

Trend Study 17-60-07

Study site name: Center Creek.

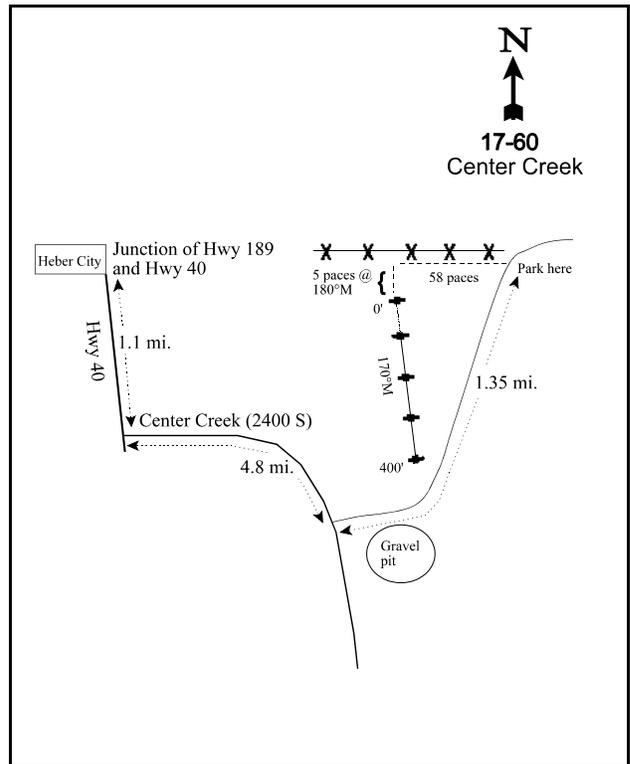
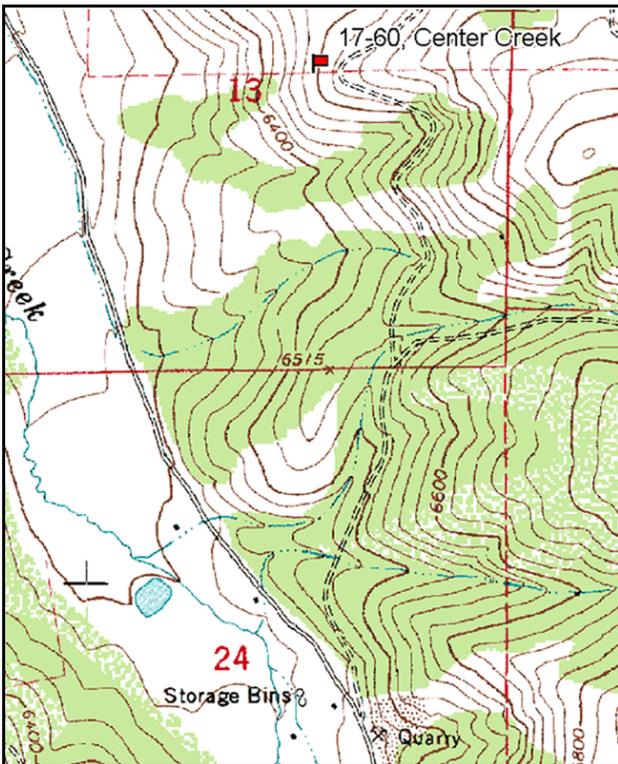
Vegetation type: Mountain Big Sage.

Compass bearing: frequency baseline 170 degrees magnetic.

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

LOCATION DESCRIPTION

From Heber City, proceed on Highway 40 towards Daniel's Canyon for 1.1 miles to Center Creek Road (2400 South). Go 3.0 miles until the road changes to a gravel road. Continue for another 1.8 miles to a gravel pit. Turn left and go 1.35 miles to a fence line, park here. Go 58 paces down the fence line. The 0-foot stake is 25 feet south of the fence line marked by browse tag # 174.



Map Name: Center Creek.

Diagrammatic Sketch

Township 4S, Range 5E, Section 13

GPS: NAD 83, UTM 12T 472300 E 4480073 N

DISCUSSION

Center Creek - Trend Study No. 17-60

Study Information

This trend study was established in 2002 to monitor important winter range on the east foothills of the Heber Valley [elevation: 6,600 feet (2,012 m), slope: 25%, aspect: west]. The study is located on private land, and the nearest perennial source of water is Center Creek 0.6 miles (1 km) to the west. Although there is no escape or thermal cover in the immediate area, deer use is moderate-high, and elk use is light-moderate. The quadrat frequency of deer pellets increased from 27% in 2002 to 45% in 2007. From the pellet group transect data, deer use was estimated at 117 days use/acre (289 ddu/ha) in 2002 and 53 days use/acre (131 ddu/ha) in 2007. Elk use was estimated at 5 days use/acre (13 edu/ha) in 2002 and 39 days use/acre (96 edu/ha) in 2007. Most of the deer and elk pellet groups appear to be from winter use, with a few from late winter and early spring. One lone juniper on site showed signs of being a rub tree for deer bucks or elk bulls. In addition, a dead deer carcass was found near the study site baseline in 2002, and another carcass was found on the study in 2007. There was also some sign of horses and cattle using the area. A quarry is located 1 mile (1.6 km) to the south. In 2007, the quarry was active and gravel was being transported on the road that is adjacent to the study.

