

Trend Study 17-68-07

Study site name: Provo River Canyon.

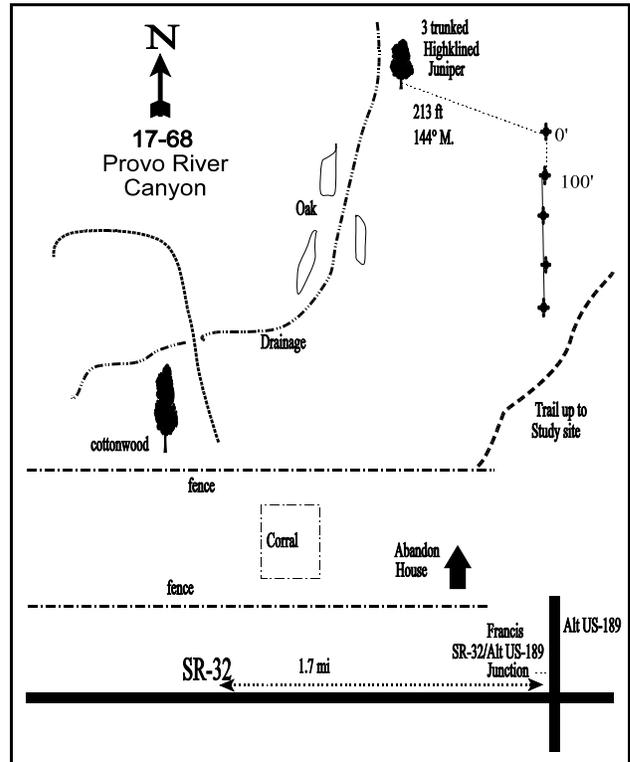
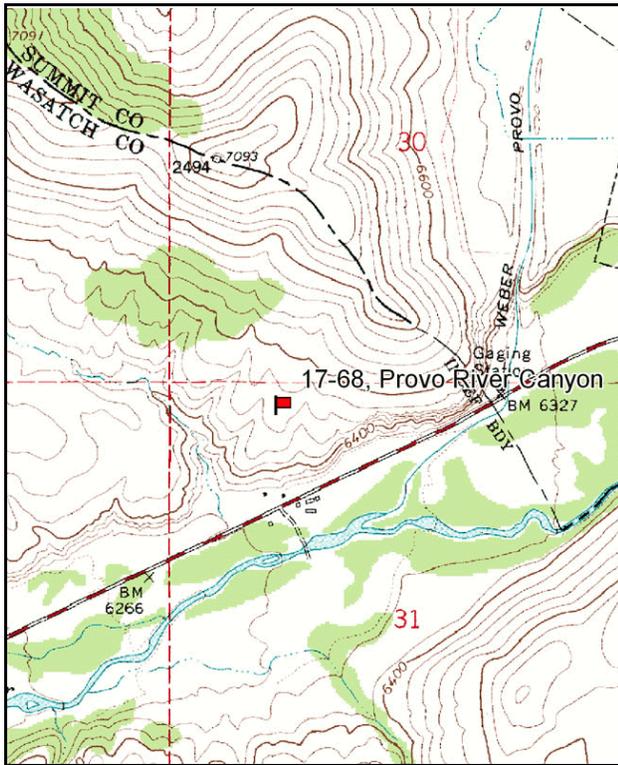
Vegetation type: Big Sagebrush-Grass.

Compass bearing: frequency baseline 160 degrees.

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

LOCATION DESCRIPTION

From the junction of SR-32 and Alt US-189 in Francis, proceed west on Hwy 32 for 1.7 miles and stop at an old corral in a marshy pasture on the right (north) opposite Victory Ranch Club (6480 E. Hwy 32). Walk to the large, narrow-leaf cottonwood northwest of the corral. The tree is at the mouth of a small canyon. Walk up the canyon approximately 500 feet until reaching the first drainage on the right. A drainage begins where the road crosses the creek for the second time. Walk up this drainage past the oak clumps to a point where the gully flattens out. To the right locate a 3-trunked, high-lined juniper. From the juniper, walk 213 feet at 144 degrees magnetic to the 0-foot stake of the baseline, marked with browse tag #7960. The baseline runs in a direction of 160 degrees magnetic.



