Trend Study 7-10-06

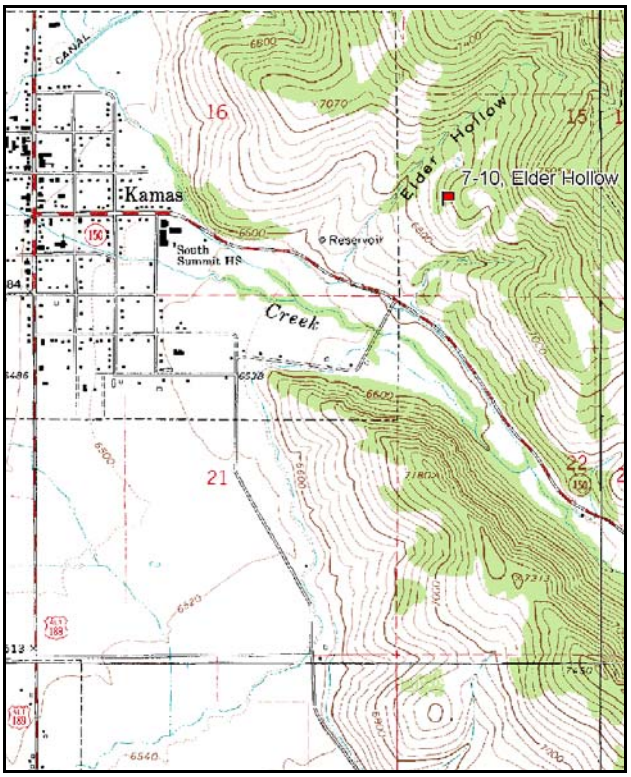
Study site name: Elder Hollow . Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 169 degrees magnetic.

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

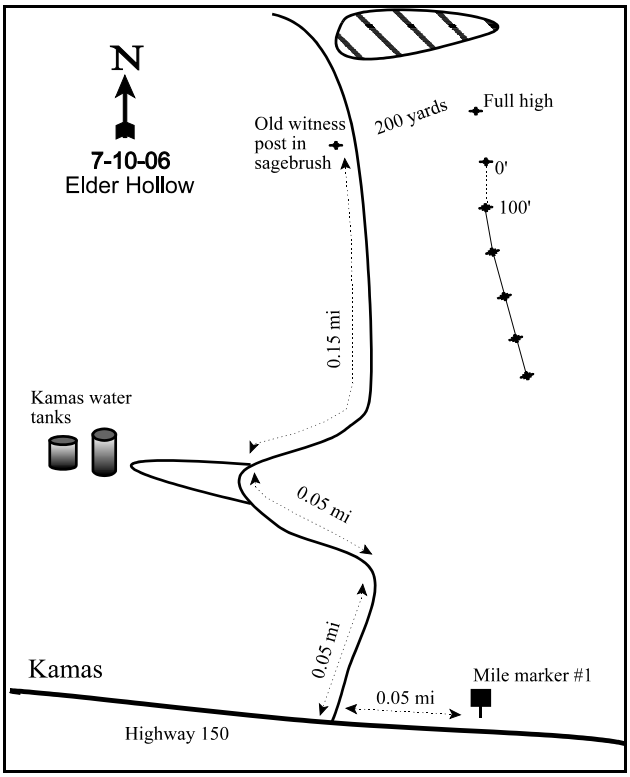
LOCATION DESCRIPTION

Westbound on Highway 150 (Mirror Lake Highway) from mile marker 1, proceed 0.05 miles to a locked gate on the right. Contact the Wildlife Biologist in the area to obtain a key. The site can also be reached by walking. Proceed through the gate, turn left, travel 0.05 miles, turn right, travel 0.05 miles, bear right, and travel 0.15 miles to green steel stake on the left. The post is in dense sagebrush 3 feet form road. From the post, walk 200 yards at 66 degrees magnetic to a witness post. The 0-foot stake is just a couple of paces south of the witness post. The baseline doglegs down through the same vegetation type. Line 1 runs 169 degrees magnetic. Line 2 runs 151 degrees magnetic. Line 3 runs 149 degrees magnetic. Lines 4 and 5 run 146 degrees magnetic.



