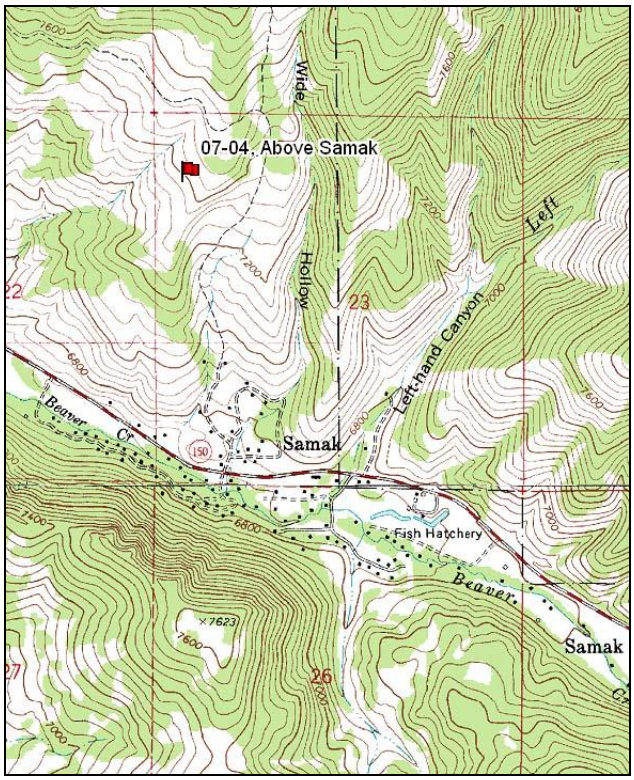
ABOVE SAMAK - TREND STUDY NO. 7-4-11

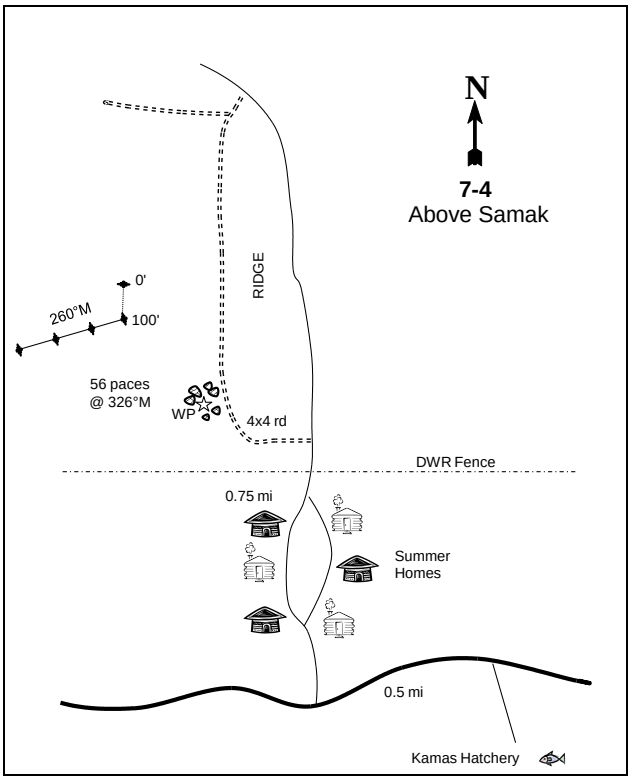
Vegetation Type: Mountain Brush
Range Type: Crucial Deer Winter, Crucial Elk Winter
NRCS Ecological Site Description: Mountain Loam (Mountain Big Sagebrush), R047XA461UT
Land Ownership: DWR
Elevation: 7,300 ft (2,225 m)
Aspect: Southwest
Slope: 23%
Transect bearing: 180° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (71ft), line 4 (34ft)

Directions:
From the Kamas fish hatchery proceed west 0.5 miles. Turn right onto a dirt road and proceed north. The road will split (go left) around the summer houses and reunite in 0.2 miles. After passing the homes, you will come to a DWR fence and gate. Proceed 0.1 miles past the gate and turn left, proceeding up a very steep hill (4X4 recommended). Drive north to a half high witness post in the middle of a rock pile on th left side of the road. The rockpile is 0.50 miles from the highway. From the rockpile, walk 56 paces at 326 degrees magnetic to the 100-foot stake of the baseline. The 0-foot stake is marked by browse tag #7959. The rest of the baseline doglegs at the 100-foot baseline stake and runs 260 degrees magnetic.