Map Name: Francis

Diagrammatic Sketch

Township 2S, Range 6E, Section 31

UTM NAD 83, UTM 12T 473377 E 4495437 N

DISCUSSION

Provo River Canyon - Trend Study No. 17- 68

Study Information

This study samples a narrow band of critical deer winter range located on a bluff north of the Provo River and west of Francis on SR-32 [elevation: 6,500 feet (1,981 m), slope: 5%-12%, aspect: south]. The nearest perennial source of water is a spring that is 950 feet (290 m) to the south, near an abandoned house. Deer use has been moderate, and elk use has been light. Even though there is little herbaceous forage, cattle and sheep alternately use the area in the spring-fall period. From the pellet group transect data, deer use was estimated at 35 days use/acre (86 ddu/ha) in 2001 and 30 days use/acre (74 ddu/ha) in 2007. Deer pellet groups were primarily from winter use, but some groups were recent, indicating a few resident deer use the area during the spring and summer. Elk use was estimated at 3 days use/acre (7 edu/ha) in 2001 and 5 days use/acre (13 edu/ha) in 2007. Cattle use was estimated at 1 day use/acre (2 cdu/ha) in 2002 and 11 days use/acre (27 cdu/ha) in 2007, but the pats appeared to be from the fall of 2006. The quadrat frequency of rabbit pellet groups increased from 9% in 1996 to 38% in 2007.

Soil

This study is located within the Little Pole soil series. Soils in this series are shallow and well-drained. They formed in material weathered from intermediate igneous rocks. The Little Pole series is classified as loamy-skeletal, mixed, superactive, frigid Lithic Haploxerolls. Specifically at the study, the soil has a clay loam texture and a neutral soil reaction (pH of 6.6). Relative bare ground cover increased from 6% in 1996 to 14% in 2001, and decreased to 8% in 2007. Relative vegetation cover increased from 41% in 1996 to 50% by 2007, while that of litter has decreased from 48% in 1996 to 39% in 2007. Although there was limited erosion in the past, the erosion condition was classified as stable in 2001 and 2007.

Browse

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the dominant browse species. It provided 27% canopy cover in 2007. Some plants have characteristics of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), and it is likely that there has been some hybridization between subspecies. Since 1996, mature plants have been tall, averaging 3 feet (0.9 m) in height with a crown width of nearly 4 feet (1.2 m). The population density decreased from 6,332 plants/acre (15,673 plants/ha) in 1984 to 4,120 plants/acre (10,198 plants/ha) in 1996, and increased to 4,280 plants/acre (10,594 plants/ha) in 2001. By 2007, the density decreased to 2,920 plants/acre (7,228 plants/ha). Seedling plants were most abundant in 1984, but few have been sampled in subsequent years. Young plants increased from 5% of the population in 1984 to 14% in 1990, and then decreased to 1% by 2007. Decadence has been high, though it has oscillated between increasing and decreasing in alternate sample years. Decadence was the lowest in 1996 (20%) and highest in 1990 (57%). Decadent plants comprised 50% of the population in 2007. The density of dead plants decreased from 920 plants/acre (2,277 plants/ha) in 1996 to 720 plants/acre (1,782 plants/ha) in 2001, and increased to 1,380 plants/acre (3,416 plants/ha) in 2007. More than 20% of the population had poor vigor in 1990, 2001, and 2007. Otherwise, vigor has been good. The average annual leader growth was 1.5 inches (3.8 cm) in 2007. Browse use on sagebrush was moderate-heavy in 1984, and has been light-moderate in subsequent sample years.

