Trend Study 4-8-06

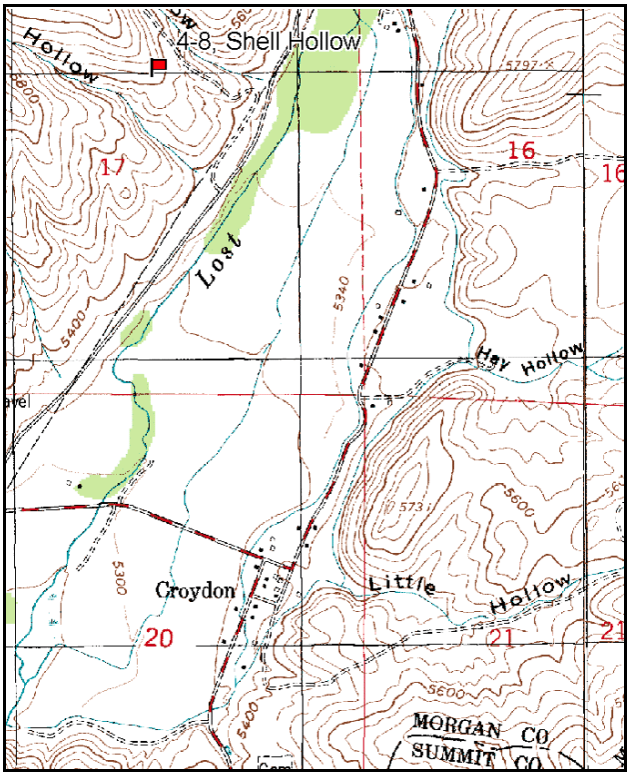
Study site name: Shell Hollow . Vegetation type: Big Sagebrush .

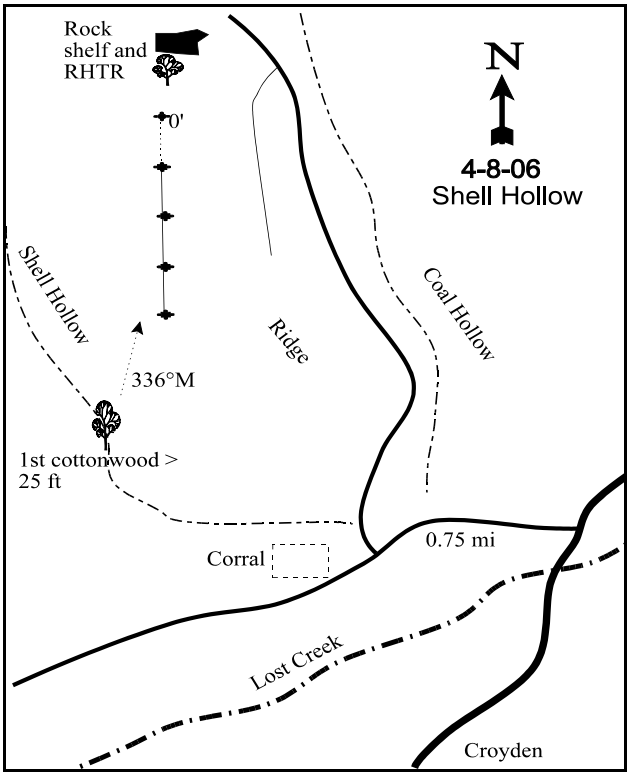
Compass bearing: frequency baseline 159 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From 6900 East and 1900 South in Croyden, proceed east 1.55 miles to a road paralleling Lost Creek. Turn left here and travel 0.75 miles to Coal Hollow Road. Just east of the road is a corral. Northwest of the corral is the ravine, Shell Hollow. Walk up Shell Hollow to the first cottonwood tree over 25 feet tall. Nearby should be a small drainage up the slope to the right. From the tree, take a bearing of 351 degrees true and walk approximately 150 yards up-slope to the 0-foot stake of the baseline marked by browse tag #7947. Ten feet north of the 0-foot stake is a sumac and a rocky shelf behind. Just east of the 0-foot stake is a large rock with a perfect seat carved by the wind. Contact the land owner prior to accessing the site.





