Trend Study 7-3-06

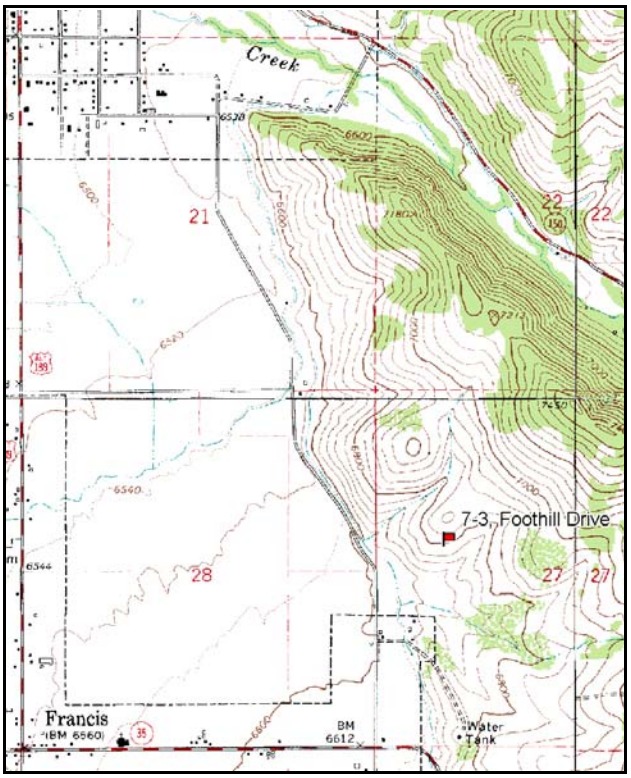
Study site name: Foothill Drive . Vegetation type: Big Sagebrush-Grass .

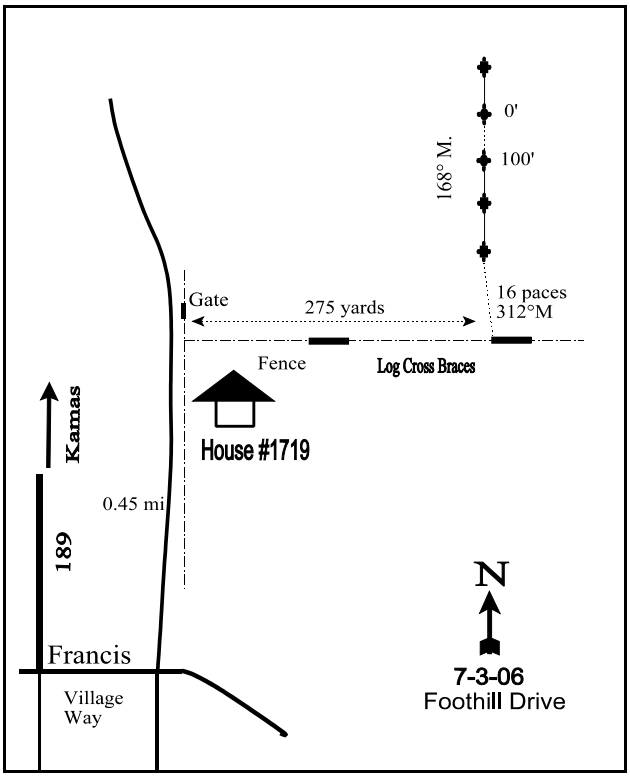
Compass bearing: frequency baseline 168 degrees magnetic.

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

LOCATION DESCRIPTION

At the junction of 189 and Village Way in Francis, proceed east for 1.0 mile. Turn left (north) onto Foothill Drive, and proceed 0.45 miles to house #1719 on the right. Park here and walk east along the east-west running fence, just north of the house, for approximately 275 yards to the second large log cross-brace on the fence. Walk 16 paces at 312 degrees magnetic to the 300-foot baseline stake. Three hundred feet to the north at a bearing of 348 degrees magnetic is the 0-foot baseline stake. The 0-foot stake is marked by browse tag #7958. The first 300 feet of the baseline runs 168 degrees magnetic. Line 4 runs off the 0-foot baseline stake at a bearing of 348 degrees magnetic.