Antelope bitterbrush (*Purshia tridentata*) is also present, but much less abundant. Bitterbrush canopy cover was 2% in 2007. The estimated density decreased from 866 plants/acre (2,144 plants/ha) in 1984 to 180 plants/acre (446 plants/ha) in 1996, and increased to 240 plants/acre (594 plants/ha) in 2001. In 2007, the density decreased to 200 plants/acre (495 plants/ha). No seedling plants have been sampled, and young plants were only sampled in 1990. Decadent plants increased from 77% of the population in 1984 to 88% in 1990, and decreased to 0% by 2001. In 2007, 40% of the population was decadent. The density of dead plants decreased from 100 plants/acre (248 plants/ha) in 1996 to 20 plants/acre (49 plants/ha) in 2001, and increased

to 40 plants/acre (99 plants/ha) in 2007. Vigor has been good, except in 1984 and 1990 when 38% and 75% of the population, respectively, had poor vigor. Browse use on bitterbrush has been moderate-heavy and heavy.

Herbaceous Understory

The herbaceous understory is dominated by cheatgrass (*Bromus tectorum*). Cheatgrass cover was 7% in 1996, 2% in 2001, and 20% in 2007. Japanese brome (*Bromus japonicus*) is also present, but not abundant. These annual species are likely to be limiting the establishment of sagebrush seedlings, as well as perennial herbaceous plants. Perennial grass cover was 7% in 1996 and 9% in both 2001 and 2007. Dominant perennial species include bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*).

Perennial forb cover was less than 1% in 1996, 4% in 2002, and 1% in 2007, and between seven and 10 perennial species have been sampled. Since 2001, silky milkvetch (*Astragalus cibarius*) has been the most abundant perennial species. Several small annual forbs are abundant and include slenderleaf collomia (*Collomia linearis*), blue-eyed Mary (*Collinsia parviflora*), owlclover (*Orthocarpus* sp.), and pale alyssum (*Alyssum alyssoides*).

1990 TREND ASSESSMENT

The browse trend is slightly down. The density of sagebrush changed little, decreasing 4%. Few seedlings were sampled, but young plants increased from 5% of the population to 14%. Decadence increased from 33% of the population to 57%. Plants with poor vigor increased from 12% of the population to 30%, and 14% of the population was classified as dying. Browse use on sagebrush shifted from moderate-heavy to light-moderate, and heavily browsed plants decreased from 36% of the population to 19%. The bitterbrush population density decreased 39%. Young plants increased from 0% of the population to 12%, but the remainder of the population was decadent. Bitterbrush plants with poor vigor increased from 38% of the population to 75%. Browse use shifted from heavy to moderate-heavy, and heavily browsed plants decreased from 92% of the population to 63%. The grass trend is up. The sum of nested frequency of perennial grasses increased 71%. There were significant increases in the nested frequencies of bluebunch wheatgrass and Sandberg bluegrass, and a significant decrease in that of thickspike wheatgrass (*Agropyron dasystachyum*). The forb trend is stable. Although the sum of nested frequency of perennial forbs increased 31%, they continued to have a low abundance.

browse - slightly down (-1)

grass - up (+2)

forb - stable (0)

1996 TREND ASSESSMENT

The browse trend is slightly up. The density of sagebrush decreased 32%. However, it is likely that much of this decrease resulted from the larger area that was sampled beginning in 1996. Thus, trend was determined from other parameters. Few seedling plants were sampled, and young plants decreased to 3% of the population. The density of mature plants nearly doubled, increasing from 29% of the population to 77%. Decadence decreased to 20% of the population. Dead plants were sampled for the first time and had a density of 920 plants/acre (2,277 plants/ha). Plants with poor vigor decreased to 3% of the population, and only 5% had been heavily browsed. The average crown width increased 24 inches (61 cm). Although there are fewer sagebrush plants, the population now consists of healthier and larger plants. The bitterbrush population decreased 66%. There were no seedling or young bitterbrush sampled, but decadence decreased to 11% of the population. Dead bitterbrush were sampled at a density of 100 plants/acre (248 plants/ha). However, all of the living plants had good vigor, even though 67% of the population had been heavily browsed. The grass trend is slightly down. The sum of nested frequency of perennial grasses decreased 11%. There were significant decreases in the nested frequencies of thickspike wheatgrass and Sandberg bluegrass, and a significant increase in that of bluebunch wheatgrass. Cheatgrass was sampled in 84% of the quadrats. The forb trend is slightly down. The sum of nested frequency of perennial forbs decreased 59%. This decrease was moderated by the already low abundance of perennial forbs. There was a significant decrease in the nested frequency of longleaf phlox (*Phlox longifolia*). The Desirable Components Index (DCI) score was poor-fair because of high browse

