

Trend Study 16A-3-07

Study site name: Santaquin Hill .

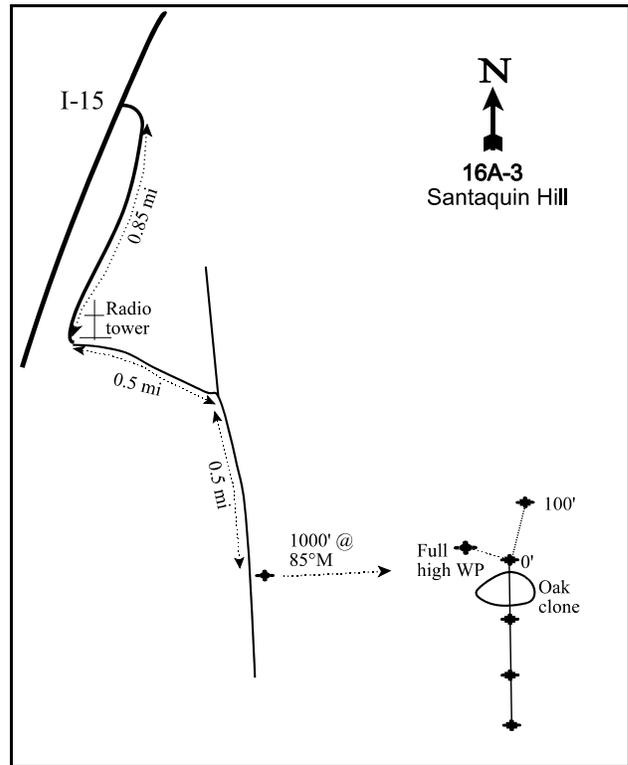
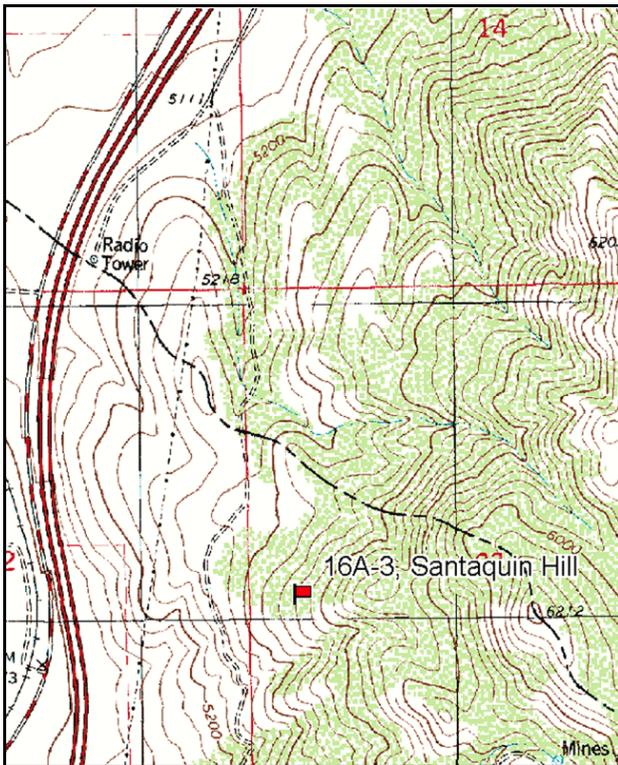
Vegetation type: Mixed Oak-Sage .

Compass bearing: frequency baseline 350 degrees magnetic (lines 2-4 @ 143°M).

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

LOCATION DESCRIPTION

From the south Santaquin exit on I-15, proceed easterly under the overpass and then southerly onto the frontage road for 0.85 miles to the radio tower. Proceed over the ridge to the east of the radio tower on a faint road for 0.5 miles to an intersection with a dirt road. Proceed south for 0.5 miles to a half high witness post on the east side of the road. From the witness post, walk 1,000 feet at 85 degrees magnetic up the ridge to a full high witness post. The 0-foot baseline stake is 20 feet south of the witness post. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, #3967, is attached to the 0-foot baseline stake.



