total for Annual Grasses		298	111	156	5.96	0.93	0.94

T y p e	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
		Total for Perennial Grasses	234	245	321	5.85	5.58
Total for Grasses	532	356	477	11.82	6.52	9.05	
F	<i>Achillea millefolium</i>	19	31	31	.16	.38	.36
F	<i>Agoseris glauca</i>	-	3	5	-	.01	.03
F	<i>Alyssum alyssoides</i> (a)	<sub>c</sub> 213	<sub>b</sub> 129	<sub>a</sub> 14	.96	.41	.04
F	<i>Allium</i> sp.	<sub>a</sub> 81	<sub>ab</sub> 113	<sub>b</sub> 129	.25	.35	.41
F	<i>Arabis</i> sp.	-	1	2	-	.00	.01
F	<i>Artemisia dracunculus</i>	6	-	-	.03	-	-
F	<i>Aster chilensis</i>	<sub>a</sub> 30	<sub>a</sub> 32	<sub>b</sub> 52	.66	.75	1.44
F	<i>Astragalus</i> sp.	14	4	-	.21	.06	-
F	<i>Astragalus utahensis</i>	1	1	4	.03	.00	.01
F	<i>Balsamorhiza macrophylla</i>	-	-	3	-	-	.18
F	<i>Balsamorhiza sagittata</i>	<sub>a</sub> 15	<sub>a</sub> 13	<sub>b</sub> 35	1.33	1.28	3.58
F	<i>Castilleja linariaefolia</i>	1	-	-	.00	-	-
F	<i>Camelina microcarpa</i> (a)	-	3	-	-	.01	-
F	<i>Calochortus nuttallii</i>	-	-	2	-	-	.00
F	<i>Chaenactis douglasii</i>	10	-	4	.04	-	.18
F	<i>Cirsium undulatum</i>	6	5	5	.27	.06	.33
F	<i>Collomia linearis</i> (a)	<sub>a</sub> 40	<sub>b</sub> 107	<sub>b</sub> 92	.12	.52	.25
F	<i>Comandra pallida</i>	5	2	-	.01	.01	-
F	<i>Collinsia parviflora</i> (a)	<sub>a</sub> 44	<sub>a</sub> 46	<sub>b</sub> 137	.41	.15	.22
F	<i>Crepis acuminata</i>	5	1	3	.04	.15	.15
F	<i>Cryptantha</i> sp.	-	5	13	-	.01	.07
F	<i>Cymopterus</i> sp.	2	3	4	.00	.06	.09
F	<i>Descurainia pinnata</i> (a)	-	2	-	-	.01	-
F	<i>Epilobium brachycarpum</i> (a)	<sub>ab</sub> 65	<sub>a</sub> 54	<sub>b</sub> 78	.61	.26	.20
F	<i>Galium aparine</i> (a)	5	-	3	.15	-	.00
F	<i>Hackelia patens</i>	-	4	-	-	.03	-
F	<i>Helianthus annuus</i> (a)	2	-	-	.63	-	-
F	<i>Helianthella uniflora</i>	-	2	10	.00	.21	.15
F	<i>Holosteum umbellatum</i> (a)	1	2	4	.00	.00	.00
F	<i>Isatis tinctoria</i>	<sub>b</sub> 36	<sub>a</sub> 8	<sub>a</sub> -	.45	.06	-
F	<i>Lactuca serriola</i>	1	8	4	.03	.02	.01
F	<i>Linum lewisii</i>	15	22	28	.14	.14	.23
F	<i>Lithospermum ruderales</i>	-	5	10	.00	.01	.18
F	<i>Lupinus argenteus</i>	11	5	2	.85	.21	.15

T y p e	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
		F	<i>Machaeranthera canescens</i>	<sub>a</sub> 1	<sub>a</sub> 1	<sub>b</sub> 34	.02
F	<i>Machaeranthera grindelioides</i>	-	2	-	-	.00	-
F	<i>Microsteris gracilis</i> (a)	<sub>a</sub> 33	<sub>b</sub> 60	<sub>a</sub> 16	.10	.14	.04
F	<i>Penstemon humilis</i>	<sub>a</sub> -	<sub>b</sub> 5	<sub>ab</sub> 3	.00	.06	.03
F	<i>Penstemon</i> sp.	-	-	1	-	-	.03
F	<i>Phlox longifolia</i>	-	-	3	-	-	.03
F	<i>Polygonum douglasii</i> (a)	<sub>a</sub> 50	<sub>a</sub> 28	<sub>b</sub> 96	.13	.06	.25
F	<i>Senecio multilobatus</i>	-	3	-	-	.03	-
F	<i>Taraxacum officinale</i>	1	3	-	.00	.01	-
F	<i>Tragopogon dubius</i>	21	18	17	.40	.23	.19
F	<i>Veronica biloba</i> (a)	<sub>b</sub> 166	<sub>a</sub> 121	<sub>b</sub> 202	.42	.33	1.20
F	<i>Viguiera multiflora</i>	5	-	5	.04	-	.18
F	<i>Wyethia amplexicaulis</i>	1	1	1	.18	.15	.18
Total for Annual Forbs		619	552	642	3.56	1.91	2.23
Total for Perennial Forbs		287	301	410	5.22	4.40	8.68
Total for Forbs		906	853	1052	8.79	6.31	10.91