Soil

This study is located within the Bezzant soil series, which consists of very deep, well-drained, moderately permeable soils. These soils formed in alluvium, colluvium, and residuum from mixed sedimentary rocks. The soil is classified as loamy-skeletal, mixed, superactive, frigid Typic Calcixerolls (USDA-NRCS 2007). Specifically at the study, the soil has a clay loam texture and a neutral reaction (pH of 7.0). Although vegetation and litter are the dominant ground cover classes, pavement and rock cover are comparatively high. The relative pavement cover has averaged 10% since 2002, and relative rock cover has averaged 14%. Relative bare ground cover decreased from 13% in 2002 to 7% in 2007. While taking soil samples, a calcium carbonate layer was found 4-6 inches (10-15 cm) below the surface, and many rocks have a calcium carbonate layer on them. Bare soil is exposed mostly on trails which crisscross the site. The erosion condition class was determined to be slight in 2002 and decreased to stable in 2007. The decrease was the result of a decrease in the density of pedestalled plants.

Browse

The browse component is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Some of the sagebrush have characteristics of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), and it is apparent that there is some hybridization between these two subspecies. Canopy cover of sagebrush was 21% in 2002 and 19% in 2007. The estimated density decreased from 3,020 plants/acre (7,475 plants/ha) in 2002 to 2,120 plants/acre (5,248 plants/ha) in 2007. No seedling plants have been sampled, and young plants have comprised 2% of the population or less. Decadence has been high, ranging from 28% to 32% of the population. The density of dead plants has also been high, at approximately 1,050 plants/acre (2,600 plants/ha) since 2002. Plants classified as dying decreased from 21% in 2002 to 16% in 2007. The average annual leader growth was 2.7 inches (6.9 cm) in 2002, and 1.6 inches (4.1 cm) in 2007. Browse use on sagebrush has been light-moderate, though an average 25% of the plants have been heavily browsed since 2002.

Other preferred species occur in limited numbers. These include serviceberry (*Amelanchier alnifolia*), Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*), and antelope bitterbrush (*Purshia tridentata*). All of these species displayed heavy use and have a hedged growth form on available plants. Collectively, they have accounted for less than 1% of the browse cover. Broom snakeweed (*Gutierrezia sarothrae*) is abundant, though the population decreased from 3,620 plants/acre (8,960 plants/ha) in 2002 to 1,160 plants/acre (2,871 plants/ha) in 2007. Canopy cover of broom snakeweed decreased from 2% in 2002 to less than 1% in 2007.

Herbaceous Understory

The herbaceous understory is diverse, but not particularly productive. Annual grasses, including cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*), are dominant. Cover of these grasses increased from 4% in 2002 to 10% in 2007. Perennial grass cover was also 4% in 2002, but decreased slightly to 3% in 2007. Between eight and nine perennial species have been sampled, and bluebunch wheatgrass (*Agropyron spicatum*) and Indian ricegrass (*Oryzopsis hymenoides*) are the dominant perennial grasses. Bulbous bluegrass (*Poa bulbosa*) is also present, but had a quadrat frequency of only 1% in 2002 and 2007. This perennial species has a phenology that is similar to that of annual grasses (Stewart and Hull 1949), and may limit the establishment of other species.

The forb component is also diverse, but does not provide much forage. Perennial forb cover decreased from 2% in 2002 to 1% in 2007. The dominant perennial forbs include hairy goldaster (*Heterotheca villosa*) and heath aster (*Leucelene ericoides*). Annual forb cover increased from 1% in 2002 to 3% in 2007. With the exception of annual sunflower (*Helianthus annuus*), the annual species that have been sampled are small plants. Pale alyssum (*Alyssum alyssoides*) was the dominant forb in 2002 and 2007, and was sampled in 69% and 92% of the quadrats, respectively. Storksbill (*Erodium cicutarium*), which may limit the establishment of other species (Kimball and Schiffman 2003), is also present. It was the second most abundant forb species in 2007.

