

Trend Study 17-24-07

Study site name: Heisetts Hollow .

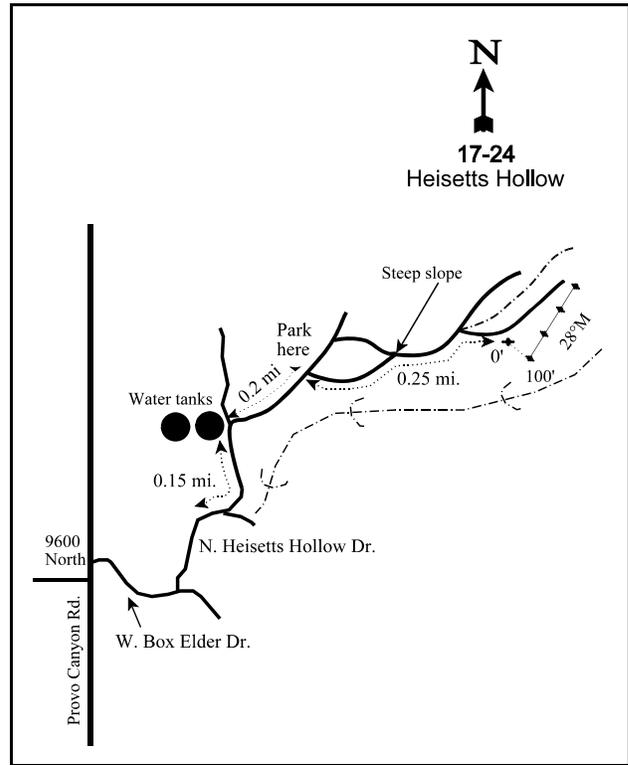
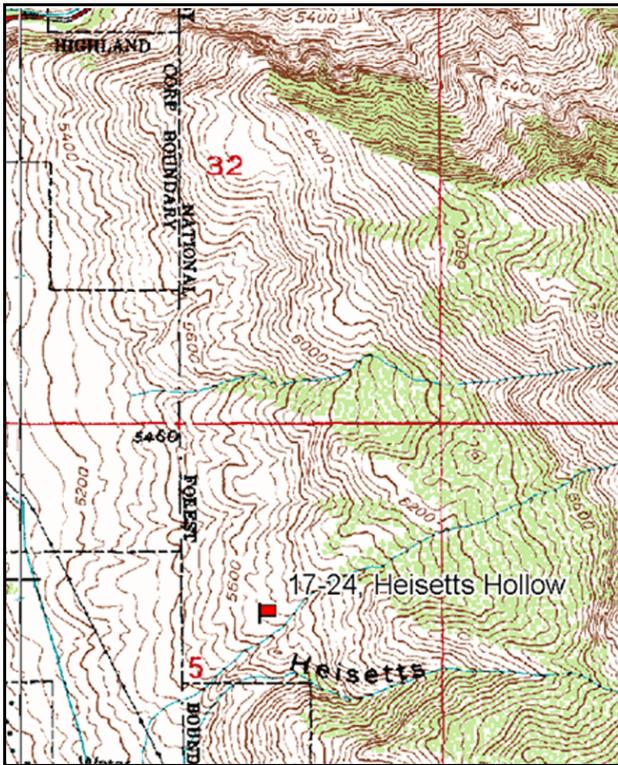
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 136 degrees magnetic (lines 2-4 @ 28°M).

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34ft), line 4 (71ft). Rebar: belt 1 on 18 ft., belt 3 on 2ft.

LOCATION DESCRIPTION

North of Pleasant Grove, turn east off Canyon Road (Rt 146) onto West Box Elder Drive. Take the next left onto North Heisetts Hollow Drive. Follow this road to a couple of large water tanks (about 0.15 miles). Continue 0.2 miles to a level parking area. There will be signs indicating that vehicle are not permitted beyond this point. From here, walk up the road 0.25 miles to the 0-foot baseline stake, staying to the right. You will pass numerous forks and trails, and a GPS unit will help you navigate to the study.



