

Trend Study 16A-2-07

Study site name: Santaquin Bench.

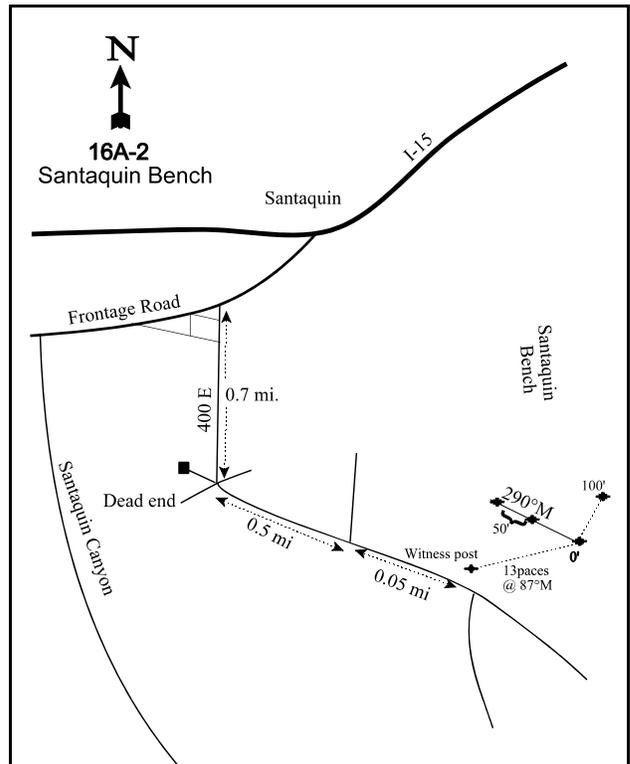
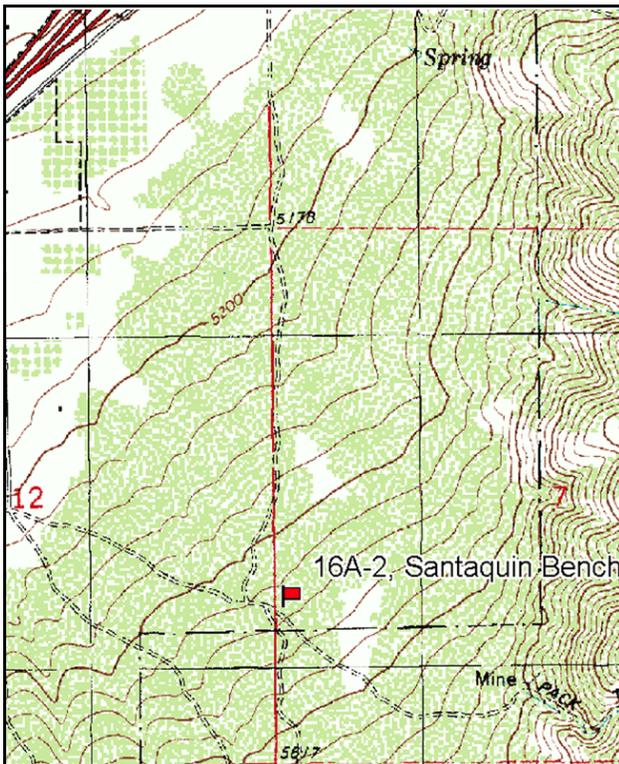
Vegetation type: Mixed Oak-Sage.

Compass bearing: frequency baseline 28 degrees magnetic (lines 2-3 @ 290°M).

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

LOCATION DESCRIPTION

From the I-15 interchange on the east side of Santaquin, proceed southwest on the frontage road (Highland Drive) for a short distance to where there are several forks. Turn left on 400 East which turns due south and passes through some orchards and home sites. Travel 0.7 miles to where the road forks at the end of a maintained road. Turn immediately to the left (east) and travel 0.50 miles to a fork in the road. Stop just beyond the fork at the witness post on the left. The 0-foot baseline stake is located 13 paces from the witness post at an azimuth of 87°M. The study markers are green steel fenceposts approximately 12 to 18 inches in height. The 0-foot baseline stake is marked by browse tag #3929. The last baseline is only 50 feet long.