Map Name: Francis

Diagrammatic Sketch

Township 2S , Range 6E , Section 27

UTM NAD 27, UTM 12T 4496275 N 478254 E

DISCUSSION

Foothill Drive - Trend Study No. 7-3

Study Information

The Foothill Drive study is located east of Francis and north of the Provo River on privately owned critical deer winter range (elevation: 6,800 feet, slope: 30%, aspect: southeast). This study samples an open mountain big sagebrush-grass hill that is surrounded by adjacent ridges dominated by Gambel oakbrush. Animal use during winter comes from deer and elk. Domestic cattle and horses also use the area. The overall intensity of use has been heavy in the past and the impact of grazing and browsing animals is evident. The field crew observed the remains of seven winter-killed deer in 1984 and one in 2006. Estimates from pellet group data in 2001 showed 56 deer days use/acre (139 ddu/ha). Use by elk and cattle was low in 2001 at an estimated 2 elk days use/acre (5 edu/ha) and 7 cow days use/acre (16 cdu/ha). In 2006, deer use was 68 days use/acre (169 ddu/ha). Cattle use was 9 days use/acre (22 cdu/ha) and horse use was 7 days use/acre (17 hdu/ha).

Soil

The Horrocks soil series consists of deep, well drained, moderately slowly permeable soils that formed in glacial deposits, alluvium, colluvium and residuum from andesite, sandstone and quartzite. These soils are on mountain slopes and terminal moraines (USDA-NRCS 2006). Soils are clay loam in texture with a slightly acidic soil reaction (6.4 pH). Soil depth is quite shallow due to the abundance of rock on the soil surface and in the profile. Effective rooting depth was estimated at only 9 inches. Vegetation and litter cover are good and coupled with the high amount of surface rock cover, erosion is mostly minimal. Protective cover at the bottom of the slope was poor where there was noticeable trampling damage from cattle, but had recovered by 2006. An erosion condition class assessment showed stable soils in 2001 and 2006. Bare ground has been very low at less than 7% cover from 1996 to 2006.

Browse

After the heavy winters of 1983-1984, approximately 84% of the mountain big sagebrush population was classified as heavily browsed. The level of use has steadily declined with each reading to only light use until 2006 when some moderate to heavy use was noted. Sagebrush vigor has been generally good, except in 1984, when 33% of the population showed poor vigor. Decadence in the sagebrush population has drastically improved since 1984. Decadence was estimated at 90% in 1984 and decreased to 10% in 2006. The population appears to have undergone a period of thinning since the 1980's. Plant size has increased with each reading. Cover increased from 6% in 1996 to 9% in 2006. Sagebrush density decreased from 1,180 plants/acre in 1996 and 2001 to 980 plants/acre in 2006. Annual leader growth on sagebrush averaged 2.2 inches in 2001 and 1.7 inches in 2006.

Most of the other browse consists of low value increasers including broom snakeweed, Oregon grape, Woods rose, prickly pear, and dwarf rabbitbrush. A few isolated, heavily browsed serviceberry plants are also found on the site.

Herbaceous Understory

The herbaceous understory provides three-fourths of the total vegetation cover, although composition is dominated by annuals and weeds. Cheatgrass is especially abundant and contributes most of the grass cover. Cheatgrass is spread uniformly over the site and thus poses a fire hazard, especially for the key browse mountain big sagebrush. Kentucky bluegrass is the most abundant perennial grass. It had its greatest abundance in 2001, but decreased to its all-time low in 2006. Showy goldeneye was the most abundant perennial forb in 1996, but this species significantly decreased in 2001. Cudweed sagewort, hairy goldaster, and showy goldeneye have been the most abundant perennial forbs. Abundant annual forbs include storksbill and willowweed.

1990 TREND ASSESSMENT

Mountain big sagebrush is the key species for deer on this critical winter range. The 1984 reading found a highly decadent (90%) and apparently declining population. In 1990, although there are still dying shrubs, it appears that the sagebrush population is improving and stabilizing. There is an abundance of sagebrush seedlings, and percent decadence decreased to 45%. Use also declined to a more moderate level with improved vigor. Sagebrush cover is variable, but averages 6% across the site. One negative change since 1984 is the great increase in the density of broom snakeweed. Nested frequency of Kentucky bluegrass declined significantly. No other perennials were abundant. There was an increase in nested frequency for thistle, low fleabane, cudweed sagewort, and showy goldeneye.