Map Name: Kamas

Township 2S , Range 6E , Section 15



Diagrammatic Sketch

UTM NAD 27, UTM 12T 4499007 N 478156 E

DISCUSSION

Elder Hollow - Trend Study No. 7-10

Study Information

The Elder Hollow trend study (elevation: 7,000 feet, slope: 35-40%, aspect: southwest) replaces the Kamas Water Tank trend study established in 1984, which sampled critical deer winter range located immediately east of Kamas. This privately owned site has been intensively grazed by sheep, cattle, and horses for many years. When it was revisited in 1996, the land was for sale, so the study site was moved up the ridge about 200 yards so it could be accessible in the future. There was little sign that the old site was used by wildlife, but the new location has abundant indications of use and is critical winter range. The vegetation type is mountain big sagebrush/grass that also contains a diverse mix of other shrub species. Pellet group quadrat frequency was 45% for deer and 27% for elk in 1996. During the 2001 reading, pellet group quadrat frequency was 39% for deer and only 3% for elk. A pellet group transect read on the site in 2001 estimated 103 deer, 8 elk, and 6 cow days use/acre (253 ddu/ha, 20 edu/ha, and 14 cdu/ha). Animal use in 2006 was estimated at 133 deer, 9 elk, and 3 cow days use/acre (327 ddu/ha, 22 edu/ha, and 7 cdu/ha).

Soil

The Yeates Hollow series consists of deep, well drained and moderately well drained, slowly permeable soils that formed in alluvium, colluvium and residuum from conglomerate, sandstone and quartzite. These soils are on fan remnants, hills, and mountain slopes (USDA-NRCS 2006). Soil is moderately deep with an effective rooting depth of 14 inches. Texture is a sandy clay loam\loam with a neutral soil reaction (7.0 pH). Rock is common on the surface and throughout the soil profile. Protective ground cover of vegetation and litter is abundant but interspaces between shrubs show signs of localized erosion. Terracing along the slope and soil pedestalling on the uphill side of shrubs is common. The erosion condition class was determined as slight in 2001. Conditions were improved in 2006 and erosion was rated as stable.

Browse

The site supports several preferred browse species. These include mountain big sagebrush, serviceberry, bitterbrush, and snowberry. The key species is mountain big sagebrush which makes up the majority of the browse cover. Sagebrush cover was 22% in 1996, declined to 19% in 2001, and declined further to only 11% in 2006. Density of sagebrush was estimated at 2,540 plants/acre in 1996, 2,140 plants/acre in 2001, and declined to 1,520 plants/acre in 2006. Recruitment has been poor. Decadence was low in 1996 at 20%, but increased to 38% in 2001 and 37% in 2006. Poor vigor increased from only 11% in 2001 to 39% of the population in 2006. Damage from the sagebrush defoliator moth (*Aroga websteri*) was noted in 2006. The decline of this population may also be due in part to drought conditions and in 2002 and 2003 when annual precipitation was only 70% of normal and precipitation at Kamas. January and February precipitation was well below normal (Utah Climate Summaries 2006), which can cause winter injury (Nelson and Tiernan 1983). Annual leader growth was averaging only 1.4 inches in 2001 and 1.7 inches in 2006.

Serviceberry is moderately abundant. Cover was 1-2% from 1996-2006. Utilization has been moderate to heavy with good vigor. Annual leader growth of serviceberry averaged only 2.3 inches in 2001 and 2.5 inches in 2006. The few scattered bitterbrush are heavily browsed but in good vigor. Mature bitterbrush have a low-growing, spreading growth form. Bitterbrush density increased from 60 plants/acre in 2001 to 220 plants/acre in 2006. Utilization was heavy, but vigor was good. A few increaser shrubs are found on the site but most occur in limited numbers. Broom snakeweed was abundant in 1996 and 2001, but was much less abundant in 2006.

Herbaceous Understory

Understory growth is limited because of the slope and aspect, combined with competition from browse species like mountain big sagebrush. A variety of perennial grasses occur on the site but none are abundant. The only common species include Kentucky bluegrass and Sandberg bluegrass. Cheatgrass, an annual, is also

moderately abundant. It accounted for 38% of the grass cover in 1996, 51% in 2001, and 65% in 2006. Cheatgrass sum of nested frequency was significantly higher in 2006 and was sampled in 99% of the quadrats. Forbs are also diverse but most occur only rarely. Common perennials include wavyleaf thistle, redroot eriogonum, silvery lupine, and low penstemon. Annual forbs are also common and produce similar cover as perennial forbs. Annual forbs like pale alyssum, storksbill, and bur buttercup dominate bare areas in the shrub interspaces.