Map Name: Devil's Slide

Diagrammatic Sketch

Township 4N , Range 4E , Section 17

UTM NAD 27, UTM 12T 4547986 N 456489 E

DISCUSSION

Shell Hollow - Trend Study No. 4-8

Study Information

This study is located on a small privately owned ridge between Shell Hollow and Coal Hollow on the west side of Lost Creek within critical deer winter range. It samples a mountain big sagebrush/basin big sagebrush hybrid community on a hillside 150 yards above Shell Hollow (elevation: 5,600 feet, slope: 30%, aspect: south). In past years, winter deer and spring sheep use was heavy on the key browse species and understory plants. Few perennial grasses and forbs remain. Cattle were present along the creek during the 1996 reading and had already utilized the available understory forage. Few deer pellet groups were encountered in 1996. A pellet group transect in 2001 estimated 21 deer and 2 cow days use/acre (51 ddu/ha and 5 cdu/ha). In 2006, pellet group estimates were 35 deer, 6 elk, 2 cow, and 8 sheep days use/acre (86 ddu/ha, 15 edu/ha, 5 cdu/ha, and 20 sdu/ha). The elk and deer use were primarily during the winter and sheep use in fall or summer. Three deer carcasses were identified below the study area and a skeleton was identified in the study area in 2006.

Soil

The soil is in the Kilfoil series, which consists of moderately deep, well drained soils that formed from weathered sandstone and shale (USDA-NRCS 2006). The average effective rooting depth is estimated at almost 11 inches, at which a hard pan layer was encountered. Soil texture is a sandy clay loam with a slightly alkaline soil reaction (pH of 7.8). It is very gravely, derived from a conglomerate parent material. Some large boulders are exposed. Relative bare ground cover was 7% in 1996, 15% in 2001, and 13% in 2006. The erosion condition class was determined as stable in 2001 and 2006.

Browse

The key browse species is mountain big sagebrush. It appears to be hybridizing with basin big sagebrush *(Artemisia tridentata tridentata)* since many are tall and have the upright growth form of basin big sagebrush. Sagebrush has provided most of the total shrub cover since 1996. Sagebrush density was relatively stable between 1984 and 1996, but then began decreasing: 4,800 plants/acre (1984), 3,798 (1990), 4,780 (1996), 3,340 (2001), and 2,820 (2006). This is a 41% decrease from 1996 to 2006. Utilization was heavy on 24% of the shrubs in 1984, but light to moderate since 1996. Decadence has declined from a high of 54% in 1990 to 20% in 2001, then increased to 39% in 2006. Plants classified with poor vigor steadily increased, reaching a high of 28% in 1996. In 2001, only 8% of the shrubs sampled displayed poor vigor, but had increased to 15% by 2006. The percentage of the population classified as dying has increased from 1% in 1996 to 13% in 2006. Part of the poor vigor of the sagebrush in 2006 might have been a product of the presence of the sagebrush defoliator moth *(Aroga websterii*), which was identified on the study, but not on any individuals sampled in density measurments. The decreasing population is likely due to low recruitment, which was has been at or below 3% since 2001. The high cheatgrass cover and frequent dry conditions are likely preventing sagebrush recruitment and the replacement of dying individuals with young. Small populations of Saskatoon serviceberry and white rubber rabbitbrush have also been sampled. Stickyleaf low rabbitbrush, an increaser, density was high in 1996 at 5,360 plants/acre and has steadily decreased to 4,080 plants/acre by 2006.

Herbaceous Understory

Perennial grasses and forbs are rare. Apart from the occasional perennial grass, herbaceous forage production came almost entirely from Japanese brome and cheatgrass in 1996. Due to the dry conditions and timing of precipitation in 2001, nested frequency and cover of Japanese brome declined significantly, while frequency and cover of annual forbs increased dramatically. In 2006, Japanese brome and cheatgrass both increased significantly. Annual grasses provided 26% cover in 1996 and 2006, but only 2% in 2001. American vetch provided 6% cover in 2006, more than any other perennial grass or forb species.

