Trend Study 17-64-07

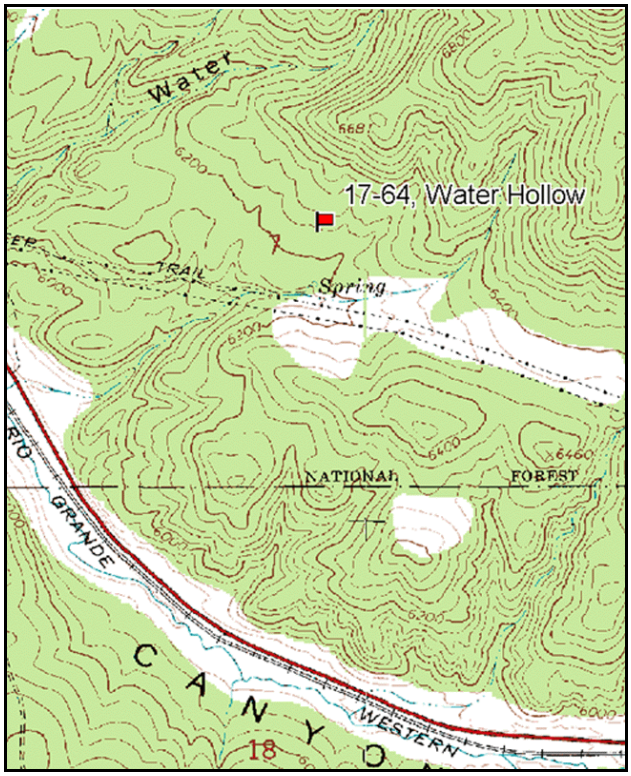
Study site name: Water Hollow . Vegetation type: Chained, Seeded P-J .

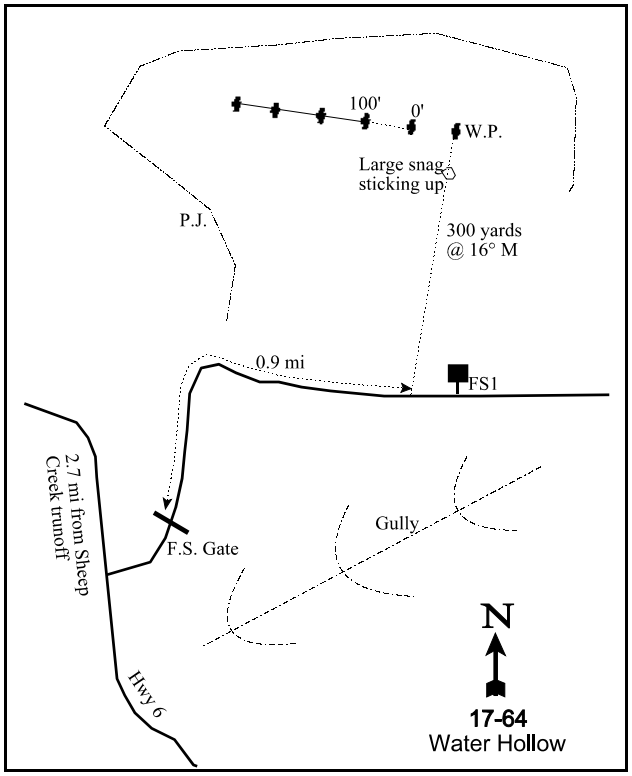
Compass bearing: frequency baseline 277 degrees magnetic.

Frequency belt placement: line 1 (11 ft), line 2 (34 ft), line 3 (59 ft), line 4 (71 ft), line 5 (95 ft).

LOCATION DESCRIPTION

From Spanish Fork Canyon, take Highway 6 to the Sheep Creek turnoff. Continue on Highway 6 for 2.2 miles to a road on the north side of the road (left). Turn left again just after exiting highway 6. Follow this road to a Forest Service gate. From the gate, go 0.9 miles to a Forest Service sign. Park here and walk 300 yards at 16 degrees magnetic to the witness post. A large clump of chained P-J is in front of the post. The 0-foot stake is just west of the witness post and is marked with browse tag # 132. Extra rebar and T-posts present on the site from another unrelated study.





