

Trend Study 16B-3-07

Study site name: Rocky Hollow .

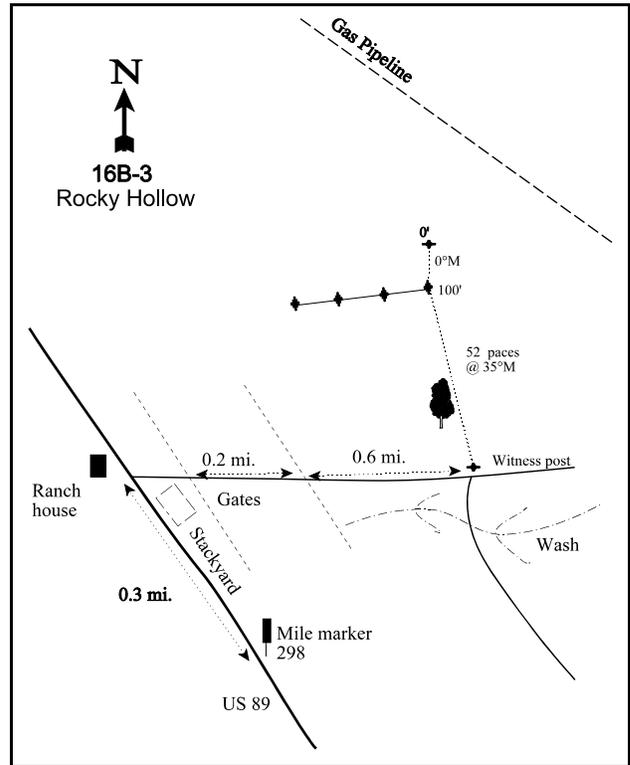
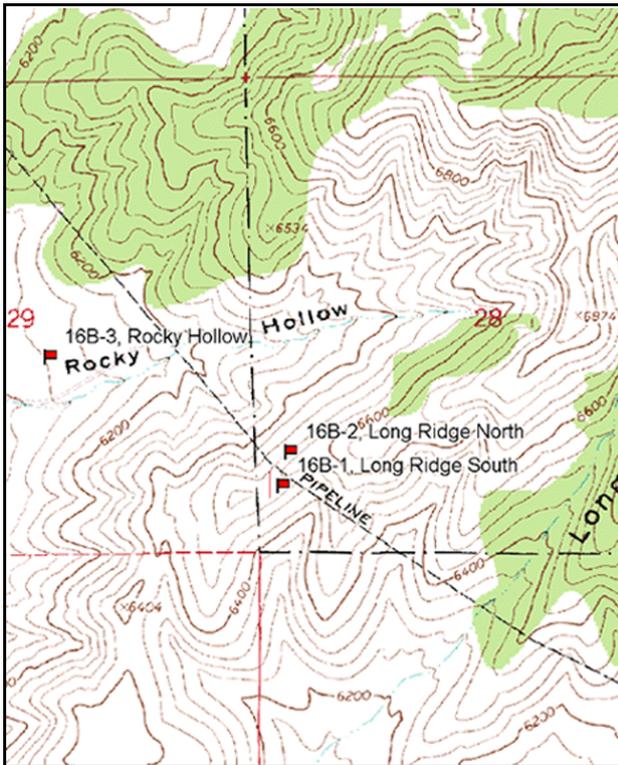
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 180 degrees magnetic (lines 2-4 @ 260°M).

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

LOCATION DESCRIPTION

Go north from Fairview on U.S. 89 for approximately 15 miles to a ranch house and stackyard (0.3 miles north of mile marker 298). Turn right, go through a DWR gate into Lassen Draw property. Go 0.2 miles to another gate/fence. Continue up road another 0.6 miles to a green and white witness post on the left ( north) just 3 paces off the road. From the witness post, walk 52 paces at 350 degrees magnetic to the 100-foot baseline stake. The 0-foot stake is marked by browse tag #180.



Map Name: Indianola

Diagrammatic Sketch

Township 11S, Range 4E, Section 29

GPS: NAD 83, UTM 12S 457412 E 4409295 N

## DISCUSSION

### Rocky Hollow - Trend Study No. 16B-3

#### Study Information

This study is located about 15 miles north of Fairview on Division of Wildlife Resources property and samples the same area as an old line-intercept transect [elevation: 6,050 feet (1,845 m), slope: 5%, aspect: west]. Big game use has been relatively heavy during winters, especially by mule deer. Thistle Creek is located about 1.0 miles (1.6 km) to the west. Quadrat frequency of deer pellets has ranged from 38% to 51%, and the frequency of elk pellets has ranged from 1% to 22%. From pellet group transect data, there were an estimated 137 deer days use/acre (337 ddu/ha) in 2002 and 107 deer days use/acre (265 ddu/ha) in 2007. No elk pellet groups were sampled in the transect in 2002, but there were an estimated 35 elk days use/acre (86 edu/ha) in 2007. Cattle pats have been observed in all sampling years but they are few in number, apparently from just a few trespassing cattle.