1990 TREND ASSESSMENT
The sagebrush on this privately owned winter range has generally good vigor and a moderately hedged growth form. Sagebrush density decreased 21%. Sagebrush canopy cover averages 29%. Recently, the range has been grazed by cattle. There is very little herbaceous understory vegetation, although several species of weedy forbs were encountered in 1990. The understory is in poor condition, providing limited protective ground cover. Perennial grass nested frequency remained low and the nested frequency of perennial forbs increased largely due to significant increases in American vetch, longleaf phlox, and pale stickseed.

browse - down (-2) grass - stable (0) forb - up (+2)

1996 TREND ASSESSMENT
Trend for the mountain big sagebrush is slightly up. Sagebrush density appears to have increased 21%, but some of these large changes in density for this shrub are likely due to the larger sample size this year, which better estimates shrub populations with clumped and/or discontinuous distributions. Presently, canopy cover of sagebrush averages just over 22%. Utilization is light to moderate and percent decadency has dropped to 24%. A high number of shrubs display poor vigor. The grass trend is stable. The nested frequency of perennial grasses increased, but this change is also due to the increased sample area. The forb trend is stable. The nested frequency of perennial forbs increased, but again many new species were sampled because of the larger sample area. The Desirable Components Index score is very poor due to very high cheatgrass cover and low perennial forb cover.

winter range condition (DC Index) - very poor (30) Mid-level potential scale
browse - slightly up (+1) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT
Trend for mountain big sagebrush is down. Sagebrush density decreased 30%, the majority of which was in the mature and decadent age classes. Utilization is mostly light to moderate, vigor has improved, and percent decadence has declined slightly. Density of the increaser, stickyleaf low rabbitbrush, has remained stable. The grass trend is slightly up. The nested frequency of perennial grasses remained unchanged, but the nested frequency of annual grasses decreased 40%. Japanese brome nested frequency decreased significantly and cheatgrass remained unchanged. The forb trend is stable. The nested frequency of perennial forbs increased slightly, as did the nested frequency of annual forbs. The forb composition is poor for big game. The DCI score increased to poor to fair because perennial grass cover increased, perennial forb cover increased, and annual grass cover decreased.

winter range condition (DC Index) - poor to fair (51) Mid-level potential scale
browse - down (-2) grass - slightly up (+1) forb - stable (0)

2006 TREND ASSESSMENT
The browse trend is slightly down. The density of mountain big sagebrush decreased 16%, decadence increased to 39% of the population, and plants classified as dying increased to 13% of the population. The grass trend is slightly down. The nested frequency of perennial grasses increased slightly, but the nested frequencies of Japanese brome and cheatgrass both increased significantly. Annual grasses provided 26% cover. The forb trend is slightly up. The nested frequency of the most beneficial perennial forb, American vetch, increased significantly and the detrimental invasive annual forb, bur buttercup, decreased significantly. The DCI score decreased to very poor to poor because annual grass cover increased, as did browse decadence.

winter range condition (DC Index) - very poor to poor (34) Mid-level potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 04 , Study no: 8