Map Name: Mill Fork

Diagrammatic Sketch

Township 10S , Range 6E , Section 7

GPS: NAD 83, UTM 12S 474876 E 4424105 N

DISCUSSION

Water Hollow - Trend Study No. 17-64

Study Information

This winter range study monitors a pinyon-juniper chaining on the north side of US-6 in Spanish Fork Canyon [elevation: 6,240 feet (1,902 m), slope: 11%, aspect: south]. The nearest perennial source of water is Soldier Creek, on the opposite side of US-6, 0.75 miles (1.2 km) to the southwest. The chaining was part of a mosaic of small chaining and seeding treatments that were completed on south-facing slopes in the 1990s. The objective of these treatments was to improve winter range and stabilize the watersheds on the north of US-6. This study is located within a 60-acre (24.3-ha) area that was treated using a smooth chain. Since the treatment, deer use has been moderate and elk use has been heavy. There is evidence that animal use occurs throughout the year, but is highest in the winter. From the pellet group transect data, deer use was estimated at 25 days use/acre (63 ddu/ha) in both 2002 and 2007. Elk use was estimated at 115 days use/acre (284 edu/ha) in 2002 and 110 days use/acre (273 edu/ha) in 2007. Rabbit pellets were sampled in 27% of the quadrats in 2002 and only in 9% in 2007.

Soil

The soil has a sandy clay loam texture and a slightly alkaline reaction (pH of 7.4). There is little rock on the surface or within the profile. The relative rock cover has been 2% or less, and that of pavement was 3% in 2002 and 2007. Relative vegetation cover increased from 22% in 2002 to 34% in 2007. However, the relative bare ground cover has also been high. It was 26% in 2002 and decreased to 21% in 2007. The study lies within the Green River Shale formation. Soils in this formation are highly erodible, and severe erosion is apparent outside of the chained area. The soil erosion condition class was determined to be slight in 2002 and 2007 due to evidence of surface litter and soil movement, and the formation of pedestals and flow patterns. Old, inactive gullies are also present, but it appears that chained trees may have been placed in the gullies to minimize channel erosion.

Browse

Prior to the chaining, this study was dominated by Utah juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus edulis*) trees. There were few shrubs in the understory. From the point-quarter estimates, the density of junipers was 30 trees/acre (74 trees/ha) in 2002 and 39 trees/acre (97 trees/ha) in 2007. In 2002, approximately 75% of the sampled junipers were trees tipped over by the chaining but were still living. The other 25% were small, young trees that either survived the chaining, or became established after the chaining. In 2007, 32% of the sampled junipers were tipped trees, and the remaining 68% were trees that were small enough to survive the chaining or had become established afterwards. The average diameter increased from 4.6 inches (11.7 cm) in 2002 to 5.4 inches (13.7 cm) in 2007. However, the canopy cover of juniper decreased from 2% in 2002 to 1% in 2007. The density of pinyon increased from 7 trees/acre (17 trees/ha) in 2002 to 22 trees/acre (54 trees/ha) in 2007. The average pinyon diameter increased from 2.1 inches (5.3 cm) in 2002 to 3.3 inches (8.4 cm) in 2007.

Fourwing saltbush (*Atriplex canescens*) and antelope bitterbrush (*Purshia tridentata*) were seeded using a dribbler as a part of the treatment. These species are present, but are not abundant. The canopy cover of fourwing saltbush increased from less than 1% in 2002 to 1% in 2007. Fourwing saltbush density was estimated at 40 plants/acre (99 plants/ha) in 2002 and 60 plants/acre (149 plants/ha) in 2007. The population consists only of mature, healthy plants that have been lightly-moderately browsed. The average annual leader growth was 3.4 inches (8.6 cm) in 2002 and 4.1 inches (10.4 cm) in 2007. The canopy cover of bitterbrush was also less than 1% in 2002 and increased to 1% in 2007. Bitterbrush density was estimated at 60 plants/acre (149 plants/ha) in 2002 and 80 plants/acre (198 plants/ha) in 2007. Young plants comprised 67% of the population in 2002, and by 2007 all of the sampled plants were mature. All plants were healthy in both

sample years, despite being heavily browsed. The average annual leader growth of bitterbrush was 4.0 inches (10.2 cm) in 2002 and 2.8 inches (7.1 cm) in 2007. Small numbers of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*), which were included within the aerial seed mix, were also sampled.

Herbaceous Understory

Perennial grasses dominate the herbaceous understory, and provided 21% cover in 2002, and 24% in 2007. Between 11 and 14 perennial species have been sampled, and the dominant species are crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Agropyron intermedium*), smooth brome (*Bromus inermis*), and Great Basin wildrye (*Elymus cinereus*). Cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*) are both present, but cover of these species has been less than 1%. However, the quadrat frequency of cheatgrass increased from 3% in 2002 to 27% in 2007, and that of Japanese brome increased from 1% to 14%.