#### Soil

The soil is classified within the Ant Flat series, a well drained, slowly permeable soil found on terraces and mountain slopes. Soils in this series formed in colluvium, residuum, and alluvium from calcareous sandstone and some quartzite, conglomerate, limestone and shale. These soils are classified as fine, smectitic, frigid Calcic Argixerolls (USDA-NRCS 2007). This soil has a porous surface horizon about 7 inches (17.8 cm) thick. The clay content increases below this depth. A calcareous zone is often located approximately 60 inches (152 cm) below the surface, and limits root penetration. The soil has a clay loam texture with a slightly acidic reaction (pH of 6.1). The soil is extremely compacted and rocky. The erosion condition was classified as stable in 2002 and 2007.

#### Browse

The key browse consists of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) which appears to be hybridizing with basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*). Sagebrush canopy cover was 15% in 2007. Density was estimated at 2,599 plants/acre (6,433 plants/ha) in 1989 and decreased to 1,440 plants/acre (3,565 plants/ha) by 2007. Some of the decrease in density is likely the result of the increase in sample area beginning in 1997. Reproduction has remained low except in 2002 when seedling density was estimated at 400 seedlings/acre (990 seedlings/ha). However, the small number of young plants observed in 2007 suggest that the 2002 seedlings died. About one-third of the population has been categorized as decadent in all sample years. Plants exhibiting poor vigor have steadily increased from 5% in 1989 to 15% in 2007. Previous to 2002, it was reported that some of the decadency and reduced vigor could be the result of winter injury. In 2007, it was observed that some of the reduced vigor was caused by the sagebrush defoliator moth (*Aroga websteri*); 40% of the sampled sagebrush plants were infested by the moth. Annual leader growth on sagebrush averaged 2 inches (5.1 cm) in 2002 and 2007. Browse use was light to moderate in 1989 and 1997, and shifted towards more heavy use in 2002 and 2007.

Utah serviceberry (*Amelanchier utahensis*) and antelope bitterbrush (*Purshia tridentata*) are present at low densities and offer additional, but limited, forage. Canopy cover of each was less than 1% in 2007. These species will likely remain in low densities in the future as reproduction is nearly absent for both. The most abundant shrub is stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), which has had densities of approximately 2,000 plants/acre (4,950 plants/ha) to 3,000 plants/acre (7,426 plants/ha). The population consists of mostly mature plants. Pricklypear cactus (*Opuntia* sp.) canopy cover was 3% in 2007.

#### Herbaceous Understory

The herbaceous understory makes up about two-thirds of the vegetative cover and is dominated by annual species. Perennial grasses and forbs are found almost exclusively under the protection of shrub canopies. Since cover data was first collected in 1997, the grass component has averaged 18% of the total ground cover.

Annual grasses, primarily cheatgrass (*Bromus tectorum*), have been sampled in nearly every quadrat since 1997. Cheatgrass has been the dominant grass and cover has averaged 10% since 1997. Bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) are the most abundant perennial grasses. Collectively, these two species have comprised approximately 7% of the total ground cover since 1997. Bottlebrush squirreltail (*Sitanion hystrix*), needle-and-thread grass (*Stipa comata*), and Indian ricegrass (*Oryzopsis hymenoides*) are present but infrequent.

Perennial and annual forb cover has been approximately 16%. Since 2002, annual species have accounted for more cover than perennial species. Additionally, annuals have had higher nested and quadrat frequencies than perennials since 1997. Annual forbs consist mostly of very small species such as bur buttercup (*Ranunculus testiculatus*), pale alyssum (*Alyssum alyssoides*), and blue-eyed Mary (*Collinsia parviflora*). The most common perennial forbs are American vetch (*Vicia americana*) and scarlet globemallow (*Sphaeralcea coccinea*). Other perennials have been highly inconsistent in nested frequency and/or presence. Since 1997, the nested frequency of annuals has increased steadily, but the nested frequency of perennials has decreased.