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	a-	a-	b18	b18	b27	1.52	1.67	1.50
G	Agropyron spicatum	-	4	10	7	9	.18	.18	.51
G	Bromus brizaeformis (a)	-	-	4	12	4	.01	.10	.01
G	Bromus japonicus (a)	-	-	c382	a198	b239	26.01	1.53	7.88
G	Bromus tectorum (a)	-	-	a6	a25	b246	.03	.51	17.92
G	Elymus cinereus	3	1	7	7	10	.06	.83	2.21
G	Oryzopsis hymenoides	-	-	1	6	4	.03	.18	.33
G	Poa pratensis	-	-	-	-	1	-	-	.00
G	Poa secunda	a-	a-	b13	b12	ab4	.08	.13	.03
Total for Annual Grasses		0	0	392	235	489	26.05	2.15	25.81
Total for Perennial Grasses		3	5	49	50	55	1.89	3.00	4.60
Total for Grasses		3	5	441	285	544	27.95	5.15	30.42
F	Achillea millefolium	-	5	3	3	2	.03	.15	.03
F	Allium acuminatum	a1	a4	b25	c123	b20	.07	.55	.08
F	Alyssum alyssoides (a)	-	-	b212	a78	b180	.96	.21	.76
F	Astragalus beckwithii	a3	a-	a-	b10	a7	-	.15	.17
F	Aster chilensis	-	3	-	-	-	-	-	-
F	Astragalus convallarius	-	-	6	-	-	.06	-	-
F	Aster sp.	-	-	-	-	1	-	-	.03
F	Astragalus utahensis	-	-	2	1	-	.01	.00	-
F	Camelina microcarpa (a)	-	-	15	13	13	.03	.04	.08
F	Calochortus nuttallii	-	-	-	2	-	-	.00	-
F	Cirsium undulatum	8	4	15	6	4	.12	.10	.01
F	Collomia grandiflora (a)	-	-	-	-	10	-	-	.02
F	Collomia linearis (a)	-	-	a8	b30	a2	.01	.12	.00
F	Comandra pallida	a-	a-	ab10	b11	ab3	.07	.10	.15
F	Collinsia parviflora (a)	-	-	a-	b34	b38	-	.18	.13
F	Descurainia pinnata (a)	-	-	-	2	2	-	.01	.00
F	Draba sp. (a)	-	-	a-	a-	b19	-	-	.04
F	Epilobium brachycarpum (a)	-	-	a-	a4	b22	-	.01	.05
F	Erodium cicutarium (a)	-	-	ab16	a7	b26	.10	.03	.44
F	Galium aparine (a)	-	-	3	1	6	.00	.03	.02
F	Gayophytum ramosissimum(a)	-	-	11	-	-	.02	-	-
F	Hackelia patens	a-	b15	b14	b12	b7	.16	.25	.13
F	Helianthus annuus (a)	-	1	-	1	3	-	.00	.03

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Holosteum umbellatum (a)	-	-	$_{a}$-	$_{b}$18	$_{b}$26	-	.08	.12
F	Lactuca serriola	$_{a}$-	$_{a}$-	$_{b}$9	$_{a}$-	$_{a}$-	.02	.00	-
F	Machaeranthera canescens	-	-	1	-	-	.00	-	-
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$55	$_{b}$54	-	.32	.11
F	Phlox longifolia	$_{a}$-	$_{c}$117	$_{a}$4	$_{b}$38	$_{b}$43	.01	.13	.28
F	Ranunculus testiculatus (a)	-	-	$_{a}$53	$_{c}$220	$_{b}$103	.13	4.38	.43
F	Tragopogon dubius	1	3	9	3	8	.02	.00	.07
F	Veronica biloba (a)	-	-	$_{a}$7	$_{c}$341	$_{b}$72	.04	7.48	.42
F	Verbascum thapsus	$_{a}$-	$_{a}$-	$_{b}$31	$_{a}$-	$_{a}$-	.09	-	-
F	Vicia americana	$_{a}$-	$_{b}$31	$_{c}$92	$_{c}$98	$_{d}$158	1.06	1.46	6.17
F	Viola sp.	-	-	-	-	7	-	-	.21
Total for Annual Forbs		0	1	325	804	576	1.31	12.92	2.69
Total for Perennial Forbs		13	182	221	307	260	1.74	2.92	7.34
Total for Forbs		13	183	546	1111	836	3.06	15.84	10.03

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

BROWSE TRENDS --
Management unit 04 , Study no: 8

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier utahensis	1	1	0	-	-	-
B	Artemisia tridentata vaseyana	97	88	78	22.27	26.68	20.50
B	Chrysothamnus nauseosus albicaulis	8	10	11	1.83	1.88	1.79
B	Chrysothamnus viscidiflorus viscidiflorus	76	65	69	6.00	2.82	6.31
B	Gutierrezia sarothrae	3	9	1	-	.36	.03
Total for Browse		185	173	159	30.11	31.75	28.64

CANOPY COVER, LINE INTERCEPT --
Management unit 04 , Study no: 8

Species	Percent Cover '06
Artemisia tridentata vaseyana	19.21
Chrysothamnus nauseosus albicaulis	.83
Chrysothamnus viscidiflorus viscidiflorus	5.38