Map Name: Santaquin

Diagrammatic Sketch

Township 10S, Range 2E, Section 7

GPS: NAD 83, UTM 12S 434518 E 4423386 N

DISCUSSION

Santaquin Bench - Trend Study No. 16A-2

Study Information

This study is located on deer and elk winter range on the Santaquin Bench within the Uinta National Forest [elevation: 5,480 feet (1,670 m), slope: 7%, aspect: northwest]. The entire area burned in 2001 as part of the Molly fire. Prior to 2001, the dominant overstory consisted of Gambel oak (*Quercus gambelii*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), with scattered Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*), antelope bitterbrush (*Purshia tridentata*), and Utah juniper (*Juniperus osteosperma*). Deer and elk pellet groups were common in 1983, but few were found in 1997 and 2002. A pellet group transect read in 2002 estimated only 1 deer day use/acre (3 ddu/ha). Use increased in 2007 to 9 deer days use/acre (22 ddu/ha) and 17 elk days use/acre (41 edu/ha).

Soil

The soil is classified within the Dry Creek series (USDA-NRCS 2007). The soils in this series formed in alluvium and colluvium from sedimentary rocks, and are deep and well-drained. The soil texture is a cobbly loam in the surface horizons and is slightly acidic (pH 6.0). Prior to 2001, the soil surface was well-protected by abundant litter under the oak clones and by grass and litter cover in the openings. Relative bare ground cover increased from 2% in 1997 to 50% in 2002 following the fire, but decreased to 3% by 2007. The soil erosion condition was classified as stable in 2002 and 2007.

Browse

Before the study burned, the preferred browse species was sagebrush, although Gambel oak accounted for half of the shrub cover. The oak formed relatively dense clumps of variable height, and some of the forage was physically unavailable due to height and/or density. The age structure was indicative of an expanding population with many young plants, especially near the edges of the clones. Vigor had been depressed in the past due to worm infestations, which severely defoliated the oak. Forty-one percent of the oak sampled in 1997 was impacted by these insects. All of the oak was burned in the 2001 fire. Burned stems were left standing with abundant young shoots sprouting. Density of resprouting oak was estimated at 7,960 stems/acre (19,669 stems/ha) in 2002 and 13,560 stems/acre (33,506 stems/ha) in 2007. The population was mostly mature in 2007 with good vigor, although the plants were noted to have a substantial amount of galls. Use has been light throughout the study.

The mountain big sagebrush population occupied the oak interspaces. Between 1983 and 1989, sagebrush density declined from 1,266 plants/acre (3,127 plants/ha) to 799 plants/acre (1,974 plants/ha). Decadence increased from 26% to 42% of the population, and reproduction and recruitment were limited. Use remained mostly light during these years, so the decline was most likely due to oak competition combined with drought in 1989 (Utah Climate Summaries 2007). When the study area was lengthened in 1997, the extended baseline was placed in more open areas to better sample the sagebrush population. As a result, density estimates were significantly larger compared to previous years. In 1997, sagebrush accounted for 47% of the shrub cover with a density of 2,540 plants/acre (6,276 plants/ha). Seventy-four percent of the population was mature, and decadence was relatively low at 16%. The fire in 2001 eliminated all of the sagebrush plants. Only one seedling was sampled in 2002. In 2007, sagebrush density was estimated at 80 plants/acre (198 plants/ha), and all of the sampled plants were mature. Vigor was good and 75% of these plants exhibited heavy use.

Herbaceous Understory

In 1997, total grass cover was nearly 20%. Abundance and composition varied greatly between the oakbrush and sagebrush dominated openings. Under the oak canopy, Kentucky bluegrass (*Poa pratensis*) was the most abundant herbaceous plant. In contrast, bluebunch wheatgrass (*Agropyron spicatum*) and Sandberg bluegrass (*Poa secunda*) were dominant under sagebrush. Annual grasses accounted for only 2% of the herbaceous

understory. After the fire, grass cover decreased to 5% in 2002, then increased to 34% in 2007 after a seeding treatment. Four perennial grasses that were not present before the fire were sampled in 2007, including intermediate wheatgrass (*Agropyron intermedium*), smooth brome (*Bromus inermis*), and Great Basin wildrye (*Elymus cinereus*), which were seeded. In 2007, bulbous bluegrass (*Poa bulbosa*) provided the majority of the grass cover, followed by intermediate wheatgrass and bluebunch wheatgrass. Cheatgrass (*Bromus tectorum*) provided 2% cover in 2007. Jointed goatgrass (*Aegilops cylindrica*), a noxious weed, was also sampled in 2007.

Forbs provided 16% cover in 1997. Bedstraw (*Galium aparine*) and Bonneville pea (*Lathyrus brachycalyx*) provided the majority of the forb cover. In 2002, total forb cover decreased to 10%, although the number of species sampled remained stable. Forbs increased to 13% cover by 2007, with bedstraw and Bonneville pea continuing to be the dominant species. Use of the herbaceous understory appeared light.