cover, low browse recruitment, high annual grass cover, and low perennial forb cover.

winter range condition (DCI) - poor-fair (49) Mid-level potential scale
browse - slightly up (+1) grass - slightly down (-1) forb - slightly down (-1)

2001 TREND ASSESSMENT

The browse trend is stable. The density of sagebrush increased 4%. No seedling plants were sampled, and young plants decreased to 2% of the population. Sagebrush decadence increased to 37% of the population, but dead plants decreased to 720 plants/acre (1,782 plants/ha). Plants with poor vigor increased to 22% of the population, and 9% of the population was classified as dying. Browse use remained light-moderate. The density of bitterbrush increased 33%. All of the sampled plants were mature and healthy, and dead plants decreased to 20 plants/acre (49 plants/ha). Heavily browsed plants decreased to 50% of the population. The grass trend is up. The sum of nested frequency of perennial grasses increased 23%, while that of annual grasses decreased 42%. There was a significant increase in the nested frequency of Sandberg bluegrass, and significant decreases in the nested frequencies of bluebunch wheatgrass and cheatgrass. Japanese brome was sampled for the first time, but only in one quadrat. The forb trend is up. The sum of nested frequency of perennial forbs increased more than seven-fold, and the number of perennial forb species sampled increased from seven to 10. There were significant increases in the nested frequencies of silvery lupine (*Lupinus argenteus*) and longleaf phlox. Silky milkvetch was sampled for the first time, and was the dominant perennial forb. The DCI score increased to fair because annual grass cover decreased and perennial grass and forb cover increased.

winter range condition (DCI) - fair (60) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - up (+2)

2007 TREND ASSESSMENT

The browse trend is down. The density of sagebrush decreased 32%. Few seedlings were sampled and young sagebrush decreased to 1% of the population. Decadence increased to 50% of the population, and the density of dead plants increased to 1,380 plants/acre (3,416 plants/ha). Plants with poor vigor increased to 34% of the population, and all of those plants were classified as dying. Browse use remained light-moderate. The bitterbrush density decreased 17%. No seedling or young bitterbrush were sampled, and decadence increased to 40% of the population. Dead plants increased to a density of 40 plants/acre (99 plants/ha). Plants with poor vigor increased from 0% of the population to 10%, all of which were classified as dying. Browse use shifted to heavy, and 80% of the population had been heavily browsed. The grass trend is down. The sum of nested frequency of perennial grasses decreased 16%, while that of annual grasses increased more than two-fold. There was a significant decrease in the nested frequency of bottlebrush squirreltail (*Sitanion hystrix*) and a significant increase in the nested frequency of cheatgrass. Cheatgrass quadrat frequency increased from 62% to 94%, and cover increased from 2% to 20%. The forb trend is down. The sum of nested frequency of perennial forbs decreased 78%. There were significant decreases in the nested frequencies of silky milkvetch and silvery lupine. The DCI score decreased to very poor due to decreased browse cover, increased decadence, increased annual grass cover, and decreased perennial forb cover.

winter range condition (DCI) - very poor (26) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 17 , Study no: 68