Map Name: Santaquin

Diagrammatic Sketch

Township 10S , Range 1E , Section 22

GPS: NAD 83, UTM 12S 431422 E 4420247 N

DISCUSSION

Santaquin Hill - Trend Study No. 16A-3

Study Information

This study is located on critical deer and elk winter range on UDWR property. It is close to the boundary between Juab and Utah Counties near the top of Santaquin Hill [elevation: 5,500 feet (1,676 m), slope: 25%, aspect: west]. The plant community is a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) grassland with interspersed Gambel oak (*Quercus gambelii*). Considerable evidence of deer and elk use in the form of pellet groups, antler drops, and forage use was apparent in 1983. Pellet group data from 1997, 2002, and 2007 estimated increasing deer use with quadrat frequencies of 22%, 33%, and 52%, respectively. Transect data estimated 112 deer days use/acre (276 ddu/ha) in 2002 and 139 deer days use/acre (342 ddu/ha) in 2007. Several deer were observed as the site was read in 2007. Most pellets were from the winter, but some were noted from spring and fall use.

Soil

The soil is classified within the Reebok series (USDA-NRCS 2007). The soils in this series are shallow and well-drained. They formed in alluvium and colluvium weathered from latite, andesite and rhyolite, quartzite, and limestone. The soil texture is a clay loam with a neutral pH (6.8). There is also a thick lime hardpan beginning approximately 13 inches (33 cm) below the surface. Protective ground cover appeared adequate to prevent serious erosion. The erosion condition classification was determined to be stable in 2002 and 2007.

Browse

The browse component consists mainly of mountain big sagebrush and Gambel oak. Sagebrush accounts for the majority of the shrub cover. Density has been relatively stable since 1983 between 2,732 plants/acre (6,748 plants/ha) and 3,199 plants/acre (7,902 plants/ha), and the population has consisted of mostly mature and decadent plants. Approximately 25% of the population was classified as dying in 2002 and 2007, and 26% of the population displayed poor vigor. Use was mostly light-moderate until 2002 and 2007, when the majority of the plants showed moderate-heavy use. Annual leader growth averaged 1.7 inches (4.3 cm) in 2002 and 2.2 inches (5.6 cm) in 2007.

Oak has provided between 35% and 42% of the total browse cover since 1997. The density increased from 3,140 plants/acre (7,759 plants/ha) in 1997 to 6,860 plants/acre (16,951 plants/ha) in 2002, then decreased to 5,020 plants/acre (12,404 plants/ha) by 2007. The population is mostly mature, with low decadence. Young recruitment has fluctuated between 2% and 90% of the population since 1983. Less than 10% of the population has shown poor vigor since 1983. Use was mostly moderate-heavy in 1997, but has decreased to mostly light in 2002 and 2007. The oak plants are low-growing, averaging 27 to 34 inches (69 to 86 cm) in height.

Herbaceous Understory

The herbaceous understory is relatively depleted. Bluebunch wheatgrass (*Agropyron spicatum*) provides approximately 10% cover and the majority of the total grass cover, but cheatgrass (*Bromus tectorum*) has steadily increased from 1% to 5% cover since 1997. Forb cover has also increased since 1997. The forb species composition is diverse. Annual forbs provided 86%-92% of the total forb cover from 1997 to 2007. Pale alyssum (*Alyssum alyssoides*) is the dominant forb, and comprised 64% to 84% of the total forb cover between 1997 and 2007. Field bindweed (*Convolvulus arvensis*), a noxious weed, was sampled in one quadrat in 2007.