Forbs are rare and provide little forage. Perennial forb cover was less than 1% in both 2002 and 2007. Lewis flax (*Linum lewisii*) and cryptantha (*Cryptantha* sp.) are the most abundant perennial species. Musk thistle (*Carduus nutans*), a noxious weed, was sampled in 2002, but only had a quadrat frequency of 2%.

2007 TREND ASSESSMENT

The browse trend is slightly up. The density of fourwing saltbush increased 50%, but abundance was still low. Only mature, healthy plants were sampled, and browse use remained light-moderate. The average height and crown measurements increased 10 inches (25 cm) and 22 inches (56 cm), respectively. Like fourwing saltbush, the density of bitterbrush increased, but abundance remained low. Young plants decreased from 67% of the population to 0%. The population consisted entirely of mature, healthy plants. Browse use remained heavy, though heavily browsed plants decreased from 100% of the population to 75%. The average height and crown measurements increased 10 inches (25 cm) and 14 inches (36 cm), respectively. No seedlings of either species were sampled. The grass trend is stable. The sum of nested frequency of perennial grasses increased 16%, including a significant increase in the nested frequency of mountain brome (*Bromus carinatus*). However, there was a significant decrease in the nested frequency of orchardgrass (*Dactylis glomerata*), and a significant increases in the nested frequencies of cheatgrass and Japanese brome. The forb trend is slightly up. The sum of nested frequency of perennial forbs increased 53%, but forb abundance remained low. Musk thistle was not sampled, but was still present. Lewis flax had high seed production. The 2002 Desirable Components Index (DCI) score was very poor because browse cover was less than the 5% threshold, perennial forb cover was low, and one noxious weed species was present. The score would have been lower if not for the high perennial grass cover. In 2007, the DCI score remained very poor.

2002 winter range condition (DCI) - very poor (30) Mid-level potential scale
2007 winter range condition (DCI) - very poor (31) Mid-level potential scale
browse - slightly up (+1) grass - stable (0) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 17 , Study no: 64

Type	Species	Nested Frequency '02	Nested Frequency '07	Average Cover % '02	Average Cover % '07
G	Agropyron cristatum	a156	a196	6.66	7.28
G	Agropyron intermedium	a128	a106	3.11	5.44
G	Agropyron smithii	a42	a52	2.02	1.40
G	Agropyron spicatum	a9	a16	.41	1.21
G	Bromus carinatus	a6	b28	.18	.96
G	Bromus inermis	a103	a111	2.67	3.35
G	Bromus japonicus (a)	a3	b40	.00	.12
G	Bromus tectorum (a)	a5	b66	.01	.40
G	Carex sp.	-	-	.00	-
G	Dactylis glomerata	b19	a5	.56	.22
G	Elymus cinereus	a24	a36	3.69	2.94
G	Oryzopsis hymenoides	a13	a6	.93	.19
G	Poa fendleriana	-	5	-	.06
G	Poa pratensis	-	4	-	.18
G	Poa secunda	a12	a24	.02	.58
G	Secale montanum	a-	a7	.00	.18
G	Sitanion hystrix	a7	a7	.21	.16
Total for Annual Grasses		8	106	0.01	0.52
Total for Perennial Grasses		519	603	20.52	24.19
Total for Grasses		527	709	20.54	24.72
F	Alyssum alyssoides (a)	-	21	-	.06
F	Astragalus sp.	2	-	.01	-
F	Camelina microcarpa (a)	-	15	-	.07
F	Carduus nutans (a)	5	-	.01	-
F	Chaenactis douglasii	-	3	-	.03
F	Cirsium sp.	a-	a1	.00	.00
F	Cryptantha sp.	-	1	-	.15
F	Descurainia pinnata (a)	-	9	-	.02
F	Gilia sp. (a)	a4	a10	.03	.05
F	Lappula occidentalis (a)	-	18	-	.05
F	Lactuca serriola	a1	a3	.00	.00
F	Linum lewisii	a18	a26	.28	.18
F	Lithospermum ruderale	a-	a-	.00	.03
F	Medicago sativa	-	-	.00	-
F	Penstemon caespitosus	a1	a7	.03	.04

Type	Species	Nested Frequency '02	Nested Frequency '07	Average Cover % '02	Average Cover % '07
F	Streptanthus cordatus	1	-	.00	-
F	Tragopogon dubius	$_a$9	$_a$8	.02	.04
Total for Annual Forbs		9	73	0.03	0.25
Total for Perennial Forbs		32	49	0.37	0.49
Total for Forbs		41	122	0.40	0.75