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'07	'96	'01	'07
G	Agropyron cristatum	a8	a13	a10	a19	a20	.68	.48	.63
G	Agropyron dasystachyum	87	34	3	11	17	.00	.08	.26
G	Agropyron spicatum	a25	b79	c124	ab87	ab75	2.71	2.32	3.08
G	Bromus japonicus (a)	-	-	-	a3	a11	-	.00	.02
G	Bromus tectorum (a)	-	-	b276	a157	c330	7.47	1.51	19.54
G	Elymus cinereus	-	-	a7	a-	a3	.03	.00	.03
G	Poa secunda	a38	c141	b84	c169	c146	2.37	5.51	4.55
G	Sitanion hystrix	a13	ab25	b33	b36	a11	.92	.60	.10
Total for Annual Grasses		0	0	276	160	341	7.47	1.51	19.56
Total for Perennial Grasses		171	292	261	322	272	6.72	9.02	8.67
Total for Grasses		171	292	537	482	613	14.19	10.53	28.24
F	Agoseris glauca	-	a9	a2	-	a1	.01	-	.00
F	Allium acuminatum	3	-	-	-	-	-	-	-
F	Alyssum alyssoides (a)	-	-	a18	a20	b163	.04	.07	2.15
F	Allium sp.	-	-	-	a2	a3	-	.00	.00
F	Arabis sp.	-	a1	-	a6	a4	-	.03	.03
F	Astragalus cibarius	-	-	-	b113	a17	-	3.39	.25
F	Astragalus convallarius	a8	a6	a3	a10	a1	.00	.04	.03
F	Astragalus sp.	a2	-	a5	-	-	.01	-	-
F	Calochortus nuttallii	1	-	-	-	-	-	-	-
F	Collomia linearis (a)	-	-	a18	b76	a36	.09	.40	.07
F	Collinsia parviflora (a)	-	-	a15	b103	b81	.02	1.18	.31
F	Crepis acuminata	ab8	b13	ab7	ab6	a2	.06	.06	.15
F	Descurainia pinnata (a)	-	-	-	-	10	-	-	.03
F	Draba sp. (a)	-	-	-	a2	a1	-	.03	.00
F	Epilobium brachycarpum (a)	-	-	1	-	-	.00	-	-
F	Erigeron pumilus	a7	a3	-	-	-	-	-	-
F	Gayophytum ramosissimum(a)	-	-	-	4	-	-	.03	-
F	Holosteum umbellatum (a)	-	-	-	b11	a3	-	.08	.00
F	Lappula occidentalis (a)	-	-	-	-	4	-	-	.01
F	Lomatium triternatum	-	-	a3	a1	-	.00	.00	-
F	Lupinus argenteus	-	-	a2	b19	a1	.15	.14	.03
F	Microsteris gracilis (a)	-	-	-	a13	a11	-	.03	.02
F	Orthocarpus sp. (a)	-	-	a4	b36	-	.08	.42	-
F	Phlox longifolia	-	b23	a2	b23	ab6	.00	.07	.09

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'07	'96	'01	'07
F	Ranunculus testiculatus (a)	-	-	-	1	-	-	.00	-
F	Senecio integerrimus	-	-	-	2	-	-	.03	-
F	Taraxacum officinale	-	-	-	1	-	-	.03	-
F	Unknown forb-perennial	16	-	-	-	-	-	-	-
F	Vicia americana	-	_a 4	-	-	_a 6	-	-	.03
Total for Annual Forbs		0	0	56	266	309	0.23	2.26	2.61
Total for Perennial Forbs		45	59	24	183	41	0.25	3.81	0.64
Total for Forbs		45	59	80	449	350	0.50	6.08	3.25

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

BROWSE TRENDS --

Management unit 17 , Study no: 68

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'07	'96	'01	'07
B	Amelanchier alnifolia	0	1	0	-	.00	-
B	Artemisia tridentata vaseyana	94	92	81	32.32	31.06	16.57
B	Chrysothamnus viscidiflorus viscidiflorus	1	1	0	.00	.03	-
B	Opuntia sp.	5	3	5	.03	.03	.03
B	Purshia tridentata	9	9	10	1.14	1.87	.50
Total for Browse		109	106	96	33.51	33.00	17.11