1989 TREND ASSESSMENT

The trend for browse is slightly down. Sagebrush density decreased from 3,199 plants/acre (7,902 plants/ha) to 2,732 plants/acre (6,748 plants/ha). Decadence increased from 25% to 63% of the population. Recruitment

was low, with young plants comprising only 5% of the population. Twenty percent of the plants sampled displayed poor vigor, and use decreased from mostly moderate to mostly light. The trend for grass is up. The sum of nested frequency for perennial grasses increased 54%. Bluebunch wheatgrass and Sandberg wheatgrass (*Poa secunda*) both increased significantly in nested frequency. The trend for forbs is up. The sum of nested frequency for forbs increased two-fold.

browse - slightly down (-1) grass - up (+2) forb - up (+2)

1997 TREND ASSESSMENT

The trend for browse is stable. The density of sagebrush changed little, and decadence declined from 63% to 27%. Recruitment increased from 5% to 19% of the population. Use was mostly light-moderate, and 12% of the plants showed heavy use. Plants displaying poor vigor remained stable at approximately 20% of the population. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased by 18%. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. The Desirable Components Index (DCI) was rated as fair-good due to an adequate browse population with high recruitment, good perennial grass cover, and low perennial forb cover.

winter range condition (DCI) - fair-good (66) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

2002 TREND ASSESSMENT

The trend for browse is stable. Sagebrush density increased very slightly, from 2,780 plants/acre (6,869 plants/ha) to 2,940 plants/acre (7,264 plants/ha). However, recruitment was low, with only 5% of the population consisting of young plants, and seedlings were rare. Plants classified as decadent and dying increased to 39% and 26% of the population, respectively. Approximately one-third of the population displayed light use, one-third showed moderate use, and one-third was browsed heavily. The trend for grass is stable. The sum of nested frequency for perennial grasses did not change. However, the frequency of annual grasses decreased by approximately 50%. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs decreased, but total forb cover did not change. Annual species remained dominant. The DCI rating decreased to poor due to increased browse decadence, decreased recruitment of preferred browse, and a decrease in perennial forb cover.

winter range condition (DCI) - poor (48) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - slightly down (-1)

2007 TREND ASSESSMENT

The trend for browse remains stable. Sagebrush density decreased very slightly to 2,820 plants/acre (6,968 plants/ha), but cover increased from 9% to 12%. Recruitment remained low, while decadence increased slightly to 43% of the population. Plants classified as dying remained stable at 24% of the population. Plants displaying poor vigor remained stable at 26% of the population, and use was mostly heavy. The trend for grass is stable. The sum of nested frequency for perennial grasses did not change. However, cheatgrass increased significantly in nested frequency, and its cover increased from 2% to 5%. The trend for forbs is stable. Forb cover increased from 4% to 11%, however this increase is largely attributed to annual species. Several annual forbs increased significantly in nested frequency. These species included pale alyssum, blue-eyed Mary (*Collinsia parviflora*), bedstraw (*Galium aparine*), and slender phlox (*Microsteris gracilis*). Additionally, bindweed, a noxious weed, was sampled in one quadrat. The DCI increased only slightly to a poor-fair rating due to an increase in preferred browse cover, despite an increase in annual grass cover and the presence of a noxious weed.

winter range condition (DCI) - poor-fair (51) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