2007 TREND ASSESSMENT

The browse trend is down. The density of sagebrush decreased 30%. Although the mature plants had good seed production, there were no seedling plants sampled. Recruitment changed little, slightly decreasing from 2% to 1%. Sagebrush decadence increased from 28% to 32%, and half of the decadent plants were classified as dying. The density of dead plants increased from 1,000 plants/acre (2,475 plants/ha) to 1,100 plants/acre (2,722 plants/ha). Browse use was fairly constant, and heavily browsed plants increased from 23% of the population to 27%. The grass trend is down. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses decreased 38%. The nested frequencies of mutton bluegrass (*Poa fendleriana*), Sandberg bluegrass (*Poa secunda*), and bottlebrush squirreltail (*Sitanion hystrix*) all decreased significantly. Although there was significant decrease in the nested frequency of Japanese brome, there was a significant increase in that of cheatgrass. Cheatgrass cover increased from 3% to 10%. The forb trend is down. The sum of nested frequency of perennial forbs decreased 61%, and the number of perennial species sampled decreased from 18 to 12. There were significant decreases in the nested frequencies of wild onion (*Allium* sp.), spring parsley (*Cymopterus* sp.), hairy goldaster, and longleaf phlox (*Phlox longifolia*). The nested frequency of storksbill significantly increased, and the quadrat frequency increased from 6% to 35%. The 2002 Desirable Components Index (DCI) score was poor because the high browse cover was countered by low recruitment, high annual grass cover, and low perennial grass and forb cover. In 2007, the DCI score decreased to very poor due to a decrease in browse cover and an increase in annual grass cover.

2002 winter range condition (DCI) - poor (44) Mid-level potential scale

2007 winter range condition (DCI) - very poor (27) Mid-level potential scale

browse - down (-2)

grass - down (-2)

forb - down (-2)

HERBACEOUS TRENDS --
Management unit 17 , Study no: 60

T y p e	Species	Nested Frequency		Average Cover %	
		'02	'07	'02	'07
G	Agropyron dasystachyum	a5	a1	.18	.00
G	Agropyron spicatum	a37	a45	1.02	1.56
G	Bromus japonicus (a)	b185	a93	1.25	.34
G	Bromus tectorum (a)	a217	b382	3.11	9.93
G	Oryzopsis hymenoides	a39	a30	1.65	.97
G	Poa bulbosa	a1	a3	.00	.00
G	Poa fendleriana	b23	a3	.12	.03
G	Poa pratensis	10	-	.09	-
G	Poa secunda	b42	a17	.39	.16
G	Sitanion hystrix	b32	a12	.29	.20
G	Stipa comata	a2	a9	.06	.07
Total for Annual Grasses		402	475	4.36	10.28
Total for Perennial Grasses		191	120	3.84	3.02
Total for Grasses		593	595	8.21	13.30
F	Agoseris glauca	6	-	.03	-
F	Alyssum alyssoides (a)	a175	b353	.76	1.92
F	Allium sp.	b47	a14	.10	.03
F	Antennaria rosea	6	-	.15	-
F	Arabis sp.	1	-	.00	-
F	Artemisia ludoviciana	a3	a1	.01	.00
F	Astragalus convallarius	a3	a4	.00	.02
F	Castilleja linariaefolia	3	-	.06	-
F	Camelina microcarpa (a)	5	-	.01	-
F	Calochortus nuttallii	13	-	.04	-
F	Chaenactis douglasii	4	-	.00	-
F	Chenopodium sp. (a)	3	-	.03	-
F	Cirsium sp.	a7	a7	.07	.16
F	Collomia linearis (a)	a5	a4	.01	.00
F	Collinsia parviflora (a)	-	15	-	.02
F	Cymopterus sp.	b15	a4	.06	.01
F	Epilobium brachycarpum (a)	20	-	.04	-
F	Eriogonum brevicaule	1	-	.00	-
F	Erodium cicutarium (a)	a20	b113	.08	1.17
F	Eriogonum racemosum	a4	a1	.03	.00
F	Gilia sp. (a)	a1	a2	.00	.00

T y p e	Species	Nested Frequency		Average Cover %	
		'02	'07	'02	'07
F	<i>Helianthus annuus</i> (a)	2	-	.01	-
F	<i>Heterotheca villosa</i>	_b 32	_a 10	.41	.22
F	<i>Leucelene ericoides</i>	_a 19	_a 17	.52	.21
F	<i>Mentzelia</i> sp.	-	2	-	.00
F	<i>Microsteris gracilis</i> (a)	_b 27	_a 3	.13	.00
F	<i>Phlox longifolia</i>	_b 18	_a 1	.06	.00
F	<i>Ranunculus testiculatus</i> (a)	-	1	-	.00
F	<i>Sphaeralcea coccinea</i>	_a 20	_a 17	.28	.09
F	<i>Viguiera multiflora</i>	3	-	.03	-
F	<i>Viola</i> sp.	-	2	-	.03
Total for Annual Forbs		258	491	1.07	3.14
Total for Perennial Forbs		205	80	1.90	0.81
Total for Forbs		463	571	2.98	3.95