CANOPY COVER, LINE INTERCEPT --

Management unit 17 , Study no: 68

Species	Percent Cover	
	'01	'07
Artemisia tridentata vaseyana	-	27.41
Opuntia sp.	-	.05
Purshia tridentata	-	2.38

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17 , Study no: 68

Species	Average leader growth (in)
	'07
Artemisia tridentata vaseyana	1.5

BASIC COVER --

Management unit 17 , Study no: 68

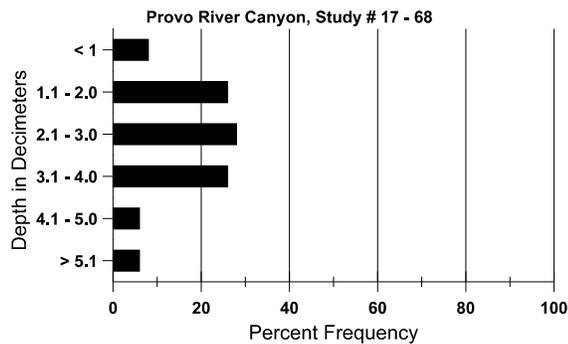
Cover Type	Average Cover %				
	'84	'90	'96	'01	'07
Vegetation	2.00	6.50	50.12	50.18	58.12
Rock	.25	1.25	1.44	1.78	1.41
Pavement	1.75	3.75	.66	1.12	1.40
Litter	69.50	66.25	58.95	50.43	45.04
Cryptogams	13.25	14.00	4.69	7.43	1.22
Bare Ground	13.25	8.25	7.22	18.03	9.65

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 68, Provo River Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
14.7	55.6 (15.6)	6.6	41.8	27.4	30.7	3.6	23.2	275.2	0.4

Stoniness Index



PELLET GROUP DATA --

Management unit 17 , Study no: 68

Type	Quadrat Frequency		
	'96	'01	'07
Rabbit	9	31	38
Elk	2	-	-
Deer	30	26	27
Cattle	-	-	5

Days use per acre (ha)	
'01	'07
-	-
3 (7)	5 (13)
35 (86)	30 (74)
1 (3)	11 (27)

BROWSE CHARACTERISTICS --
Management unit 17 , Study no: 68

		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	0	-	-	-	-	-	0	0	-	-	0	-/-
01	0	20	-	-	-	-	0	0	-	-	0	-/-
07	0	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata vaseyana												
84	6332	200	333	3933	2066	-	40	36	33	-	12	33/28
90	6065	66	866	1733	3466	-	45	19	57	4	30	30/27
96	4120	20	120	3160	840	920	37	5	20	3	3	34/51
01	4280	-	80	2600	1600	720	32	7	37	9	22	36/43
07	2920	20	40	1420	1460	1380	33	11	50	34	34	37/46
Chrysothamnus viscidiflorus viscidiflorus												
84	332	-	66	133	133	-	0	0	40	-	0	11/10
90	266	-	-	200	66	-	0	0	25	-	50	12/14
96	20	-	20	-	-	-	0	0	0	-	0	-/-
01	20	-	-	20	-	-	0	0	0	-	0	-/-
07	0	-	-	-	-	-	0	0	0	-	0	10/13
Opuntia sp.												
84	66	-	-	66	-	-	0	0	-	-	0	6/21
90	133	-	-	133	-	-	0	0	-	-	0	6/7
96	200	-	-	200	-	40	10	0	-	-	0	6/22
01	60	-	-	60	-	-	0	0	-	-	0	5/18
07	120	-	20	100	-	20	0	0	-	-	0	5/9
Purshia tridentata												
84	866	-	-	200	666	-	0	92	77	-	38	33/34
90	532	-	66	-	466	-	25	63	88	23	75	-/-
96	180	-	-	160	20	100	11	67	11	-	0	25/47
01	240	-	-	240	-	20	33	50	0	-	0	29/42
07	200	-	-	120	80	40	10	80	40	10	10	28/35