1989 TREND ASSESSMENT

The trend for browse is down. The sagebrush openings appeared to be becoming smaller and the plants on the edges were declining in vigor due to shading and competition. The density of oak increased from 4,866 plants/acre (12,024 plants/ha) to 11,799 plants/acre (29,155 plants/ha). Sagebrush density decreased from 1,266 plants/acre (3,128 plants/ha) to 799 plants/acre (1,974 plants/ha). Only mature and decadent plants were sampled, and decadence increased from 26% to 42% of the population. The plants appeared to be lightly hedged. The trend for grass is up. The sum of nested frequency for perennial grasses increased by 20%. Kentucky bluegrass, an increaser, increased significantly in nested frequency, while Sandberg bluegrass decreased significantly. The trend for forbs is up. The sum of nested frequency for perennial forbs doubled, due to a large increase in the nested frequency of Bonneville pea.

browse - down (-2)

grass - up (+2)

forb - up (+2)

1997 TREND ASSESSMENT

The trend for browse is slightly up. Sagebrush density increased from 799 plants/acre (1,974 plants/ha) to 2,540 plants/acre (6,274 plants/ha), but the increase in sampling area was likely responsible for this change. Decadence declined from 42% to 16% of the population, and 10% of the sampled plants were young. Vigor slightly improved and use increased to light-moderate. The trend for grass is stable. The sum of nested frequency for perennial grasses changed very little. Kentucky bluegrass continued to increase in nested frequency, while Sandberg bluegrass continued to decrease. The trend for forbs is up. The sum of nested frequency for perennial forbs increased 33%. Eight perennial species that were not present in 1989 were sampled in 1997. The Desirable Components Index (DCI) was rated as excellent due to favorable browse and perennial herbaceous cover, and low annual grass cover.

winter range condition (DCI) - excellent (88) Mid-level potential scale

browse - slightly up (+1)

grass - stable (0)

forb - up (+2)

2002 TREND ASSESSMENT

The trend for browse is down. The study burned in the summer of 2001, eliminating the sagebrush population and reducing the total browse cover from 23% to 3%. One seedling sagebrush plant was sampled in 2002. Oak resprouted at a density of 7,960 plants/acre (19,669 plants/ha), and the entire population was made up of young, vigorous plants. However, oak is less desirable for wintering big game than sagebrush. The trend for grass is down. The sum of nested frequency for perennial grasses decreased by 51%, with significant decreases in Kentucky bluegrass and bluebunch wheatgrass nested frequency. Total grass cover declined from 20% to 5%. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs decreased 19%. Total forb cover decreased from 16% to 10% and several species declined significantly in nested frequency. However, the majority of the species that were sampled in 1997 returned after the fire. The DCI was rated as very poor, due to the loss of preferred browse and herbaceous cover following the fire.

winter range condition (DCI) - very poor (22) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - slightly down (-1)

2007 TREND ASSESSMENT

The trend for browse is stable, although the sagebrush population did not recover from the fire as quickly as the less-preferred oak. Only 80 sagebrush plants/acre (198 plants/ha) were sampled in 2007, and all were mature and vigorous. Most of the plants displayed heavy use. Oak density continued to increase from 7,960 plants/acre (19,669 plants/ha) to 13,560 plants/acre (33,506 plants/ha). The population was largely mature, with no decadent plants sampled. The trend for grass is slightly up. Four perennial grass species were sampled for the first time, and there was a significant increase in the nested frequency of bluebunch wheatgrass. However, two undesirable species, cheatgrass and bulbous bluegrass, also increased significantly. Additionally, jointed goatgrass, a noxious weed, was sampled in two quadrats. Total grass cover increased from 5% to 34%. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Total forb cover increased from 10% to 13%, and the species composition remained similar to that before the fire. The DCI rating improved to good due to the resprouting of the oak population and the recovering understory of perennial grasses and forbs, despite increasing annual grass cover and the presence of a noxious weed.

winter range condition (DCI) - good (73) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 16A, Study no: 2