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 04 , Study no: 8

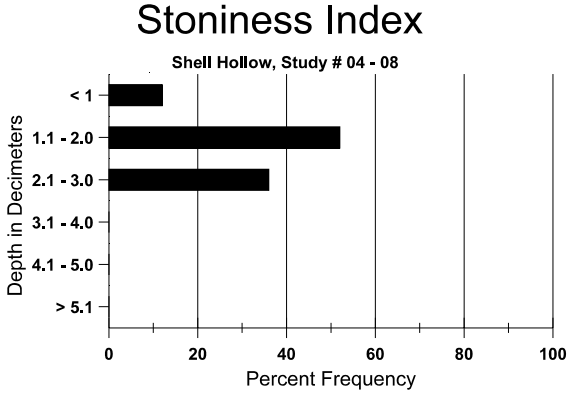
Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata vaseyana	1.8	2.3

BASIC COVER --
Management unit 04 , Study no: 8

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	1.50	5.75	55.91	52.17	54.70
Rock	2.50	1.50	1.75	1.55	1.64
Pavement	10.75	13.50	1.62	5.81	4.17
Litter	58.00	47.75	51.50	46.72	47.29
Cryptogams	0	0	.06	.03	.00
Bare Ground	27.25	31.50	8.15	18.02	16.39

SOIL ANALYSIS DATA --
Herd Unit 04, Study no: 08, Shell Hollow

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.6	78.2 (11.9)	7.8	49.6	23.4	27.0	2.5	18.1	217.6	0.7



PELLET GROUP DATA --
Management unit 04 , Study no: 8

Type	Quadrat Frequency		
	'96	'01	'06
Sheep	-	-	1
Rabbit	-	6	8
Elk	-	-	2
Deer	10	6	8
Cattle	-	1	-

Days use per acre (ha)	
'01	'06
-	8 (20)
-	-
-	6 (15)
21 (51)	35 (86)
2 (5)	2 (5)

BROWSE CHARACTERISTICS --
Management unit 04 , Study no: 8

		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)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**20**	-	-	20	-	-	0	100	-	-	0	23/40
01	**20**	-	20	-	-	-	0	0	-	-	0	25/43
06	**0**	-	-	-	-	-	0	0	-	-	0	25/29
Artemisia tridentata vaseyana												
84	**4800**	-	400	2800	1600	-	74	24	33	-	3	30/34
90	**3798**	533	266	1466	2066	-	60	2	54	5	19	29/37
96	**4780**	20	380	3240	1160	460	43	8	24	1	28	29/48
01	**3340**	-	100	2580	660	540	20	2	20	7	8	35/47
06	**2820**	40	60	1660	1100	860	28	4	39	13	15	33/45
Chrysothamnus nauseosus albicaulis												
84	**132**	-	66	66	-	-	50	0	0	-	0	21/27
90	**266**	-	-	-	266	-	50	0	100	15	50	-/-
96	**220**	-	20	160	40	40	0	0	18	-	9	29/38
01	**200**	-	20	80	100	20	10	0	50	10	10	32/44
06	**240**	-	60	140	40	-	25	0	17	8	17	23/28
Chrysothamnus viscidiflorus viscidiflorus												
84	**1799**	-	66	1600	133	-	56	0	7	-	0	14/17
90	**3533**	-	200	2000	1333	-	21	2	38	7	30	10/12
96	**5360**	-	640	4560	160	20	2	0	3	.74	5	13/16
01	**4560**	-	160	4260	140	-	4	0	3	2	2	9/13
06	**4080**	-	140	3900	40	-	2	0	1	.49	3	13/18

		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)
Gutierrezia sarothrae												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**140**	60	-	140	-	-	0	0	0	-	0	11/9
01	**280**	-	-	220	60	-	0	0	21	7	7	8/10
06	**20**	-	-	20	-	-	0	0	0	-	0	8/7
Opuntia sp.												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	4/9
01	**0**	-	-	-	-	-	0	0	-	-	0	4/14
06	**0**	-	-	-	-	-	0	0	-	-	0	8/20
Rhus trilobata												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	72/128
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	62/115
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	23/41