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

T y p e	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
G	<i>Agropyron spicatum</i>	_a 181	_b 246	_b 230	_b 253	_b 235	10.56	10.89	8.18
G	<i>Bromus japonicus</i> (a)	-	-	_b 129	-	_a 6	1.89	-	.04
G	<i>Bromus tectorum</i> (a)	-	-	_a 117	_a 125	_b 187	.76	1.83	5.26
G	<i>Poa pratensis</i>	_a 8	_a 7	-	_a 3	-	-	.03	-
G	<i>Poa secunda</i>	_a 74	_b 153	_a 102	_a 85	_a 101	.85	.50	.87
Total for Annual Grasses		0	0	246	125	193	2.66	1.83	5.30
Total for Perennial Grasses		263	406	332	341	336	11.42	11.42	9.04
Total for Grasses		263	406	578	466	529	14.09	13.26	14.35
F	<i>Alyssum alyssoides</i> (a)	-	-	_a 293	_a 302	_b 349	2.36	3.38	9.56
F	<i>Antennaria rosea</i>	-	-	_a 1	_a 2	-	.00	.00	-
F	<i>Arabis</i> sp.	_a 2	_a 10	_a 7	-	-	.02	-	-
F	<i>Astragalus beckwithii</i>	-	-	_a 2	_a 1	_a 10	.05	.00	.65
F	<i>Astragalus cibarius</i>	_a 11	_a 5	_a 11	-	-	.21	-	-
F	<i>Astragalus eurekaensis</i>	_a 1	_a 3	-	_a 2	_a -	-	.01	.00
F	<i>Castilleja linariaefolia</i>	-	-	_a -	_a 1	-	.00	.00	-
F	<i>Calochortus nuttallii</i>	_a 5	_a 23	_a 12	_a 18	_a 12	.03	.07	.03
F	<i>Chaenactis douglasii</i>	_a 6	_a 5	_a 7	-	-	.04	-	-
F	<i>Cirsium undulatum</i>	-	-	-	_a -	_a 5	-	.00	.06
F	<i>Convolvulus arvensis</i>	-	-	-	-	1	-	-	.00
F	<i>Comandra pallida</i>	-	-	-	4	-	-	.01	-
F	<i>Collinsia parviflora</i> (a)	-	-	_a 21	_a 17	_b 52	.05	.07	.17
F	<i>Crepis acuminata</i>	-	_a 2	_a 4	_a 2	-	.00	.00	-
F	<i>Draba</i> sp. (a)	-	-	3	-	-	.00	-	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	_a 36	_a 20	-	.08	.05	-
F	<i>Eriogonum brevicaule</i>	-	-	-	1	-	-	.00	-
F	<i>Erodium cicutarium</i> (a)	-	-	-	-	4	-	-	.00
F	<i>Erigeron pumilus</i>	-	-	1	-	-	.00	-	-
F	<i>Galium aparine</i> (a)	-	-	_a 43	_a 40	_b 70	.48	.14	.34
F	<i>Helianthus annuus</i> (a)	-	-	3	-	-	.00	-	-
F	<i>Holosteum umbellatum</i> (a)	-	-	_a 5	_a 7	-	.01	.01	-
F	<i>Lactuca serriola</i>	-	-	_a 9	_a 1	_a 8	.02	.00	.01
F	<i>Microsteris gracilis</i> (a)	-	-	_a 30	_a 27	_b 58	.06	.07	.12
F	<i>Petradoria pumila</i>	-	-	_a 1	_a 3	_a -	.03	.15	.15
F	<i>Phlox longifolia</i>	_a 8	_b 30	_{ab} 28	_{ab} 24	_{ab} 22	.05	.05	.08
F	<i>Ranunculus testiculatus</i> (a)	-	-	_a 50	_a 67	_a 61	.13	.25	.14

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
F	<i>Streptanthus cordatus</i>	_a 1	_a 3	-	-	-	-	-	-
F	<i>Taraxacum officinale</i>	-	-	-	1	-	-	.00	-
F	<i>Tragopogon dubius</i>	_a 8	-	_a 2	_a 5	_a 2	.03	.01	.03
Total for Annual Forbs		0	0	484	480	594	3.19	4.00	10.36
Total for Perennial Forbs		42	81	85	65	60	0.52	0.35	1.04
Total for Forbs		42	81	569	545	654	3.71	4.35	11.40

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

BROWSE TRENDS --

Management unit 16A, Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	<i>Artemisia tridentata vaseyana</i>	70	72	70	10.42	8.92	11.68
B	<i>Chrysothamnus nauseosus albicaulis</i>	7	3	4	.66	.16	.78
B	<i>Gutierrezia sarothrae</i>	23	10	7	.81	.03	-
B	<i>Quercus gambelii</i>	30	33	35	8.67	4.98	6.70
Total for Browse		130	118	116	20.58	14.10	19.16