Map Name: Hoyt Peak



Diagrammatic Sketch:



Township: 2S Range: 6E Section: 22

GPS: NAD 83, UTM 12S 479672 E 4498471 N

ABOVE SAMAK - TREND STUDY NO. 7-4

Site Information

Site Description: The study is located on the Kamas Wildlife Management Area in Beaver Creek Canyon. This area can be classified as deer and elk winter range during more mild winters or transitional spring-fall range during harsher winters. The site and surrounding area was burned and seeded in the early-1960's. Prior to the fire, the community was dominated by Gambel oak (*Quercus gambelii*) with a few other mountain brush species and little herbaceous cover. The site is now made up of scattered openings of mountain brush and seeded grasses interspersed with Gambel oak clones. Animal presence has been variable depending on wintering conditions. Deer pellet groups has been sampled in moderate abundance since 2001. Elk pellet groups were sampled in moderate abundance in 2001, but in low abundance since 2006. Cattle pats were sampled in low abundance in 2001 and 2011, but in moderate abundance in 2006 (Table - Pellet Group Data).

Browse: Browse composition consists of a mix of Gambel oak, mountain snowberry (*Symphoricarpos oreophilus*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Saskatoon serviceberry (*Amelanchier alnifolia*), and several less numerous shrubs. There was moderate to heavy use on all browse species during the harsh winter of 1983-84. Following the initial sample year, Gambel oak utilization has been light. The oak population has consisted of a preponderance of young plants in the past. Oak clones are located primarily around the first two sample belts, and vary in height throughout the site with the larger ones being estimated at 12 to 15 feet. The serviceberry population is comprised of a small density of heavily utilized plants. Mountain big sagebrush is comprised of a moderately dense population of moderately used plants. Density of sagebrush has been decreasing steadily since the outset of the study. Recruitment of young sagebrush plants has been fairly poor over the course of the study. Mountain snowberry is a moderately dense population of lightly utilized plants. Antelope bitterbrush (*Purshia tridentata*) is found on the site in low density, with most plants growing in a prostrate growth form and displaying heavy use (Table - Browse Characteristics). Cover of bitterbrush has been increasing since 1996, but is still low on the site (Table - Browse Trends).

Herbaceous Understory: The composition of the herbaceous understory is dominated by seeded species, primarily grasses. The seeded grass species smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), and intermediate wheatgrass (*A. intermedium*) are all very common and dominate the grass component of the site. The invasive perennial grass bulbous bluegrass (*Poa bulbosa*) is found on the site, and increased significantly in nested frequency in 2011. Perennial forb species are diverse on the site, but most individual species occur in low abundance. Alfalfa (*Medicago sativa*), also a seeded species, is the most abundant forb in terms of cover (Table - Herbaceous Trends). At this higher elevation, alfalfa has not shown signs of decline like it has on many other lower elevation range seedings.

Soil: Soils on the site are part of the Yeates Hollow-Henefer complex. Parent material for these soils consists either of colluvium derived from conglomerate, sandstone, and quartzite, or colluviums derived from quartzite, sandstone, and shale (Soil Survey Staff 2011). Soil texture was classified as a clay loam with a neutral soil reaction (6.8 pH) (Table - Soil Analysis Data). Bare ground cover is low, with a large amount of vegetation, litter, rock, and pavement cover (Table - Basic Cover). Due to the high amount of rock in the upper soil profile, the moderately steep slope, and the southwest aspect, this site can be rather dry during the summer. Some "trailing" and trampling damage associated with livestock use is apparent, but does not appear to cause substantial erosion problems. The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** The density of mountain big sagebrush decreased 31% from 2,398 plants/acre to 1,665 plants/acre. Decadence of sagebrush increased from 14% to 28%, and poor vigor

increased from 0% to 12%. Recruitment of young sagebrush plants decreased from 28% to 8% of the population. Serviceberry density decreased 29% from 465 plants/acre to 332 plants/acre.