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

#### BROWSE TRENDS --

Management unit 02 , Study no: 40

T y p e	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
		B	<i>Amelanchier alnifolia</i>	3	1	1	.15
B	<i>Artemisia tridentata vaseyana</i>	76	74	73	14.11	20.20	15.32
B	<i>Chrysothamnus nauseosus consimilis</i>	2	1	1	-	-	.00
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	24	24	24	1.19	1.91	1.70
B	<i>Eriogonum heracleoides</i>	1	0	0	.63	-	-
B	<i>Mahonia repens</i>	5	3	6	.09	.24	.24
B	<i>Prunus virginiana</i>	4	6	6	.38	.36	.36
B	<i>Purshia tridentata</i>	9	9	8	1.69	2.79	2.11
B	<i>Rosa woodsii</i>	2	1	1	.63	.03	.03
B	<i>Symphoricarpos oreophilus</i>	26	25	25	2.10	3.73	4.36
Total for Browse		152	144	145	20.98	29.29	24.18

CANOPY COVER, LINE INTERCEPT --  
 Management unit 02 , Study no: 40

Species	Percent Cover
	'06
Amelanchier alnifolia	.08
Artemisia tridentata vaseyana	19.36
Chrysothamnus nauseosus consimilis	.01
Chrysothamnus viscidiflorus viscidiflorus	2.83
Mahonia repens	.16
Prunus virginiana	.75
Purshia tridentata	2.36
Symphoricarpos oreophilus	6.53

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 02 , Study no: 40

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

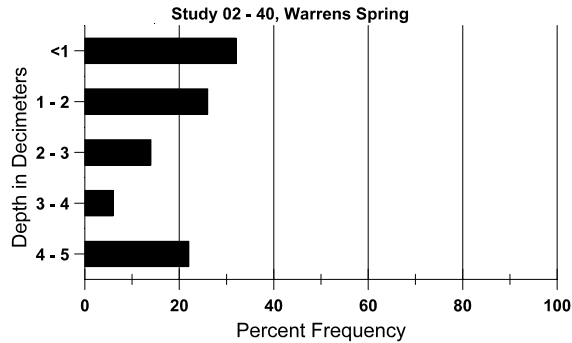
BASIC COVER --  
 Management unit 02 , Study no: 40

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

SOIL ANALYSIS DATA --  
 Herd Unit 02, Study no: 40, Warrens Spring

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.1	59.8 (15.6)	6.8	29.9	35.7	34.4	4.7	12.9	279.4	0.7

## Stoniness Index



### PELLET GROUP DATA --

Management unit 02 , Study no: 40

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	2	1	1
Elk	4	1	3
Deer	22	14	14
Cattle	1	3	-
Moose	-	-	-

Days use per acre (ha)	
'01	'06
-	-
11 (28)	1 (2)
44 (107)	52 (127)
9 (23)	7 (18)
1 (1)	-

### BROWSE CHARACTERISTICS --

Management unit 02 , Study no: 40

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<b>Amelanchier alnifolia</b>												
96	<b>60</b>	-	-	60	-	20	100	0	-	-	0	36/29
01	<b>20</b>	-	-	20	-	-	100	0	-	-	0	38/41
06	<b>20</b>	-	-	20	-	-	0	100	-	-	0	34/39
<b>Artemisia tridentata vaseyana</b>												
96	<b>2460</b>	60	340	1800	320	220	24	0	13	2	2	23/38
01	<b>2560</b>	20	100	2080	380	140	5	0	15	4	4	23/35
06	<b>2700</b>	80	180	1980	540	400	7	0	20	8	10	26/38
<b>Chrysothamnus nauseosus consimilis</b>												
96	<b>40</b>	-	-	40	-	-	50	0	-	-	0	33/58
01	<b>20</b>	-	-	20	-	-	0	0	-	-	0	22/18
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	24/30

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<b>Chrysothamnus viscidiflorus viscidiflorus</b>												
96	<b>880</b>	-	40	820	20	-	0	0	2	-	5	16/23
01	<b>840</b>	-	40	780	20	-	0	0	2	-	0	13/22
06	<b>800</b>	60	100	700	-	20	0	0	0	-	0	15/24
<b>Eriogonum heracleoides</b>												
96	<b>20</b>	-	-	20	-	-	0	0	-	-	0	2/4
01	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
<b>Mahonia repens</b>												
96	<b>520</b>	-	60	460	-	-	0	0	-	-	0	5/8
01	<b>660</b>	-	40	620	-	-	0	0	-	-	0	3/5
06	<b>1040</b>	60	-	1040	-	-	0	0	-	-	0	3/5
<b>Prunus virginiana</b>												
96	<b>120</b>	-	80	40	-	-	0	0	-	-	0	30/28
01	<b>320</b>	20	280	40	-	-	6	0	-	-	0	32/31
06	<b>360</b>	-	100	260	-	-	11	17	-	-	0	23/14
<b>Purshia tridentata</b>												
96	<b>180</b>	-	-	140	40	20	22	22	22	22	22	24/52
01	<b>180</b>	-	-	160	20	20	22	67	11	-	0	23/49
06	<b>180</b>	-	-	160	20	-	22	67	11	-	0	20/49
<b>Rosa woodsii</b>												
96	<b>40</b>	-	-	40	-	-	0	0	-	-	0	14/4
01	<b>20</b>	-	20	-	-	-	0	0	-	-	0	22/11
06	<b>40</b>	-	-	40	-	-	0	0	-	-	0	-/-
<b>Symphoricarpos oreophilus</b>												
96	<b>760</b>	-	40	600	120	-	0	0	16	3	8	21/35
01	<b>840</b>	20	40	700	100	-	0	0	12	7	7	22/36
06	<b>960</b>	-	80	880	-	-	0	0	0	-	0	18/34