### 1997 TREND ASSESSMENT

The browse trend is slightly down. Mountain big sagebrush density decreased by 35%. Some of the decrease is likely the result of the larger sample area used in 1997. Young plants increased slightly from 3% of the population to 8%. Sagebrush decadence decreased from 38% to 29% of the population. It was also noted that the average crown widths increased 61%, suggesting that the stand consisted of fewer, larger plants. The grass trend is up. The sum of nested frequency of perennial grasses increased, and there was a significant increase in the nested frequency of Sandberg bluegrass. Two new perennial grass species were also measured. Cheatgrass was sampled in 98% of the quadrats. The forb trend is up. The sum of nested frequency for perennial forbs increased more than two-fold. Much of this increase was the result of a significant increase in the nested frequency of American vetch. Additionally longstalk springparsely (*Cymopterus longipes*), Beckwith milkvetch (*Astragalus beckwithii*), and Utah locoweed (*Astragalus utahensis*) were all sampled for the first time. The Desirable Components Index (DCI) score was poor due to high annual grass cover, moderate preferred browse cover, and elevated shrub decadence.

winter range condition (DCI) - poor (43) Mid-level potential scale  
browse - slightly down (-1)      grass - up (+2)      forb - up (+2)

### 2002 TREND ASSESSMENT

The browse trend is stable. All of the key parameters were stable, including density, reproduction, percent decadence, and vigor. Sagebrush reproductive potential increased ten-fold to 400 seedlings/acre (990 plants/ha). The density of dead plants remained constant at 660 plants/acre (1,634 plants/ha). The grass trend is slightly down. The sum of nested frequency of perennial grasses increased 5%, which would usually correspond to a stable trend. However, Japanese brome (*Bromus japonicus*) was measured for the first time, and was present in 32% of the quadrats and provided 1% cover. The nested frequency significantly increased for bluebunch wheatgrass and decreased for bottlebrush squirreltail. Cheatgrass cover The forb trend is down. The sum of nested frequency of perennial forbs decreased by 39%. There was a significant increase in nested frequency of bur buttercup, an allelopathic annual (Buchanan et al. 1978). Bur buttercup was found in 65% of the quadrats. The DCI score remained poor due to a decrease in perennial grass and forb cover that countered the slight increase in preferred browse cover.

winter range condition (DCI) - poor (41) Mid-level potential scale  
browse - stable (0)      grass - slightly down (-1)      forb - down (-2)

### 2007 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density decreased by 10% and cover decreased from 15% to 10%. Sagebrush decadence increased, and both reproduction and the number of dead plants decreased. Vigor

and percentage of plants showing moderate-heavy use remained stable. The grass trend is slightly up. The sum of nested frequency for perennial grasses increased 17% and annuals decreased 19%. There was a significant decrease in the nested frequency of bluebunch wheatgrass and a significant increase in that of Sandberg bluegrass. The decrease in the nested frequency of annuals was caused by the absence of Japanese brome . The forb trend is down. The sum of nested frequency of perennial forbs decreased 32%. The forb composition shifted towards smaller, annual plants. Bur buttercup increased significantly in nested frequency, accounted for 44% of forb cover, and was found in 83% of the quadrats. The DCI score decreased to very poor due to a decrease in preferred browse cover, perennial forb cover, and an increase in annual grass cover.

winter range condition (DCI) - very poor (32) Mid-level potential scale  
browse - slightly down (-1)      grass - slightly up (+1)      forb - down (-2)