2001 TREND ASSESSMENT

Trend for browse is slightly down. Mountain big sagebrush density has declined slightly (16%). Utilization continues to be moderate to heavy with good vigor on all but 29% of the decadent shrubs. Recruitment is poor. Serviceberry has increased in density, displays moderate to heavy use, good vigor, with no decadent plants sampled. Trend for grasses is stable. Sum of nested frequency for perennial grasses was basically unchanged. The biggest change for perennial grasses is the significant decline in the nested frequency of Kentucky bluegrass. This is somewhat counterbalanced by a significant increase in crested wheatgrass and Sandberg bluegrass. Kentucky bluegrass is still the most abundant perennial grass. Cheatgrass, an annual, provides half of the total grass cover. The forb trend is slightly up as frequency of perennial forbs has increased slightly. Annual forbs increased substantially and currently produce as much cover as perennial forbs. The largest change came from the significant increase in bur buttercup. The Desirable Components Index (see methods) rated this site as fair in 1996 and poor-fair in 2001. The decline was due to increased decadence of sagebrush and less perennial grass cover.

1996 winter range condition (DC Index) - fair (58) Mid-level potential scale
2001 winter range condition (DC Index) - poor-fair (51) Mid-level potential scale
browse - slightly down (-1) grass - stable (0) forb - slightly up (+1)

2006 TREND ASSESSMENT

The browse trend is down. Mountain big sagebrush density declined 29%. Sagebrush cover decreased from 19% to 11%. Sagebrush vigor was poor. Sagebrush defoliator moth and very dry years in 2002 and 2003 have contributed to this decline. Serviceberry density also declined 45%. Bitterbrush density did increase, but is only a minor portion of the total browse cover. The grass trend is down. Perennial grasses were stable, but cheatgrass increased significantly in sum of nested frequency. Cheatgrass quadrat frequency increased from 84% to 99%. Cover was also up to 10%, which can be a fire hazard. The forb trend is down. Perennial forbs decreased in sum of nested frequency and a weedy species like storksbill increased significantly in nested frequency. The DCI score declined to poor. Preferred browse cover was lower and cheatgrass cover increased, which detrimentally effects the site.

winter range condition (DC Index) - poor (39) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 07 , Study no: 10

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron cristatum	a16	ab25	b43	.28	.47	1.37
G	Agropyron spicatum	a6	a11	b25	.03	.13	1.07
G	Bromus carinatus	b10	ab2	a-	.08	.01	-
G	Bromus tectorum (a)	a303	a277	b388	3.80	3.95	10.46
G	Carex sp.	17	17	15	.36	.28	.25
G	Oryzopsis hymenoides	-	3	3	.00	.01	.03
G	Poa bulbosa	-	-	11	-	-	.39
G	Poa fendleriana	4	1	4	.06	.00	.18
G	Poa pratensis	c125	b65	a33	4.13	.64	.33
G	Poa secunda	50	74	69	.90	1.96	1.87
G	Sitanion hystrix	13	25	12	.25	.14	.13
G	Stipa comata	-	8	6	-	.06	.04
Total for Annual Grasses		303	277	388	3.80	3.95	10.46
Total for Perennial Grasses		241	231	221	6.12	3.72	5.70
Total for Grasses		544	508	609	9.93	7.68	16.16
F	Agoseris glauca	2	13	11	.00	.05	.08
F	Alyssum alyssoides (a)	272	316	318	1.76	2.36	3.42
F	Artemisia ludoviciana	14	26	18	.22	.58	.40
F	Arabis perennans	6	1	-	.01	.00	-
F	Astragalus convallarius	1	8	7	.00	.21	.12
F	Astragalus sp.	-	-	1	-	.00	.01
F	Astragalus utahensis	1	-	-	.00	-	-
F	Camelina microcarpa (a)	-	6	-	-	.02	-
F	Calochortus nuttallii	6	10	1	.01	.02	.00
F	Chaenactis douglasii	5	-	-	.03	-	-
F	Cirsium undulatum	b35	b32	a9	.56	.91	.69
F	Collomia linearis (a)	a-	b14	ab9	-	.05	.02
F	Comandra pallida	7	9	7	.06	.09	.06
F	Collinsia parviflora (a)	a8	b138	a14	.04	.53	.02
F	Crepis acuminata	-	-	4	-	-	.03
F	Cynoglossum officinale	-	4	-	-	.03	-
F	Draba sp. (a)	24	5	1	.03	.04	.00
F	Epilobium brachycarpum (a)	10	10	3	.02	.03	.00
F	Erodium cicutarium (a)	a1	b38	c86	.00	.89	2.17
F	Eriogonum racemosum	29	21	18	.21	.54	.46