Map Name: Timpanogos Cave

Diagrammatic Sketch

Township 5S, Range 2E, Section 5

GPS: NAD 83, UTM 12T 437051 E 4474127 N

DISCUSSION

Heisetts Hollow - Trend Study No. 17-24

Study Information

This study is located on the upper Lake Bonneville terrace near the mouth of Heisetts Hollow and uphill from the Salt Lake Aqueduct [elevation: 5,600 feet (1,710 m), slope: 5-22%, aspect: southwest]. This entire area is critical deer winter range. An old browse transect is located in the immediate area. The nearest perennial source of water is Heisetts Hollow, and is approximately 550 feet (170 m) to the south. Deer and elk use have been both light and moderate. From the pellet group transect, there were an estimated 65 deer days use/acre (160 ddu/ha) in 2002 and 78 deer days use/acre (193 ddu/ha) in 2007. All of the deer pellet groups appeared to be from winter use. Elk use was estimated at 3 days use/acre (8 edu/ha) in 2002 and increased to 43 days use/acre (106 edu/ha) in 2007. There was also 1 bighorn sheep days use/acre (2 sdu/ha) in 2007.

Soil

The soil texture is a clay loam, and contains a moderate amount of rock in the profile. Phosphorous is low at only 5.7 ppm. Values less than 6 ppm may limit normal plant growth and development (Tiedemann and Lopez 2004). The steeper slopes are somewhat terraced and there are pedestals around plants. Some soil movement is evident on a foot trail located directly north of the site. There did not appear to be any significant erosion occurring recently; the erosion condition was classified as stable in 2002 and 2007.

Browse

The main key browse component is a sparse population of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Sagebrush canopy cover was less than 1% in 2002, and increased to 5% in 2007. The density increased from approximately 865 plants/acre (2,141 plants/ha) in 1983 and 1989 to 1,120 plants/acre (2,772 plants/ha) in 1997. The density decreased to 920 plants/acre (2,277 plants/ha) in 2002 and 640 plants/acre (1,585 plants/ha) in 2007. There have been few seedlings or young plants sampled in any year. Percent decadence has oscillated between increasing and decreasing in alternate sample years, and was lowest in 1983 (19%) and highest in 1989 (46%). Dead plants were not sampled in 1983 or 1989, but have averaged 247 plants/acre (610 plants/ha) since 1997. Plants exhibiting poor vigor decreased from 34% in 1983 to 4% in 1989, and then increased to 25% by 2007. Since 1989, the majority of the plants in poor vigor were classified as dying. The average annual leader growth was 1.9 inches (4.8 cm) in 2002 and 1.5 inches (3.8 cm) in 2007. Browse use on sagebrush has been moderate and heavy.

Other preferred browse occur in small numbers and include true mountain mahogany (*Cercocarpus ledifolius*), white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*), and Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Browse use on mahogany has been moderate-heavy. The few cliffrose on the site are tall and mostly unavailable to browsing.

Herbaceous Understory

Perennial grasses are the dominant herbaceous understory component. Perennial grasses provided 37% cover in 1997, 35% in 2002, and 30% in 2007. Bluebunch wheatgrass (*Agropyron spicatum*) and bulbous bluegrass (*Poa bulbosa*) are the most abundant species. Cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*) are present, but are a much smaller component of the understory. Bulbous bluegrass has a phenology similar to cheatgrass (Stewart and Hull 1949), and may be suppressing the growth of other perennial and annual species.

Forbs are relatively diverse but occur infrequently. The total forb cover has averaged less than 3% since 1997. The more common perennial species include northern sweetvetch (*Hedysarum boreale*), longleaf phlox (*Phlox longifolia*), and yellow salsify (*Tragopogon dubius*). Pale alyssum (*Alyssum alyssoides*) and storksbill (*Erodium cicutarium*) are the most common annual species.

1989 TREND ASSESSMENT

The browse trend is stable. The density of sagebrush, and the proportion of the population in the young age class remained stable. Although decadence increased from 19% to 46%, the proportion of plants exhibiting poor vigor decreased from 35% to 4% of the population. Browse use shifted from moderate-heavy to heavy. The grass trend is slightly up. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses increased 89%. There were significant decreases in the nested frequencies of thickspike wheatgrass (*Agropyron dasystachyum*) and bulbous bluegrass. Sandberg bluegrass (*Poa secunda*) was sampled for the first time and had a quadrat frequency of 95%. The forb trend is slightly up. The sum of nested frequency of perennial forbs increased 85%, and most of the increase was due to western ragweed (*Ambrosia psilostachya*). This species has a low forage value, so the increase is less significant.