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

1996 TREND ASSESSMENT

The browse trend is limited to only one species, mountain big sagebrush. Density decreased, but these changes in density for this shrub are likely due to the larger sample size used beginning in 1992 which better estimates shrub populations with clumped and/or discontinuous distributions. Sagebrush appears to have stabilized with improved vigor and decreased decadence. All these parameters indicate a stable population. The herbaceous understory is made up of weedy increasers. Annuals and biennials dominate this site. Trend for perennial grasses is slightly down. These species provide high amounts of fine fuel that could provide fuel for a destructive wildfire, which would destroy sagebrush. The forb trend is stable with sum of nested frequency for perennial species changing very little. The Desirable Components Index (see methods) rated this site as very poor due to the poor understory with abundant weeds.

winter range condition (DC Index) - very poor (32) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

2001 TREND ASSESSMENT

Trend for browse is stable. Mountain big sagebrush has a stable density, percent decadence slightly decreased, and use is mostly light. The number of young sagebrush remains stable at 10% of the population. The trend for grasses is slightly up. Nested frequency of Kentucky bluegrass significantly increased. The trend for forbs is down as perennials decreased and annuals increased. The Desirable Components Index (see methods) rated this site as poor due to the abundance of annuals in the understory.

winter range condition (DC Index) - very poor-poor (35) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - down (-2)

2006 TREND ASSESSMENT

The browse trend is stable. Sagebrush density did decrease slightly, but percent decadence also decreased. Young plants were less abundant, but seedlings were numerous. This population has self thinned itself and matured as average height and crown increased by about five inches since 2001. Sagebrush cover increased from 7% to 9% in 2006. The grass trend is down. Kentucky bluegrass and Sandberg bluegrass each decreased significantly, while cheatgrass significantly increased. Cheatgrass was sampled in 100% of the quadrats and at 16% cover is a fire hazard. The forb trend is also down as perennials have decreased again and annuals are even more abundant. A noxious weed (musk thistle) was also sampled for the first time in 2006. Storksbill and willowweed were the most abundant forbs.

winter range condition (DC Index) - very poor (24) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 07 , Study no: 3