- **1990 to 1996 - stable (0):** Differences in density may be related to the larger sample area used in 1996; therefore, trend was determined using other parameters. Decadence of mountain big sagebrush decreased to 6%, and poor vigor decreased to 0%. However, recruitment of young sagebrush plants also continued to decrease to 5% of the population.
- **1996 to 2001 - slightly down (-1):** Mountain big sagebrush density decreased 11% from 1,320 plants/acre to 1,180 plants/acre, though cover increased slightly from 6% to 8%. Decadence of sagebrush increased to 17%, and poor vigor increased to 7%. Recruitment of young sagebrush plants continued to decrease to 2%.
- **2001 to 2006 - down (-2):** The density of sagebrush decreased by 24% to 900 plants/acre, and cover decreased to 6%. Decadence of sagebrush increased to 24%, and poor vigor increased slightly to 9%. Recruitment of young sagebrush plants increased to 11% of the population. Density of serviceberry decreased 31% from 260 plants/acre to 180 plants/acre.
- **2006 to 2011 - stable (0):** Sagebrush density decreased slightly to 820 plants/acre, and cover decreased slightly to 5%. Decadence of sagebrush remained similar at 20%, and poor vigor increased to 15%. Recruitment of young sagebrush plants decreased slightly to 7% of the population.

Grass:

- **1984 to 1990 - stable (0):** The sum of nested frequency of perennial grasses remained similar. Grass species identification was difficult due to heavy utilization before the study was sampled.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial grasses increased 11%.
- **1996 to 2001 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover decreased from 23% to 16%.
- **2001 to 2006 - stable (0):** The sum of nested frequency and cover of perennial grasses remained similar.
- **2006 to 2011 - stable (0):** The sum of nested frequency of perennial grasses remained similar, though cover increased to 25%. There was a significant increase in the nested frequency of the invasive perennial grass species bulbous bluegrass, and cover increased from less than 1% to 2%.

Forb:

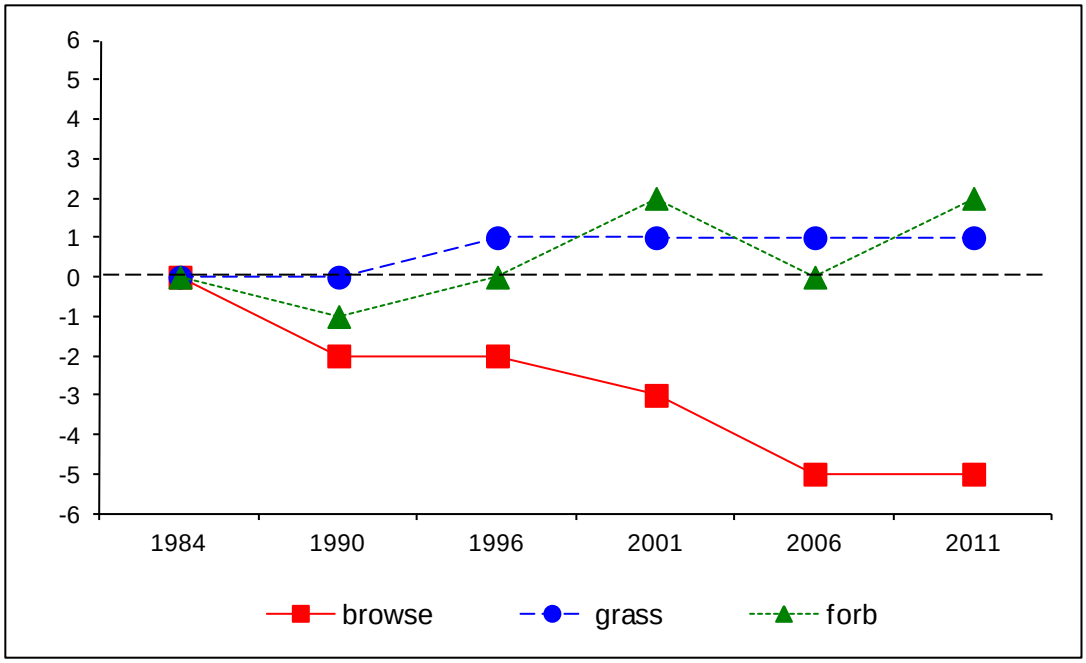
- **1984 to 1990 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased by 16%.
- **1990 to 1996 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 13%.
- **1996 to 2001 - up (+2):** There was a 41% increase in the sum of nested frequency of perennial grasses, and cover increased from 6% to 8%.
- **2001 to 2006 - down (-2):** The sum of nested frequency of perennial forbs decreased by 41%, and cover decreased to 6%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased nearly three-fold, and cover increased to 14%.