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (+1)

1997 TREND ASSESSMENT

The browse trend is up. The density of sagebrush increased 29%. Seedling plants were sampled for the first time, and the young age class increased from 4% to 7% of the population. The density of mature plants increased from 433 plants/acre (1,070 plants/ha) to 780 plants/acre (1,930 plants/ha). Additionally, decadence decreased to 23%. However, the density of dead plants increased from 0 to 240 plants/acre (595 plants/ha). Plants with poor vigor increased from 4% to 13%, and all of those plants were classified as dying. Browse use shifted from heavy to moderate and the average crown width increased by 18 inches (46 cm). The grass trend is stable. Even though the sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased 43%, there was a favorable shift in frequency of the individual species. There was a significant increase in the nested frequency of bluebunch wheatgrass, which is more robust and provides more forage than either bulbous or Sandberg bluegrass. Sandberg bluegrass significantly decreased and bulbous bluegrass significantly increased. It is possible that there has been some misidentification of these two species in years past. Both are small and dry early in the growing season. The forb trend is up. The sum of nested frequency of perennial forbs increased 67%, including significant increases in yellow salsify and longleaf phlox. The Desirable Components Index (DCI) score was fair due to the moderate browse cover and high perennial grass cover.

winter range condition (DCI) - fair (55) Mid-level potential scale

browse - up (+2)

grass - stable (0)

forb - up (+2)

2002 TREND ASSESSMENT

The browse trend is down. The density of sagebrush decreased 18%, and most of the decrease was attributed to fewer mature plants. No seedlings were sampled. The density of young plants decreased, but young plants continued to comprise 7% of the population. Decadence increased to 41% of the population, and the density of dead plants increased to 300 plants/acre (743 plants/ha). The proportion of plants with poor vigor increased to 24%, and the majority of those plants were classified as dying. Browse use shifted to heavy. The grass trend is stable. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses increased 4%. Bluebunch wheatgrass and cheatgrass significantly decreased in nested frequency. Kentucky bluegrass (*Poa pratensis*) was sampled for the first time. The forb trend is down. The sum of nested frequency of perennial forbs decreased 27%, including significant decreases in western ragweed and yellow salsify. The DCI score decreased to poor-fair due to an increase in browse decadence.

winter range condition (DCI) - poor-fair (49) Mid-level potential scale

browse - down (-2)

grass - stable (0)

forb - down (-2)

2007 TREND ASSESSMENT

The browse trend is down. The density of sagebrush decreased 30%. No seedling or young plants were sampled. Decadence decreased to 34% of the population, and the density of dead plants decreased to 200

plants/acre (495 plants/ha). Plants with poor vigor comprised 25% of the population, and 16% of the population was classified as dying. Browse use shifted to moderate-heavy. The grass trend is down. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses decreased 31%, including significant decreases in Kentucky and Sandberg bluegrass. Although bulbous bluegrass decreased significantly in nested frequency, there was a significant increase in that of cheatgrass. Japanese brome was also sampled for the first time. None of the grasses had been grazed. The forb trend is slightly down. The sum of nested frequency of perennial forbs decreased 28%. The number of perennial species sampled decreased from 15 to 10. Yellow salsify plants were heavily grazed. The DCI score decreased to poor due to a decrease in browse cover.

winter range condition (DCI) - poor (45) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - slightly down (-2)

HERBACEOUS TRENDS --
 Management unit 17 , Study no: 24

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
G	Agropyron cristatum	a9	a7	-	-	a3	-	-	.03
G	Agropyron dasystachyum	b86	a8	-	a2	a3	-	.00	.06
G	Agropyron spicatum	a196	a237	c289	b254	b210	20.39	13.22	14.84
G	Bromus japonicus (a)	-	-	-	-	13	-	-	.05
G	Bromus tectorum (a)	-	-	b133	a39	b101	1.51	.19	1.18
G	Poa bulbosa	bc284	a120	cd307	d303	b241	16.68	19.25	15.22
G	Poa pratensis	-	-	-	b42	a6	-	.59	.06
G	Poa secunda	-	c299	b28	b32	a7	.17	1.48	.07
Total for Annual Grasses		0	0	133	39	114	1.51	0.19	1.23
Total for Perennial Grasses		575	671	624	633	470	37.25	34.56	30.29
Total for Grasses		575	671	757	672	584	38.76	34.76	31.53
F	Alyssum alyssoides (a)	-	-	b128	a87	ab123	.49	.18	.47
F	Allium sp.	-	-	3	-	-	.00	-	-
F	Ambrosia psilostachya	-	c52	b35	a4	a10	.18	.06	.10
F	Artemisia ludoviciana	a3	a2	-	-	-	-	-	-
F	Arabis perennans	-	-	2	-	-	.03	-	-
F	Astragalus sp.	-	a2	-	b17	-	-	.35	-
F	Astragalus utahensis	-	-	a3	a6	a6	.15	.06	.18
F	Castilleja chromosa	a7	a1	a2	a5	a2	.00	.04	.03
F	Calochortus nuttallii	a7	a1	-	a4	-	-	.01	-
F	Cirsium undulatum	-	a2	b11	ab12	ab11	.19	.09	.10
F	Comandra pallida	a4	a8	a3	-	-	.01	-	-
F	Collinsia parviflora (a)	-	-	-	-	2	-	-	.00
F	Crepis acuminata	-	-	a5	a7	a8	.01	.04	.06