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	14	17	19	15	9	.30	.41	.04
G	Bromus japonicus (a)	-	-	$_{b}$150	$_{b}$123	$_{a}$52	2.35	1.10	.24
G	Bromus tectorum (a)	-	-	$_{ab}$298	$_{a}$292	$_{b}$337	10.20	10.08	16.37
G	Poa bulbosa	-	-	-	-	1	-	-	.00
G	Poa fendleriana	-	-	-	-	1	-	-	.03
G	Poa pratensis	$_{d}$138	$_{bc}$91	$_{ab}$54	$_{c}$100	$_{a}$32	1.06	2.16	.40
G	Poa secunda	$_{b}$48	$_{ab}$41	$_{b}$59	$_{b}$42	$_{a}$13	1.25	.43	.25
G	Sitanion hystrix	-	-	-	-	-	-	-	.00
Total for Annual Grasses		0	0	448	415	389	12.55	11.19	16.61
Total for Perennial Grasses		200	149	132	157	56	2.61	3.00	0.73
Total for Grasses		200	149	580	572	445	15.17	14.20	17.34
F	Agoseris glauca	-	-	-	-	2	-	-	.00
F	Alyssum alyssoides (a)	-	-	$_{b}$38	$_{a}$8	$_{b}$58	.16	.07	.32
F	Allium sp.	-	-	-	2	5	-	.00	.01
F	Antennaria rosea	-	3	-	-	-	-	-	-
F	Arabis sp.	-	-	-	5	4	-	.01	.01
F	Artemisia ludoviciana	$_{a}$10	$_{a}$28	$_{a}$36	$_{b}$67	$_{a}$32	2.03	3.72	.33
F	Aster sp.	5	-	3	-	10	.03	-	.21
F	Astragalus sp.	9	-	-	2	3	-	.00	.00
F	Camelina microcarpa (a)	-	-	-	-	1	-	-	.00
F	Carduus nutans (a)	-	-	-	-	5	-	-	.12
F	Cirsium undulatum	$_{c}$51	$_{d}$94	$_{bc}$47	$_{ab}$16	$_{a}$5	1.09	1.32	.04
F	Collomia linearis (a)	-	-	-	3	-	-	.00	-
F	Comandra pallida	3	-	-	-	3	-	-	.03
F	Collinsia parviflora (a)	-	-	$_{a}$-	$_{b}$7	$_{b}$13	-	.02	.07
F	Crepis acuminata	1	-	-	-	-	-	-	-
F	Cryptantha sp.	$_{b}$10	$_{ab}$3	$_{ab}$1	$_{ab}$2	$_{a}$-	.00	.00	-
F	Descurainia pinnata (a)	-	-	-	2	1	-	.00	.00
F	Draba sp. (a)	-	-	2	-	8	.00	-	.01
F	Epilobium brachycarpum (a)	-	-	$_{b}$164	$_{a}$81	$_{b}$169	2.44	.41	1.31
F	Erodium cicutarium (a)	$_{b}$18	$_{a}$-	$_{b}$20	$_{c}$220	$_{c}$225	.27	7.85	4.25
F	Erigeron pumilus	$_{a}$-	$_{c}$37	$_{b}$11	$_{a}$-	$_{a}$-	.40	-	-
F	Eriogonum racemosum	$_{ab}$9	$_{a}$6	$_{ab}$9	$_{ab}$16	$_{b}$13	.13	.60	.15
F	Eriogonum umbellatum	-	-	-	-	3	-	-	.03
F	Grindelia squarrosa	-	-	-	3	-	-	.00	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Heterotheca villosa	$_{a}$-	$_{b}$15	$_{b}$31	$_{c}$55	$_{b}$28	1.60	4.15	.95
F	Holosteum umbellatum (a)	-	-	$_{a}$59	$_{a}$41	$_{b}$146	.44	.11	.59
F	Lactuca serriola	$_{a}$-	$_{ab}$7	$_{b}$22	$_{a}$1	$_{ab}$7	.07	.00	.01
F	Lupinus argenteus	$_{b}$15	$_{b}$12	$_{a}$-	$_{a}$-	$_{a}$-	.00	-	-
F	Machaeranthera canescens	2	-	-	-	-	-	-	-
F	Marrubium vulgare	-	-	-	-	-	-	.03	-
F	Microsteris gracilis (a)	-	-	-	-	3	-	-	.00
F	Phlox longifolia	-	-	-	1	1	-	.00	.00
F	Polygonum douglasii (a)	-	-	$_{b}$17	$_{ab}$8	$_{a}$2	.04	.07	.00
F	Potentilla gracilis	-	-	2	2	1	.00	.00	.03
F	Ranunculus testiculatus (a)	-	-	$_{a}$-	$_{a}$3	$_{b}$12	-	.00	.08
F	Sphaeralcea grossulariifolia	-	-	1	-	-	.00	-	-
F	Tragopogon dubius	3	2	11	9	2	.05	.04	.00
F	Verbascum thapsus	-	-	5	-	1	.33	-	.03
F	Viguiera multiflora	$_{a}$3	$_{b}$63	$_{c}$115	$_{a}$21	$_{b}$59	3.50	.73	1.36
Total for Annual Forbs		18	0	300	373	643	3.37	8.56	6.78
Total for Perennial Forbs		121	270	294	202	179	9.27	10.66	3.24
Total for Forbs		139	270	594	575	822	12.64	19.23	10.03

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

BROWSE TRENDS --
Management unit 07 , Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	1	2	1	.15	.06	.15
B	Artemisia tridentata vaseyana	42	39	37	5.77	7.40	8.64
B	Cercocarpus montanus	0	0	1	-	-	-
B	Chrysothamnus depressus	3	2	1	.03	-	-
B	Gutierrezia sarothrae	52	55	3	2.41	1.66	-
B	Mahonia repens	28	29	32	.42	1.12	1.07
B	Opuntia sp.	13	17	14	.21	.45	.21
B	Rosa woodsii	6	7	7	.59	.81	.93
Total for Browse		145	151	96	9.60	11.51	11.00

CANOPY COVER, LINE INTERCEPT --
Management unit 07 , Study no: 3

Species	Percent Cover '06
Artemisia tridentata vaseyana	10.13
Mahonia repens	.96
Opuntia sp.	.25
Rosa woodsii	1.00