DEER DESIRABLE COMPONENTS INDEX - HIGH POTENTIAL SCALE --
Management unit 7, study no: 4

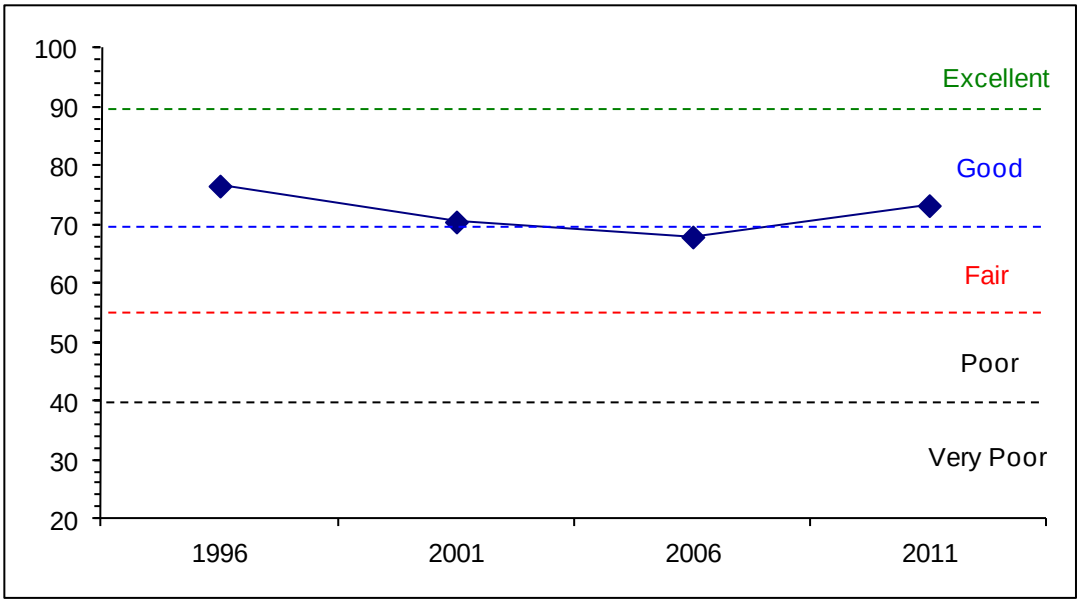
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
96	13.6	13.0	9.9	30.0	0.0	10.0	0.0	**76.5**	Good
01	15.6	10.1	4.7	30.0	0.0	10.0	0.0	**70.4**	Fair-Good
06	12.6	8.2	7.1	30.0	0.0	10.0	0.0	**67.9**	Fair
11	12.8	11.7	8.8	30.0	0.0	10.0	0.0	**73.2**	Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 7 Study no: 4



DEER DESIRABLE COMPONENTS INDEX TREND, HIGH POTENTIAL--
Management unit 7, Study no: 4