HERBACEOUS TRENDS --  
Management unit 16B, Study no: 3

T y p e	Species	Nested Frequency				Average Cover %		
		'89	'97	'02	'07	'97	'02	'07
G	Agropyron smithii	-	2	-	-	.03	-	-
G	Agropyron spicatum	ab80	a63	b101	a65	3.84	4.05	4.61
G	Bromus japonicus (a)	-	-	86	-	-	.50	-
G	Bromus tectorum (a)	-	a328	a319	a327	13.18	6.80	10.16
G	Oryzopsis hymenoides	b15	ab3	a3	a2	.38	.03	.04
G	Poa secunda	a43	b104	b111	c168	3.18	2.15	3.25
G	Sitanion hystrix	ab23	b39	a12	a24	.89	.36	.35
G	Stipa comata	-	a9	a3	a9	.46	.18	.53
Total for Annual Grasses		0	328	405	327	13.18	7.31	10.16
Total for Perennial Grasses		161	220	230	268	8.80	6.80	8.79
Total for Grasses		161	548	635	595	21.98	14.11	18.96
F	Agoseris glauca	-	b15	ab9	a3	.26	.16	.03
F	Alyssum alyssoides (a)	-	a170	c317	b283	.71	6.76	3.03
F	Allium sp.	a13	b61	c84	a9	.20	.30	.01
F	Antennaria rosea	-	3	-	-	.00	-	-
F	Astragalus beckwithii	-	a21	a26	-	.58	.12	-
F	Astragalus utahensis	-	22	-	-	.79	-	-
F	Castilleja linariaefolia	-	b17	a4	-	.21	.00	-
F	Camelina microcarpa (a)	-	a2	a3	a-	.00	.00	.00
F	Cirsium sp.	-	3	-	-	.03	-	-
F	Collomia linearis (a)	-	b46	a15	a7	.11	.03	.01
F	Comandra pallida	3	-	-	-	-	-	-
F	Collinsia parviflora (a)	-	b313	c340	a251	3.76	8.25	1.36
F	Crepis acuminata	a4	a1	a3	-	.00	.00	-
F	Cryptantha sp.	-	-	-	3	-	-	.01

Type	Species	Nested Frequency				Average Cover %		
		'89	'97	'02	'07	'97	'02	'07
F	<i>Cymopterus longipes</i>	-	<sub>b</sub> 39	-	<sub>a</sub> 14	.08	-	.06
F	<i>Descurainia pinnata</i> (a)	-	-	-	1	-	-	.00
F	<i>Draba</i> sp. (a)	-	-	-	152	-	-	.90
F	<i>Erigeron pumilus</i>	<sub>a</sub> 2	-	-	<sub>a</sub> 4	-	-	.00
F	<i>Eriogonum racemosum</i>	3	-	-	-	-	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	-	1	-	-	.00
F	<i>Lithospermum ruderales</i>	<sub>a</sub> 3	<sub>a</sub> 15	<sub>a</sub> 10	<sub>a</sub> 3	.49	.19	.18
F	<i>Lomatium triternatum</i>	<sub>b</sub> 21	<sub>a</sub> 3	-	-	.00	-	-
F	<i>Lupinus argenteus</i>	<sub>a</sub> 6	<sub>a</sub> 6	-	<sub>a</sub> 14	.40	-	.19
F	<i>Machaeranthera canescens</i>	4	-	-	-	-	-	-
F	<i>Microsteris gracilis</i> (a)	-	<sub>a</sub> 6	<sub>b</sub> 26	<sub>a</sub> 2	.01	.06	.00
F	<i>Phlox longifolia</i>	<sub>a</sub> 1	<sub>a</sub> 7	<sub>a</sub> 2	<sub>a</sub> 3	.01	.01	.04
F	<i>Polygonum douglasii</i> (a)	-	<sub>b</sub> 14	<sub>a</sub> 1	-	.18	.00	-
F	<i>Ranunculus testiculatus</i> (a)	-	<sub>a</sub> 72	<sub>b</sub> 215	<sub>c</sub> 257	.54	4.22	5.96
F	<i>Sphaeralcea coccinea</i>	<sub>a</sub> 51	<sub>a</sub> 61	<sub>a</sub> 61	<sub>a</sub> 53	1.23	.99	1.07
F	<i>Tragopogon dubius</i>	-	<sub>a</sub> 5	-	<sub>a</sub> 2	.04	-	.00
F	<i>Vicia americana</i>	<sub>a</sub> 54	<sub>b</sub> 137	<sub>a</sub> 53	<sub>a</sub> 62	3.19	1.06	.76
Total for Annual Forbs		0	623	917	954	5.32	19.35	11.30
Total for Perennial Forbs		165	416	252	170	7.54	2.85	2.38
Total for Forbs		165	1039	1169	1124	12.87	22.21	13.68

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

#### BROWSE TRENDS --

Management unit 16B, Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	<i>Amelanchier utahensis</i>	2	2	2	.03	.03	.15
B	<i>Artemisia tridentata vaseyana</i>	61	58	53	11.59	14.92	9.87
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	54	61	51	3.90	2.82	2.35
B	<i>Echinocereus</i> sp.	0	0	1	-	-	-
B	<i>Gutierrezia sarothrae</i>	0	1	1	-	-	-
B	<i>Mahonia repens</i>	0	1	0	-	-	-
B	<i>Opuntia</i> sp.	56	55	61	1.75	2.12	2.09
Total for Browse		173	178	169	17.27	19.90	14.47