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 07 , Study no: 3

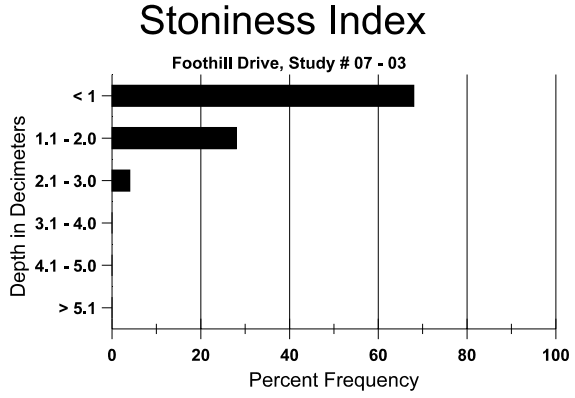
Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	-	3.5
Artemisia tridentata vaseyana	2.3	1.7

BASIC COVER --
Management unit 07 , Study no: 3

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	3.00	5.50	40.96	47.83	34.70
Rock	29.00	34.25	32.87	37.01	44.18
Pavement	1.00	2.50	1.21	3.64	4.41
Litter	52.50	50.50	41.41	30.40	22.21
Cryptogams	.75	.75	.31	0	.01
Bare Ground	13.75	6.50	1.34	4.97	6.54

SOIL ANALYSIS DATA --
Herd Unit 07, Study no: 03, Foothill Drive

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
9.0	57.4 (9.8)	6.4	42.2	29.1	28.7	5.0	27.4	243.2	0.6



PELLET GROUP DATA --
Management unit 07 , Study no: 3

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	7	1
Horse	-	-	2
Elk	-	-	1
Deer	23	11	22
Cattle	7	-	6

Days use per acre (ha)	
'01	'06
-	-
1 (1)	7 (17)
2 (5)	-
56 (139)	68 (169)
7 (16)	9 (23)

BROWSE CHARACTERISTICS --
Management unit 07 , 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)
Amelanchier alnifolia												
84	**33**	-	-	-	33	-	0	100	100	-	0	-/-
90	**33**	-	33	-	-	-	100	0	0	-	0	-/-
96	**20**	-	-	20	-	-	100	0	0	-	0	19/29
01	**40**	-	-	40	-	-	50	50	0	-	0	30/37
06	**20**	-	-	20	-	-	100	0	0	-	0	22/31
Artemisia tridentata vaseyana												
84	**1632**	100	-	166	1466	-	16	84	90	10	33	15/13
90	**1932**	833	200	866	866	-	50	7	45	4	7	27/28
96	**1180**	-	120	820	240	660	32	2	20	-	0	18/34
01	**1180**	-	120	860	200	200	5	2	17	8	8	21/38
06	**980**	180	60	820	100	40	35	29	10	6	6	25/43
Cercocarpus montanus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	100	0	-	-	0	-/-
Chrysothamnus depressus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**80**	-	-	80	-	-	25	0	-	-	0	9/18
01	**40**	-	-	40	-	-	0	0	-	-	0	-/-
06	**20**	-	-	20	-	-	0	100	-	-	0	6/11

		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												
84	**1100**	-	-	1100	-	-	0	0	0	-	0	9/12
90	**10599**	-	3666	6933	-	-	0	0	0	-	0	9/13
96	**4360**	-	180	4180	-	20	0	0	0	-	0	9/12
01	**2680**	-	-	2600	80	40	0	0	3	.74	.74	9/12
06	**60**	-	20	40	-	-	67	0	0	-	0	6/6
Mahonia repens												
84	**933**	-	933	-	-	-	0	0	-	-	0	-/-
90	**1266**	33	1133	133	-	-	0	0	-	-	0	4/3
96	**3260**	-	360	2900	-	-	0	0	-	-	0	5/8
01	**7000**	-	-	7000	-	-	0	0	-	-	0	3/4
06	**6740**	-	340	6400	-	-	0	0	-	-	0	3/4
Opuntia sp.												
84	**366**	-	100	266	-	-	0	0	0	-	0	4/6
90	**166**	66	-	133	33	-	0	0	20	-	20	4/9
96	**400**	-	40	340	20	-	0	0	5	-	0	5/11
01	**620**	-	40	560	20	-	0	0	3	-	0	5/12
06	**1140**	20	340	420	380	-	0	0	33	-	5	5/18
Rosa woodsii												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**1060**	-	500	560	-	-	0	0	0	-	0	16/18
01	**1400**	-	-	1380	20	20	69	26	1	1	1	8/7
06	**1960**	-	460	1500	-	20	0	0	0	-	0	7/8
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	-/-
01	**0**	-	-	-	-	-	0	0	-	-	0	-/-
06	**0**	-	-	-	-	-	0	0	-	-	0	15/29