CANOPY COVER, LINE INTERCEPT --

Management unit 16A, Study no: 3

Species	Percent Cover	
	'02	'07
<i>Artemisia tridentata vaseyana</i>	-	12.94
<i>Chrysothamnus nauseosus albicaulis</i>	-	1.20
<i>Quercus gambelii</i>	-	8.46

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 16A, Study no: 3

Species	Average leader growth (in)	
	'02	'07
<i>Artemisia tridentata vaseyana</i>	1.7	2.2

BASIC COVER --

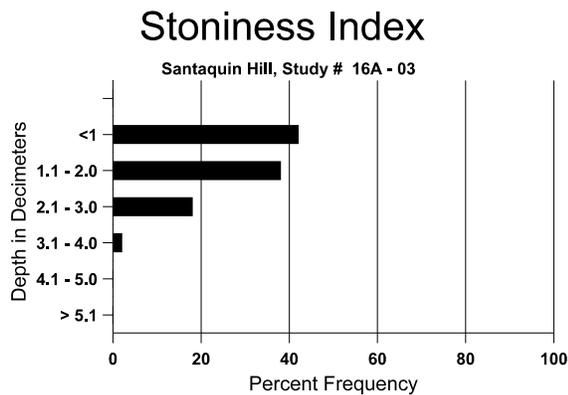
Management unit 16A, Study no: 3

Cover Type	Average Cover %				
	'83	'89	'97	'02	'07
Vegetation	0	7.50	35.97	33.26	43.40
Rock	17.00	15.00	23.06	25.70	25.57
Pavement	4.00	14.00	3.11	4.19	2.93
Litter	61.50	55.25	47.94	47.63	38.72
Cryptogams	0	1.25	.57	.31	.37
Bare Ground	17.50	7.00	7.12	5.78	7.44

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 03, Santaquin Hill

Effective rooting depth (in)	Temp °F (depth)	pH	Clay loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
15.3	54.8 (16.0)	6.8	40.4	29.1	30.6	3.2	16.3	204.8	.6



PELLET GROUP DATA --

Management unit 16A, Study no: 3

Type	Quadrat Frequency		
	'97	'02	'07
Rabbit	11	15	21
Elk	2	2	1
Deer	20	33	52

Days use per acre (ha)	
'02	'07
-	-
-	-
112 (276)	139 (342)

BROWSE CHARACTERISTICS --
Management unit 16A, 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)
<i>Artemisia tridentata vaseyana</i>												
83	3199	-	133	2266	800	-	71	10	25	-	0	18/21
89	2732	-	133	866	1733	-	20	0	63	5	20	17/22
97	2780	100	520	1500	760	1140	43	12	27	19	19	17/25
02	2940	20	160	1620	1160	1700	38	28	39	26	26	20/31
07	2820	20	120	1500	1200	1420	29	45	43	24	26	26/35
<i>Chrysothamnus nauseosus albicaulis</i>												
83	0	-	-	-	-	-	0	0	0	-	0	-/-
89	0	-	-	-	-	-	0	0	0	-	0	-/-
97	140	-	-	140	-	-	14	14	0	-	0	27/35
02	80	-	-	60	20	60	0	0	25	25	25	29/47
07	80	-	-	-	80	-	0	25	100	75	75	29/42
<i>Gutierrezia sarothrae</i>												
83	533	-	-	533	-	-	0	0	0	-	0	16/10
89	2666	-	800	1600	266	-	0	0	10	-	0	9/12
97	740	20	60	660	20	-	0	0	3	-	0	8/7
02	260	-	20	200	40	240	0	0	15	15	15	6/7
07	160	20	60	100	-	20	0	0	0	-	13	9/12
<i>Quercus gambelii</i>												
83	7132	733	1866	5000	266	-	85	0	4	-	0	27/18
89	9332	1266	8400	866	66	-	23	0	1	-	0	33/21
97	3140	100	840	2220	80	80	26	43	3	.63	.63	30/29
02	6860	-	160	6700	-	140	.58	16	0	-	8	32/20
07	5020	100	2200	2540	280	600	7	0	6	2	2	34/28