CANOPY COVER, LINE INTERCEPT --

Management unit 16B, Study no: 3

Species	Percent Cover	
	'02	'07
Amelanchier utahensis	-	.41
Artemisia tridentata vaseyana	-	15.33
Chrysothamnus viscidiflorus viscidiflorus	-	3.81
Opuntia sp.	-	3.11

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 16B, Study no: 3

Species	Average leader growth (in)	
	'02	'07
Amelanchier utahensis	3.1	3.6
Artemisia tridentata vaseyana	2.0	1.9
Purshia tridentata	-	1.8

BASIC COVER --

Management unit 16B, Study no: 3

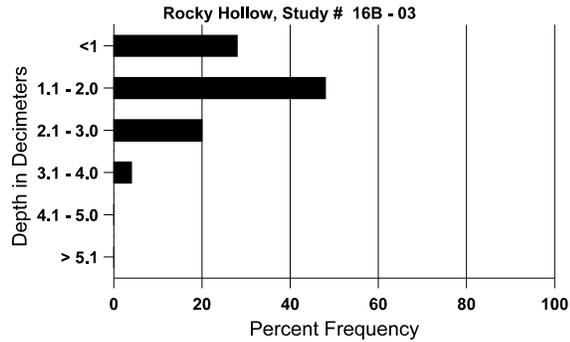
Cover Type	Average Cover %			
	'89	'97	'02	'07
Vegetation	10.00	46.29	57.96	48.54
Rock	10.75	7.54	7.44	6.43
Pavement	6.00	.98	2.80	.90
Litter	53.25	37.26	32.64	42.15
Cryptogams	1.75	3.27	4.30	1.87
Bare Ground	18.25	16.51	15.26	15.87

SOIL ANALYSIS DATA --

Herd Unit 16B, Study no: 03, Rocky Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy clay loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
15.5	50.4 (15.7)	6.1	54.7	24.7	20.6	1.5	22.8	316.8	.4

## Stoniness Index



### PELLET GROUP DATA --

Management unit 16B, Study no: 3

Type	Quadrat Frequency		
	'97	'02	'07
Rabbit	5	24	28
Elk	19	1	22
Deer	38	48	51
Cattle	2	1	1
Sheep	-	-	-

Days use per acre (ha)	
'02	'07
-	-
-	35 (86)
137 (337)	107 (365)
1 (2)	-
1 (2)	-

### BROWSE CHARACTERISTICS --

Management unit 16B, Study no: 3

		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 utahensis</b>												
89	<b>199</b>	66	66	133	-	-	0	67	0	-	33	29/29
97	<b>40</b>	-	-	40	-	20	0	100	0	-	0	32/41
02	<b>40</b>	-	-	20	20	20	100	0	50	-	0	46/47
07	<b>40</b>	-	-	20	20	-	0	100	50	50	50	42/48
<b>Artemisia tridentata vaseyana</b>												
89	<b>2599</b>	-	66	1533	1000	-	46	0	38	3	5	32/31
97	<b>1700</b>	40	140	1060	500	660	44	0	29	11	11	35/51
02	<b>1600</b>	400	80	1040	480	660	41	16	30	14	14	31/39
07	<b>1440</b>	40	40	860	540	460	35	18	38	14	15	39/44

		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)
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
89	<b>2666</b>	-	200	2466	-	-	0	0	0	-	15	13/13
97	<b>2040</b>	-	40	1960	40	20	0	0	2	.98	2	12/17
02	<b>2960</b>	20	120	2300	540	20	.67	0	18	3	3	10/16
07	<b>2240</b>	-	40	2020	180	20	3	0	8	2	3	11/17
<i>Echinocereus sp.</i>												
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
07	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-
<i>Eriogonum microthecum</i>												
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	9/10
<i>Gutierrezia sarothrae</i>												
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>60</b>	-	-	60	-	-	0	0	-	-	0	-/-
07	<b>20</b>	-	-	20	-	-	0	0	-	-	0	7/11
<i>Mahonia repens</i>												
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
89	<b>1199</b>	66	266	933	-	-	0	0	0	-	17	6/16
97	<b>2400</b>	-	20	2300	80	-	0	0	3	.83	.83	11/17
02	<b>1620</b>	-	20	1420	180	-	0	0	11	1	2	6/20
07	<b>3160</b>	20	20	2960	180	20	0	0	6	4	4	7/19
<i>Purshia tridentata</i>												
89	<b>66</b>	-	66	-	-	-	0	0	-	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	59/70