HERBACEOUS TRENDS--
Management unit 07, Study no: 4

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron cristatum	abc117	ab100	bc145	abc124	c149	a108	5.53	2.86	4.31	4.83
G	Agropyron dasystachyum	a-	a-	a-	b11	a-	a-	-	.27	-	-
G	Agropyron intermedium	a55	a47	c103	ab77	ab78	a61	4.07	1.88	1.88	2.57
G	Agropyron spicatum	b26	ab20	ab16	ab5	a-	a1	.46	.04	-	.00
G	Bromus inermis	a243	ab267	ab249	ab266	ab260	b288	12.64	10.56	9.60	15.41
G	Bromus japonicus (a)	-	-	-	3	-	-	-	.03	-	-
G	Poa bulbosa	a-	a-	a3	a9	a10	b80	.00	.16	.13	2.35
G	Poa fendleriana	a-	b20	a1	a5	a3	a6	.00	.18	.18	.03
G	Poa pratensis	-	4	-	-	-	3	-	-	-	.15
G	Poa secunda	3	8	7	14	17	6	.10	.25	.57	.01
G	Stipa lettermani	-	7	-	-	-	-	-	-	-	-
Total for Annual Grasses		0	0	0	3	0	0	0	0.03	0	0
Total for Perennial Grasses		444	473	524	511	517	553	22.83	16.22	16.69	25.37
Total for Grasses		444	473	524	514	517	553	22.83	16.25	16.69	25.37
F	Achillea millefolium	5	4	1	2	5	7	.06	.03	.03	.15
F	Agoseris glauca	a-	a-	a-	a3	a-	b28	-	.00	-	.24
F	Allium acuminatum	a10	a18	a6	a27	a19	b91	.04	.10	.06	.44
F	Alyssum alyssoides (a)	-	-	-	2	-	5	-	.00	-	.01
F	Arabis sp.	-	4	4	9	1	2	.04	.07	.03	.00
F	Aster sp.	-	-	-	-	3	-	-	-	.03	-
F	Astragalus convallarius	3	2	6	-	7	2	.06	-	.33	.03
F	Astragalus sp.	a-	a-	a-	b15	b11	c49	-	.34	.13	1.77
F	Calochortus nuttallii	-	-	-	4	-	3	-	.01	-	.00
F	Castilleja chromosa	-	-	-	-	3	4	-	-	.00	.06
F	Chaenactis douglasii	-	-	1	-	-	-	.00	-	-	-
F	Cirsium sp.	1	6	-	-	-	1	-	-	-	.03
F	Collinsia parviflora (a)	-	-	a31	bc86	ab53	c110	.14	.33	.14	.40
F	Comandra pallida	-	-	-	5	4	10	-	.07	.04	.09
F	Crepis acuminata	-	-	-	-	-	-	-	-	.00	-
F	Cryptantha sp.	b20	a-	a-	a-	a-	a-	-	-	-	-
F	Descurainia pinnata (a)	-	-	-	-	-	2	-	-	-	.00
F	Draba sp. (a)	-	-	-	-	-	3	-	-	-	.00
F	Epilobium brachycarpum (a)	-	-	a-	a2	a15	b17	-	.00	.11	.07
F	Erigeron pumilus	15	10	15	-	-	5	.13	-	-	.21
F	Eriogonum racemosum	-	-	-	7	1	-	-	.09	.03	-
F	Geranium sp.	a-	a-	a-	a-	a-	b23	-	-	-	.16
F	Holosteum umbellatum (a)	-	-	-	-	7	-	-	-	.02	-
F	Lithophragma sp.	-	-	-	-	-	5	-	-	-	.01
F	Lomatium triternatum	-	-	-	-	-	2	-	-	-	.00
F	Machaeranthera canescens	b35	a6	a4	a-	a-	a3	.04	-	-	.00
F	Medicago sativa	42	40	55	59	44	65	2.96	4.21	2.58	7.15
F	Microsteris gracilis (a)	-	-	a-	c51	b11	c75	-	.22	.02	.25
F	Penstemon humilis	b55	b55	b55	ab29	a8	a15	1.02	.32	.10	.60