T y p e	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
G	Aegilops cylindrica (a)	-	-	-	-	7	-	-	.06
G	Agropyron intermedium	-	-	-	-	170	-	-	6.56
G	Agropyron spicatum	_{ab} 89	_{bc} 126	_c 136	_a 86	_{bc} 119	6.75	2.00	5.78
G	Bromus brizaeformis (a)	-	-	-	-	5	-	-	.01
G	Bromus inermis	-	-	-	-	28	-	-	.63
G	Bromus japonicus (a)	-	-	-	-	208	-	-	3.39
G	Bromus tectorum (a)	-	-	_a 50	_a 56	_b 162	.30	.23	2.32
G	Elymus cinereus	-	-	-	-	2	-	-	.15
G	Festuca myuros (a)	-	-	_a 3	_a 1	-	.00	.00	-
G	Poa bulbosa	-	-	_a 30	_a 21	_b 193	.96	.32	13.27
G	Poa fendleriana	-	-	_a 6	-	_a 1	.18	-	.00
G	Poa pratensis	_a 52	_b 124	_c 202	_a 71	_a 39	10.03	2.16	.95
G	Poa secunda	_c 167	_b 127	_a 63	_a 43	_a 43	1.23	.43	.90
G	Sitanion hystrix	_a 26	_a 24	-	-	-	-	-	-
G	Unknown grass - annual (a)	-	-	47	-	-	.39	-	-
Total for Annual Grasses		0	0	100	57	382	0.69	0.23	5.78
Total for Perennial Grasses		334	401	437	221	595	19.16	4.91	28.26
Total for Grasses		334	401	537	278	977	19.86	5.15	34.05

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
F	<i>Alyssum alyssoides</i> (a)	-	-	_a 46	_a 32	_b 147	.12	.09	.79
F	<i>Allium</i> sp.	_{ab} 22	_b 46	_c 81	_c 90	_a 12	.30	.30	.03
F	<i>Antennaria</i> sp.	-	_a 3	_a 2	_a 1	-	.00	.00	-
F	<i>Arabis</i> sp.	-	-	4	-	-	.01	-	-
F	<i>Astragalus cibarius</i>	-	-	-	-	10	-	-	.31
F	<i>Aster</i> sp.	-	-	4	-	-	.01	-	-
F	<i>Astragalus</i> sp.	-	-	_a 6	-	_a 3	.07	-	.00
F	<i>Cirsium</i> sp.	_a 1	_a 2	_a 8	_a 6	_a -	.23	.01	.15
F	<i>Collomia linearis</i> (a)	4	-	-	-	-	-	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	_a 103	_b 158	_a 84	.35	1.15	.26
F	<i>Cymopterus</i> sp.	_a 7	_a 5	_b 30	_a 5	_a 7	.12	.04	.04
F	<i>Descurainia pinnata</i> (a)	-	-	_a 3	_a 1	_a -	.00	.00	.00
F	<i>Draba</i> sp. (a)	-	-	_a 16	-	_b 30	.03	-	.10
F	<i>Epilobium brachycarpum</i> (a)	-	-	_c 84	_a 3	_b 38	.30	.01	.17
F	<i>Erodium cicutarium</i> (a)	-	-	-	-	5	-	-	.04
F	<i>Eriogonum racemosum</i>	_{ab} 15	_b 20	_a 6	_a 3	_{ab} 7	.01	.01	.10
F	<i>Eriogonum umbellatum</i>	_b 22	_a 2	_a 8	_a -	-	.04	-	-
F	<i>Galium aparine</i> (a)	-	-	_b 192	_a 87	_a 83	5.72	.89	3.71
F	<i>Geranium</i> sp.	-	-	2	-	-	.00	-	-
F	<i>Holosteum umbellatum</i> (a)	-	-	_a 7	_a 4	_b 134	.02	.01	.51
F	<i>Hymenoxys acaulis</i>	-	-	-	8	-	-	.45	-
F	<i>Hydrophyllum capitatum</i>	-	_a 1	-	-	_a 4	-	-	.03
F	<i>Lathyrus brachycalyx</i>	_a 43	_{cd} 157	_d 153	_{bc} 120	_b 104	7.55	6.11	3.86
F	<i>Lappula occidentalis</i> (a)	-	-	-	_a 2	_a 5	-	.03	.15
F	<i>Lactuca serriola</i>	-	-	_a 3	_a 1	_a 8	.00	.00	.02
F	<i>Medicago sativa</i>	-	-	-	-	2	-	-	.21
F	<i>Microsteris gracilis</i> (a)	-	-	_b 29	_a 6	_b 31	.11	.04	.09
F	<i>Montia perfoliata</i> (a)	-	-	-	-	40	-	-	1.22
F	<i>Phlox longifolia</i>	_a 9	_a 19	_a 25	_{ab} 25	_b 50	.13	.15	.24
F	<i>Polygonum douglasii</i> (a)	-	-	_a 18	_b 83	_a 36	.03	.31	.10
F	<i>Ranunculus testiculatus</i> (a)	-	-	_a 56	_a 38	_a 47	.19	.11	.10
F	<i>Sisymbrium altissimum</i> (a)	-	-	-	-	3	-	-	.00
F	<i>Solidago</i> sp.	-	-	-	13	-	-	.02	-
F	<i>Taraxacum officinale</i>	-	-	-	-	-	-	.00	-
F	<i>Tragopogon dubius</i>	-	_a 3	_a 12	_a 7	_b 39	.67	.04	.70
F	<i>Trifolium</i> sp.	-	-	-	1	1	-	.00	.03