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
F	<i>Descurainia pinnata</i> (a)	-	-	-	5	-	-	.01	-
F	<i>Draba</i> sp. (a)	-	-	-	-	12	-	-	.01
F	<i>Erodium cicutarium</i> (a)	-	-	_a 44	_a 55	_a 29	.26	1.37	.18
F	<i>Helianthus annuus</i> (a)	-	_a 17	-	_a 14	-	-	.03	-
F	<i>Hedysarum boreale</i>	_a 12	_a 11	_a 26	_a 4	_a 10	.71	.16	.99
F	<i>Lappula occidentalis</i> (a)	-	-	-	23	-	-	.05	-
F	<i>Lactuca serriola</i>	-	-	_a 1	_a 5	-	.00	.01	-
F	<i>Lithospermum ruderales</i>	-	_a 3	_a 3	-	-	.01	-	-
F	<i>Lygodesmia</i> sp.	-	-	-	_a 13	_a 7	-	.12	.15
F	<i>Oenothera</i> sp.	_a 2	-	_a 5	_a 1	-	.33	.00	-
F	<i>Orobancha</i> sp.	5	-	-	-	-	-	-	-
F	<i>Phlox longifolia</i>	_a 3	_{ab} 6	_c 28	_{bc} 21	_{ab} 8	.08	.08	.04
F	<i>Sedum lanceolatum</i>	-	-	-	1	-	-	.00	-
F	<i>Sphaeralcea coccinea</i>	_a 8	_a 7	_a 6	_a 13	_a 9	.03	.03	.05
F	<i>Tragopogon dubius</i>	_a 2	-	_b 31	_a 7	_{ab} 16	.24	.10	.04
F	Unknown forb-perennial	-	3	-	-	-	-	-	-
Total for Annual Forbs		0	17	172	184	166	0.76	1.64	0.68
Total for Perennial Forbs		53	98	164	120	87	2.00	1.19	1.75
Total for Forbs		53	115	336	304	253	2.76	2.84	2.44

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

BROWSE TRENDS --

Management unit 17 , Study no: 24

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	<i>Artemisia tridentata vaseyana</i>	35	32	28	8.28	6.99	4.79
B	<i>Atriplex confertifolia</i>	1	1	1	.03	.15	-
B	<i>Cercocarpus montanus</i>	1	1	2	.15	.41	.53
B	<i>Chrysothamnus nauseosus albicaulis</i>	4	2	1	.15	.03	-
B	<i>Cowania mexicana stansburiana</i>	0	0	0	-	.15	-
B	<i>Gutierrezia sarothrae</i>	72	6	18	3.59	.01	.22
B	<i>Quercus gambelii</i>	0	0	1	-	-	-
Total for Browse		113	42	51	12.21	7.75	5.55

CANOPY COVER, LINE INTERCEPT --

Management unit 17 , Study no: 24

Species	Percent Cover	
	'02	'07
Artemisia tridentata vaseyana	.20	4.83
Cercocarpus montanus	-	1.08
Cowania mexicana stansburiana	-	.08
Gutierrezia sarothrae	-	1.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17 , Study no: 24

Species	Average leader growth (in)	
	'02	'07
Artemisia tridentata vaseyana	1.9	1.5