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

BROWSE TRENDS --

Management unit 17 , Study no: 60

T y p e	Species	Strip Frequency		Average Cover %	
		'02	'07	'02	'07
B	<i>Amelanchier alnifolia</i>	7	6	.41	.15
B	<i>Artemisia tridentata</i> vaseyana	76	70	21.50	15.72
B	<i>Chrysothamnus viscidiflorus</i> <i>viscidiflorus</i>	3	1	.15	-
B	<i>Gutierrezia sarothrae</i>	38	30	1.99	.31
B	<i>Mahonia repens</i>	5	9	.45	.25
B	<i>Opuntia</i> sp.	31	32	.28	.35
B	<i>Purshia tridentata</i>	8	9	.30	.38
B	<i>Tetradymia canescens</i>	15	12	.59	1.08
Total for Browse		183	169	25.68	18.25

CANOPY COVER, LINE INTERCEPT --

Management unit 17 , Study no: 60

Species	Percent Cover	
	'02	'07
Amelanchier alnifolia	.01	.01
Artemisia tridentata vaseyana	20.68	18.60
Chrysothamnus viscidiflorus viscidiflorus	.13	.05
Gutierrezia sarothrae	2.18	.26
Mahonia repens	.33	.61
Opuntia sp.	.15	.18
Purshia tridentata	.51	.11
Tetradymia canescens	.88	1.21

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17 , Study no: 60

Species	Average leader growth (in)	
	'02	'07
Artemisia tridentata vaseyana	2.7	1.6

BASIC COVER --

Management unit 17 , Study no: 60

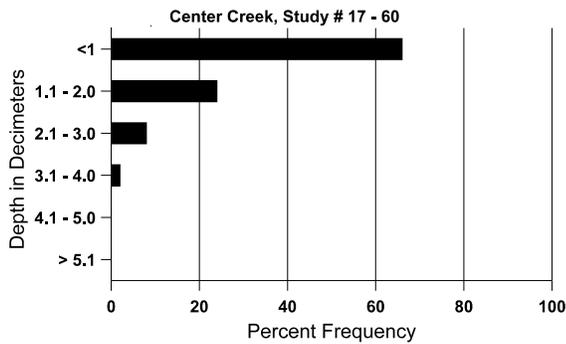
Cover Type	Average Cover %	
	'02	'07
Vegetation	36.21	42.93
Rock	18.43	12.69
Pavement	12.66	10.21
Litter	33.97	39.47
Cryptogams	.22	0
Bare Ground	15.71	7.41

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 60, Center Creek

Effective rooting depth (in)	Temp °F (depth)	pH	Clay loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
12.5	67.0 (12.7)	7.0	41.3	24.7	34.0	4.3	16.4	278.4	.7

Stoniness Index



PELLET GROUP DATA --

Management unit 17, Study no: 60

Type	Quadrat Frequency		Days use per acre (ha)	
	'02	'07	'02	'07
Rabbit	7	29	-	-
Elk	1	5	5 (13)	39 (96)
Deer	27	45	117 (289)	53 (131)
Cattle	1	1	-	-

BROWSE CHARACTERISTICS --

Management unit 17, Study no: 60

		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												
02	160	-	40	120	-	-	13	88	0	-	0	17/27
07	140	-	20	100	20	-	0	100	14	-	0	11/14
Artemisia tridentata vaseyana												
02	3020	-	60	2100	860	1000	32	23	28	21	21	28/39
07	2120	-	20	1420	680	1100	30	27	32	16	16	28/39
Chrysothamnus viscidiflorus viscidiflorus												
02	60	-	-	60	-	-	0	0	-	-	33	9/16
07	20	-	-	20	-	-	0	0	-	-	0	7/10
Cowania mexicana stansburiana												
02	0	-	-	-	-	-	0	0	-	-	0	85/67
07	0	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
02	3620	-	-	3420	200	180	0	0	6	3	4	8/10
07	1160	360	100	1040	20	-	3	5	2	-	7	8/7

		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)	
Mahonia repens													
02	2260	-	-	2260	-	-	0	0	-	-	0	3/4	
07	4400	-	40	4360	-	-	0	0	-	-	1	3/4	
Opuntia sp.													
02	1080	-	120	940	20	-	0	0	2	2	2	4/8	
07	1000	20	80	880	40	20	0	0	4	2	6	4/8	
Purshia tridentata													
02	160	-	-	140	20	-	0	100	13	-	0	9/26	
07	200	-	20	160	20	-	0	70	10	10	10	9/24	
Rhus trilobata													
02	0	-	-	-	-	-	0	0	-	-	0	27/51	
07	0	-	-	-	-	-	0	0	-	-	0	25/56	
Tetradymia canescens													
02	360	-	-	340	20	-	6	6	6	-	0	10/16	
07	340	-	-	320	20	-	6	0	6	6	6	11/21	