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Petradoria pumila	$_{a}$-	$_{a}$-	$_{ab}$25	$_{c}$38	$_{ab}$29	$_{b}$23	1.08	2.44	2.45	1.88
F	Phlox longifolia	$_{a}$-	$_{ab}$8	$_{a}$2	$_{ab}$9	$_{ab}$11	$_{b}$20	.00	.05	.07	.06
F	Polygonum douglasii (a)	-	-	$_{ab}$21	$_{a}$3	$_{b}$23	$_{ab}$21	.04	.00	.05	.07
F	Ranunculus testiculatus (a)	-	-	$_{a}$21	$_{b}$94	$_{b}$98	$_{b}$91	.07	1.78	.93	.42
F	Senecio integerrimus	$_{a}$-	$_{a}$2	$_{a}$-	$_{a}$12	$_{a}$2	$_{b}$40	-	.08	.00	.78
F	Verbascum thapsus	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$28	$_{a}$-	$_{a}$-	-	.48	-	-
F	Veronica biloba (a)	-	-	$_{b}$117	$_{b}$116	$_{a}$57	$_{b}$105	.46	.50	.30	2.41
F	Viola sp.	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$16	-	-	-	.09
F	Zigadenus paniculatus	-	2	4	4	-	5	.09	.06	-	.09
Total for Annual Forbs		0	0	190	354	264	429	0.72	2.84	1.58	3.65
Total for Perennial Forbs		186	157	178	251	148	419	5.55	8.38	5.91	13.92
Total for Forbs		186	157	368	605	412	848	6.27	11.23	7.50	17.56

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

BROWSE TRENDS--
Management unit 07, Study no: 4

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	13	12	8	10	1.27	1.42	1.06	1.34
B	Artemisia tridentata vaseyana	39	38	35	35	6.27	8.01	5.76	4.97
B	Cercocarpus montanus	0	0	0	1	-	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	0	1	1	1	.12	.06	.24	.18
B	Gutierrezia sarothrae	3	7	8	8	-	-	-	.03
B	Mahonia repens	34	35	35	32	.90	.21	.70	.85
B	Opuntia sp.	0	0	0	1	-	-	-	-
B	Purshia tridentata	1	2	2	2	.03	.48	.56	1.41
B	Quercus gambelii	19	21	16	21	3.82	2.72	3.00	2.45
B	Symphoricarpos oreophilus	29	36	41	38	3.82	5.22	4.74	5.25
Total for Browse		138	152	146	149	16.25	18.13	16.08	16.48

CANOPY COVER, LINE INTERCEPT--
Management unit 07, Study no: 4

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.70	.63
Artemisia tridentata vaseyana	6.73	8.60
Chrysothamnus viscidiflorus viscidiflorus	.33	-
Mahonia repens	.40	1.01
Purshia tridentata	1.18	1.50
Quercus gambelii	6.91	10.06
Symphoricarpos oreophilus	6.19	8.03

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 07, Study no: 4

Species	Average leader growth (in)		
	'01	'06	'11
Amelanchier alnifolia	2.3	2.4	3.4
Artemisia tridentata vaseyana	1.3	2.0	4.2

BASIC COVER--
Management unit 07, Study no: 4

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	5.00	11.00	44.96	44.24	35.26	56.80
Rock	12.50	13.25	16.81	15.30	16.32	15.08
Pavement	9.25	15.00	3.97	5.63	6.30	2.11
Litter	54.75	40.50	45.09	35.33	39.91	39.33
Cryptogams	0	.75	.66	.33	.06	.03
Bare Ground	18.50	19.50	9.90	21.62	15.23	10.09

SOIL ANALYSIS DATA --
Management unit 07, Study no: 4, Study Name: Above Samak

Effective rooting depth (in)	pH	N/A			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
15.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

PELLET GROUP DATA--
Management unit 07, Study no: 4

Type	Quadrat Frequency			
	'96	'01	'06	'11
Rabbit	-	1	5	-
Elk	8	17	11	1
Deer	12	8	13	2
Cattle	3	4	6	3

Days use per acre (ha)		
'01	'06	'11
-	-	-
23 (56)	11 (26)	8 (20)
31 (76)	21 (51)	20 (50)
9 (23)	22 (54)	7 (16)