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	Eriogonum umbellatum	-	1	2	-	.03	.06
F	Gayophytum ramosissimum(a)	-	-	5	-	-	.04
F	Hackelia patens	-	-	4	-	-	.03
F	Heterotheca villosa	$_{a}$1	$_{ab}$5	$_{b}$13	.03	.40	.48
F	Holosteum umbellatum (a)	$_{a}$1	$_{b}$20	$_{ab}$8	.00	.09	.01
F	Lactuca serriola	-	1	-	-	.00	-
F	Lithospermum ruderale	$_{a}$-	$_{a}$-	$_{b}$11	.15	-	.33
F	Lomatium sp.	-	1	-	-	.00	-
F	Lupinus argenteus	$_{a}$13	$_{b}$45	$_{a}$17	.75	2.53	.60
F	Microsteris gracilis (a)	$_{a}$-	$_{b}$29	$_{a}$6	-	.06	.02
F	Oenothera pallida	3	7	4	.00	.06	.03
F	Penstemon humilis	$_{b}$42	$_{ab}$29	$_{a}$17	.87	.48	.73
F	Penstemon sp.	2	4	2	.00	.03	.15
F	Phlox longifolia	-	3	-	-	.01	-
F	Polygonum douglasii (a)	8	-	4	.01	-	.01
F	Ranunculus testiculatus (a)	$_{a}$60	$_{b}$211	$_{b}$217	.20	2.04	1.33
F	Taraxacum officinale	$_{a}$-	$_{b}$5	$_{b}$2	-	.01	.03
F	Tragopogon dubius	$_{b}$14	$_{ab}$7	$_{a}$-	.08	.06	-
F	Viguiera multiflora	$_{b}$20	$_{a}$6	$_{a}$4	.16	.06	.18
F	Zigadenus paniculatus	3	7	2	.01	.10	.06
Total for Annual Forbs		384	787	671	2.08	6.15	7.07
Total for Perennial Forbs		204	245	154	3.21	6.26	4.57
Total for Forbs		588	1032	825	5.30	12.41	11.65

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

BROWSE TRENDS --
Management unit 07 , Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	20	31	21	1.53	1.84	1.36
B	Artemisia tridentata vaseyana	74	73	56	21.76	18.50	10.86
B	Chrysothamnus depressus	3	3	3	-	-	-
B	Chrysothamnus nauseosus albicaulis	1	2	0	-	.03	-
B	Chrysothamnus nauseosus consimilis	0	1	0	-	.03	-
B	Chrysothamnus viscidiflorus viscidiflorus	5	10	7	.53	.19	.62
B	Eriogonum heracleoides	1	1	0	-	.00	-
B	Gutierrezia sarothrae	38	42	28	1.24	1.41	.25
B	Mahonia repens	4	2	1	-	-	-
B	Opuntia sp.	17	13	16	.54	.16	.27
B	Prunus virginiana	1	0	0	-	-	-
B	Purshia tridentata	4	3	6	.56	.53	.41
B	Symphoricarpos oreophilus	38	46	48	3.80	6.99	4.78
B	Tetradymia canescens	14	14	15	.21	.46	.62
Total for Browse		220	241	201	30.20	30.17	19.19

CANOPY COVER, LINE INTERCEPT --
Management unit 07 , Study no: 10

Species	Percent Cover '06
Amelanchier alnifolia	2.61
Artemisia tridentata vaseyana	12.56
Chrysothamnus depressus	.18
Chrysothamnus nauseosus albicaulis	.35
Chrysothamnus viscidiflorus viscidiflorus	.55
Gutierrezia sarothrae	.36
Opuntia sp.	.16
Purshia tridentata	.76
Symphoricarpos oreophilus	7.81
Tetradymia canescens	.85