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
F	Unknown forb-annual (a)	-	-	63	-	-	.31	-	-
F	Viola sp.	-	-	-	-	2	-	-	.00
F	Wyethia amplexicaulis	-	-	-	-	3	-	-	.03
F	Zigadenus paniculatus	_a 2	_a 4	_a 5	_a 3	_a 4	.06	.06	.03
Total for Annual Forbs		4	0	617	414	683	7.21	2.66	7.29
Total for Perennial Forbs		121	262	349	283	256	9.25	7.25	5.82
Total for Forbs		125	262	966	697	939	16.46	9.92	13.11

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

BROWSE TRENDS --

Management unit 16A, Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	Artemisia tridentata vaseyana	71	0	4	10.86	.01	-
B	Gutierrezia sarothrae	3	0	0	.56	-	-
B	Quercus gambelii	48	52	52	11.56	2.68	21.59
Total for Browse		122	52	56	22.99	2.69	21.59

CANOPY COVER, LINE INTERCEPT --

Management unit 16A, Study no: 2

Species	Percent Cover	
	'02	'07
Quercus gambelii	-	35.70

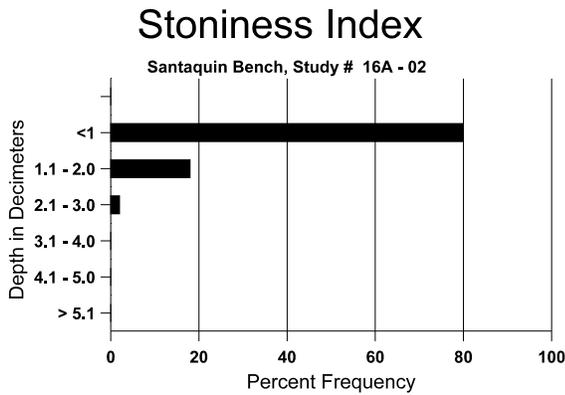
BASIC COVER --

Management unit 16A, Study no: 2

Cover Type	Average Cover %				
	'83	'89	'97	'02	'07
Vegetation	1.25	3.25	54.34	18.60	67.33
Rock	2.25	3.75	3.68	4.94	2.91
Pavement	.25	2.00	1.83	12.90	.81
Litter	91.75	81.75	67.93	19.62	49.53
Cryptogams	.25	2.25	.23	.03	.19
Bare Ground	4.25	7.00	2.00	55.59	3.16

SOIL ANALYSIS DATA --
Herd Unit 16A, Study no: 02, Santaquin Bench

Effective rooting depth (in)	Temp °F (depth)	pH	Loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
13.5	46.5 (16.7)	6.0	46.4	29.1	24.6	3.9	20.2	211.2	.7



PELLET GROUP DATA --
Management unit 16A, Study no: 2

Type	Quadrat Frequency		
	'97	'02	'07
Rabbit	-	-	11
Elk	1	1	2
Deer	7	2	3

Days use per acre (ha)	
'02	'07
-	-
-	17 (41)
1 (3)	9 (22)

BROWSE CHARACTERISTICS --
Management unit 16A, Study no: 2

		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	1266	-	133	800	333	-	26	5	26	-	21	21/21
89	799	66	-	466	333	-	8	0	42	17	17	22/28
97	2540	-	260	1880	400	860	28	4	16	11	11	27/39
02	0	20	-	-	-	320	0	0	0	-	0	-/-
07	80	-	-	80	-	-	0	75	0	-	0	12/14

		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												
83	0	-	-	-	-	-	0	0	0	-	0	-/-
89	133	-	-	133	-	-	0	0	0	-	0	7/9
97	80	-	20	40	20	-	0	0	25	25	25	9/12
02	0	-	-	-	-	-	0	0	0	-	0	-/-
07	0	-	-	-	-	-	0	0	0	-	0	-/-
Quercus gambelii												
83	4866	1866	1800	3000	66	-	3	0	1	-	1	66/39
89	11799	1466	8800	2666	333	-	0	0	3	.16	.56	120/39
97	5100	280	1660	3400	40	520	5	2	1	-	0	69/46
02	7960	-	7960	-	-	200	0	3	0	-	0	7/9
07	13560	340	800	12760	-	160	0	0	0	-	0	45/26