BROWSE CHARACTERISTICS--
Management unit 07, Study no: 4

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Amelanchier alnifolia									
84	**465**	14	86	0	-	29	71	0	40/37
90	**332**	40	40	20	133	20	60	0	34/30
96	**280**	0	79	21	20	14	71	7	31/43
01	**260**	0	77	23	-	46	46	8	29/33
06	**180**	0	44	56	-	22	78	22	37/41
11	**200**	10	80	10	-	60	30	10	36/43

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana									
84	**2398**	28	58	14	199	61	39	0	20/29
90	**1665**	8	64	28	-	52	8	12	19/23
96	**1320**	5	89	6	20	61	6	0	21/35
01	**1180**	2	81	17	40	41	14	7	25/34
06	**900**	11	64	24	100	20	9	9	27/42
11	**820**	7	73	20	20	32	5	15	27/48
Cercocarpus montanus									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**0**	0	0	-	-	0	0	0	-/-
01	**0**	0	0	-	-	0	0	0	-/-
06	**0**	0	0	-	-	0	0	0	-/-
11	**20**	0	100	-	-	100	0	0	71/59
Chrysothamnus depressus									
84	**0**	0	0	0	-	0	0	0	-/-
90	**0**	0	0	0	-	0	0	0	-/-
96	**0**	0	0	0	-	0	0	0	-/-
01	**20**	0	0	100	-	100	0	0	-/-
06	**20**	0	0	100	-	0	0	0	2/2
11	**20**	0	100	0	-	0	0	0	7/18
Chrysothamnus viscidiflorus viscidiflorus									
84	**0**	0	0	0	-	0	0	0	-/-
90	**0**	0	0	0	-	0	0	0	-/-
96	**60**	0	100	0	-	0	0	0	12/17
01	**180**	0	100	0	-	0	0	0	10/12
06	**280**	0	93	7	-	0	0	7	12/20
11	**480**	42	58	0	-	0	0	0	15/24
Mahonia repens									
84	**15799**	0	100	0	-	0	0	0	4/6
90	**4998**	84	16	0	-	0	0	0	4/5
96	**2880**	3	97	0	-	0	0	0	3/5
01	**4880**	7	93	0	20	0	0	0	3/3
06	**4940**	2	97	1	-	0	0	0	3/4
11	**3800**	5	95	0	-	0	0	0	4/7
Opuntia sp.									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**0**	0	0	-	-	0	0	0	-/-
01	**0**	0	0	-	-	0	0	0	4/8
06	**0**	0	0	-	-	0	0	0	6/13
11	**20**	0	100	-	-	0	0	0	4/15

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Purshia tridentata									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**20**	0	100	-	-	0	100	0	11/41
01	**40**	0	100	-	-	50	0	0	19/68
06	**40**	0	100	-	-	50	50	0	13/48
11	**60**	0	100	-	-	67	33	0	18/51
Quercus gambelii									
84	**12598**	79	21	0	3066	75	8	0	47/37
90	**10798**	78	8	14	4199	15	0	3	58/29
96	**1360**	51	46	3	220	24	0	0	31/25
01	**3340**	38	49	13	-	0	0	18	51/20
06	**1500**	28	59	13	820	1	0	9	35/23
11	**2240**	53	47	0	-	0	0	0	-/-
Symphoricarpos oreophilus									
84	**1066**	12	88	0	-	100	0	0	18/29
90	**1999**	7	67	27	66	20	7	33	14/15
96	**1200**	10	77	13	-	38	12	7	16/31
01	**1500**	9	88	3	-	0	0	0	15/28
06	**2240**	29	70	2	180	2	.89	.89	16/29
11	**1500**	8	92	0	-	3	0	0	17/35
Tetradymia canescens									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**0**	0	0	-	-	0	0	0	-/-
01	**0**	0	0	-	-	0	0	0	8/20
06	**0**	0	0	-	-	0	0	0	-/-
11	**0**	0	0	-	-	0	0	0	-/-