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 07 , Study no: 10

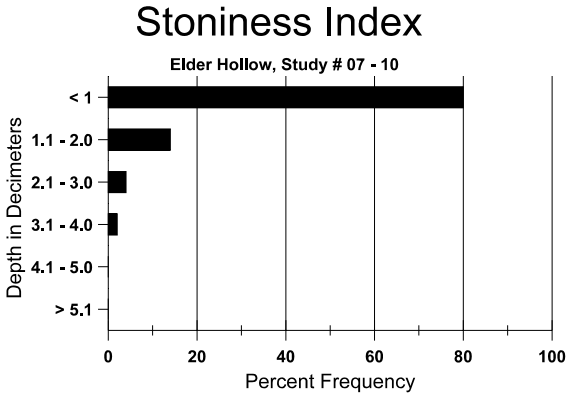
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	2.3	2.5
Artemisia tridentata vaseyana	1.4	1.7

BASIC COVER --
Management unit 07 , Study no: 10

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	41.93	46.54	43.02
Rock	22.34	19.41	21.83
Pavement	4.72	4.82	4.77
Litter	43.82	38.67	29.56
Cryptogams	.26	.32	.30
Bare Ground	6.30	13.25	13.17

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 10, Elder Hollow

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
14.1	38.4 (13.2)	7.0	48.2	27.1	24.7	3.7	16.6	198.4	0.6



PELLET GROUP DATA --
Management unit 07 , Study no: 10

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	1	4	10
Elk	27	3	-
Deer	45	39	56
Cattle	-	-	1

Days use per acre (ha)	
'01	'06
-	-
8 (20)	9 (22)
102 (253)	133 (327)
6 (14)	3 (7)

BROWSE CHARACTERISTICS --
Management unit 07 , Study no: 10

		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												
96	**520**	-	40	480	-	-	35	54	-	-	0	22/29
01	**840**	-	60	780	-	-	45	33	-	-	2	23/30
06	**460**	-	40	420	-	-	9	87	-	-	0	27/31
Artemisia tridentata vaseyana												
96	**2540**	-	160	1880	500	880	50	28	20	3	3	20/44
01	**2140**	-	40	1280	820	560	50	17	38	10	11	22/39
06	**1520**	20	80	880	560	680	37	24	37	24	39	22/40
Chrysothamnus depressus												
96	**100**	-	-	100	-	-	0	0	-	-	0	7/17
01	**100**	-	-	100	-	-	40	0	-	-	0	5/16
06	**60**	-	-	60	-	-	0	0	-	-	0	7/18
Chrysothamnus nauseosus albicaulis												
96	**20**	-	-	20	-	-	0	0	-	-	0	-/-
01	**40**	-	-	40	-	-	0	0	-	-	0	50/53
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus consimilis												
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**20**	-	20	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus												
96	**160**	-	40	120	-	-	0	0	0	-	0	11/19
01	**340**	-	-	340	-	-	18	18	0	-	0	8/75
06	**260**	-	-	240	20	-	31	0	8	-	0	11/21

		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)
Eriogonum heracleoides												
96	**20**	-	-	20	-	-	0	0	-	-	0	-/-
01	**20**	-	-	20	-	-	0	0	-	-	0	8/15
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
96	**4100**	40	700	3400	-	-	0	0	0	-	0	8/12
01	**3100**	-	120	2980	-	80	0	0	0	-	0	7/8
06	**1140**	40	140	980	20	-	5	0	2	2	2	7/8
Mahonia repens												
96	**100**	-	-	100	-	-	0	0	-	-	0	4/4
01	**180**	-	-	180	-	-	0	0	-	-	0	2/3
06	**40**	-	-	40	-	-	0	0	-	-	0	-/-
Opuntia sp.												
96	**560**	-	20	520	20	-	0	0	4	4	7	4/12
01	**340**	-	60	280	-	-	0	0	0	-	0	4/8
06	**400**	-	80	280	40	20	0	0	10	10	10	4/14
Prunus virginiana												
96	**20**	-	-	20	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Purshia tridentata												
96	**80**	-	-	80	-	-	0	100	-	-	0	10/51
01	**60**	-	-	60	-	-	33	67	-	-	0	9/50
06	**220**	-	-	220	-	-	18	73	-	-	0	9/32
Symphoricarpos oreophilus												
96	**1260**	20	220	1020	20	-	10	0	2	2	2	21/30
01	**1200**	20	140	1040	20	-	7	2	2	-	0	22/33
06	**1600**	20	140	1420	40	-	9	1	3	-	0	24/35
Tetradymia canescens												
96	**480**	-	120	320	40	-	0	0	8	4	4	8/18
01	**440**	-	20	400	20	-	14	0	5	-	0	9/14
06	**480**	-	40	380	60	-	8	0	13	4	4	11/21