BASIC COVER --

Management unit 17 , Study no: 24

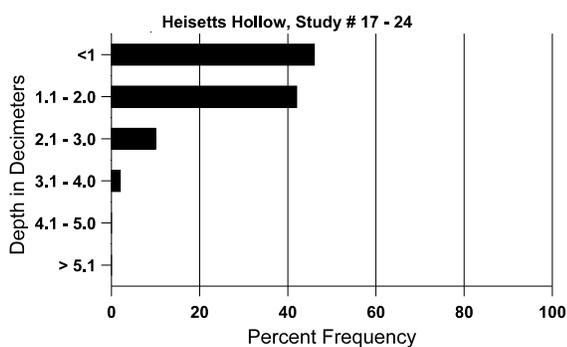
Cover Type	Average Cover %				
	'83	'89	'97	'02	'07
Vegetation	7.00	22.25	53.82	49.99	41.43
Rock	3.00	4.50	4.96	7.68	2.88
Pavement	6.75	19.75	6.84	8.94	6.31
Litter	72.50	41.00	39.14	31.17	31.23
Cryptogams	.25	0	.59	.22	.06
Bare Ground	10.50	12.50	7.46	14.68	9.37

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 24, Heisetts Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	Clay loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
24.3	49.6 (17.7)	7.1	32.0	35.4	32.6	3.8	5.7	105.6	.6

Stoniness Index



PELLET GROUP DATA --

Management unit 17 , Study no: 24

Type	Quadrat Frequency		
	'97	'02	'07
Sheep	-	-	-
Rabbit	1	3	13
Elk	1	1	34
Deer	43	46	12

Days use per acre (ha)	
'02	'07
-	1 (2)
-	-
3 (8)	43 (106)
65 (160)	78 (193)

BROWSE CHARACTERISTICS --

Management unit 17 , Study no: 24

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier alnifolia</i>												
83	33	-	-	33	-	-	0	100	-	-	100	30/35
89	33	-	-	33	-	-	0	100	-	-	100	28/31
97	0	-	-	-	-	-	0	0	-	-	0	-/-
02	0	-	-	-	-	-	0	0	-	-	0	-/-
07	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Artemisia tridentata vaseyana</i>												
83	865	-	33	666	166	-	35	54	19	31	35	22/28
89	866	-	33	433	400	-	15	85	46	4	4	24/29
97	1120	60	80	780	260	240	54	30	23	13	13	25/47
02	920	-	60	480	380	300	11	85	41	22	24	22/35
07	640	-	-	420	220	200	28	50	34	16	25	24/39
<i>Atriplex confertifolia</i>												
83	0	-	-	-	-	-	0	0	0	-	0	-/-
89	0	-	-	-	-	-	0	0	0	-	0	-/-
97	20	-	-	20	-	-	100	0	0	-	0	15/27
02	40	-	-	20	20	-	0	100	50	-	0	6/16
07	40	-	-	40	-	-	0	0	0	-	0	8/16
<i>Cercocarpus montanus</i>												
83	0	-	-	-	-	-	0	0	-	-	0	-/-
89	33	-	33	-	-	-	0	100	-	-	0	-/-
97	20	20	-	20	-	-	0	100	-	-	0	70/127
02	40	-	-	40	-	-	100	0	-	-	0	89/113
07	60	-	20	40	-	-	67	33	-	-	0	83/89

		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)
Chrysothamnus nauseosus albicaulis												
83	33	-	-	33	-	-	0	0	0	-	0	20/24
89	66	-	-	66	-	-	0	0	0	-	0	26/26
97	80	-	-	80	-	-	0	0	0	-	0	28/48
02	40	-	-	20	20	-	50	50	50	-	0	27/44
07	40	-	-	40	-	20	0	0	0	-	0	33/55
Cowania mexicana stansburiana												
83	0	-	-	-	-	-	0	0	-	-	0	-/-
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	38/48
02	0	-	-	-	-	-	0	0	-	-	0	66/57
07	0	-	-	-	-	-	0	0	-	-	0	66/75
Gutierrezia sarothrae												
83	1233	4100	733	500	-	-	0	0	0	-	0	11/8
89	1433	-	-	733	700	-	0	0	49	7	44	9/8
97	10300	8900	4280	5980	40	20	0	0	0	-	0	6/7
02	120	-	40	80	-	-	0	0	0	-	17	7/7
07	660	-	80	560	20	-	3	0	3	-	3	9/10
Quercus gambelii												
83	133	-	33	100	-	-	25	75	-	-	50	33/35
89	366	-	200	166	-	-	0	91	-	-	0	59/33
97	0	-	-	-	-	-	0	0	-	-	0	52/43
02	0	-	-	-	-	-	0	0	-	-	0	-/-
07	20	-	-	20	-	-	0	0	-	-	0	37/24