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

BROWSE TRENDS --
Management unit 17 , Study no: 64

Type	Species	Strip Frequency '02	Strip Frequency '07	Average Cover % '02	Average Cover % '07
B	Atriplex canescens	2	3	.63	.41
B	Juniperus osteosperma	1	3	1.86	1.86
B	Purshia tridentata	2	2	-	.15
Total for Browse		5	8	2.49	2.42

CANOPY COVER, LINE INTERCEPT --
Management unit 17 , Study no: 64

Species	Percent Cover '02	Percent Cover '07
Atriplex canescens	.48	.80
Juniperus osteosperma	2.46	1.48
Purshia tridentata	.31	.88

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 17 , Study no: 64

Species	Average leader growth (in) '02	Average leader growth (in) '07
Atriplex canescens	3.4	4.1
Purshia tridentata	4.0	2.8

POINT-QUARTER TREE DATA --
Management unit 17 , Study no: 64

Species	Trees per Acre	
	'02	'07
Juniperus osteosperma	30	39
Pinus edulis	7	22

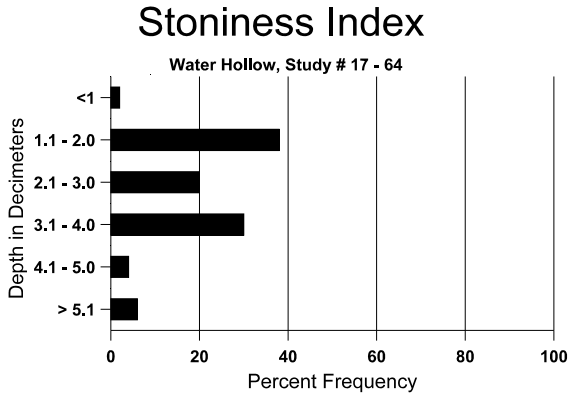
Average diameter (in)	
'02	'07
4.6	5.4
2.1	3.3

BASIC COVER --
Management unit 17 , Study no: 64

Cover Type	Average Cover %	
	'02	'07
Vegetation	25.31	36.94
Rock	1.94	.70
Pavement	3.73	3.69
Litter	56.09	45.00
Cryptogams	.23	.56
Bare Ground	30.10	23.16

SOIL ANALYSIS DATA --
Herd Unit 17, Study no: 64, Water Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy clay loam			%0M	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
15.4	60.4 (12.8)	7.4	48.7	20.0	31.3	3.4	4.5	236.8	.7



PELLET GROUP DATA --
Management unit 17 , Study no: 64

Type	Quadrat Frequency	
	'02	'07
Rabbit	27	9
Elk	36	31
Deer	14	11

Days use per acre (ha)	
'02	'07
-	-
115 (284)	110 (273)
25 (63)	25 (63)

BROWSE CHARACTERISTICS --
Management unit 17 , Study no: 64

		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)
Artemisia tridentata vaseyana												
02	**0**	-	-	-	-	20	0	0	-	-	0	19/26
07	**0**	-	-	-	-	-	0	0	-	-	0	22/31
Atriplex canescens												
02	**40**	-	-	40	-	-	50	0	-	-	0	45/51
07	**60**	-	-	60	-	-	33	0	-	-	0	55/73
Chrysothamnus nauseosus albicaulis												
02	**0**	-	-	-	-	-	0	0	-	-	0	29/43
07	**0**	-	-	-	-	-	0	0	-	-	0	32/41
Chrysothamnus viscidiflorus viscidiflorus												
02	**0**	-	-	-	-	-	0	0	-	-	0	14/24
07	**0**	-	-	-	-	-	0	0	-	-	0	23/32
Gutierrezia sarothrae												
02	**0**	-	-	-	-	500	0	0	-	-	0	-/-
07	**0**	-	-	-	-	-	0	0	-	-	0	20/25
Juniperus osteosperma												
02	**20**	-	20	-	-	-	0	0	-	-	0	-/-
07	**60**	-	-	60	-	-	0	0	-	-	0	-/-
Purshia tridentata												
02	**60**	-	40	20	-	-	0	100	-	-	0	17/28
07	**80**	-	-	80	-	-	25	75	-	-	0	27/42
Symphoricarpos oreophilus												
02	**0**	-	-	-	-	-	0	0	-	-	0	12/18
07	**0**	-	-	-	-	-	0	0	-	-	0	14/16