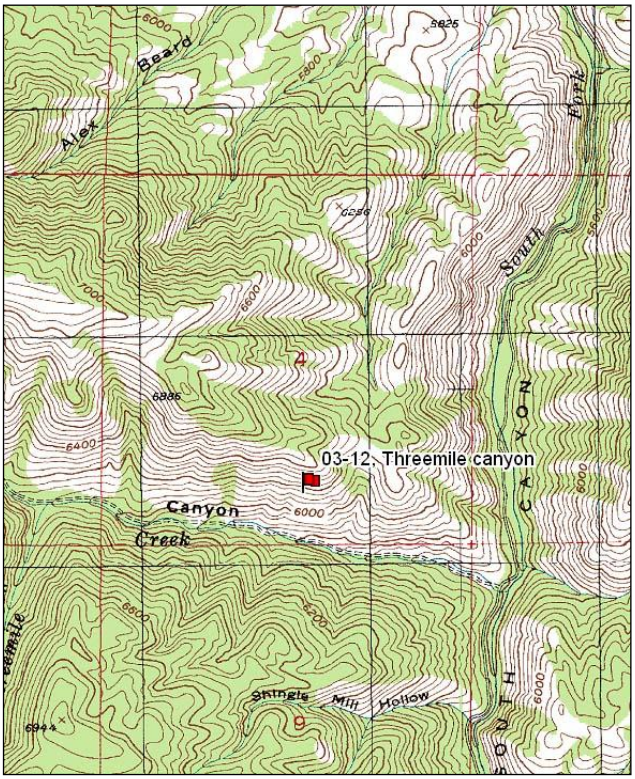
THREEMILE CANYON - TREND STUDY NO. 3-12-11

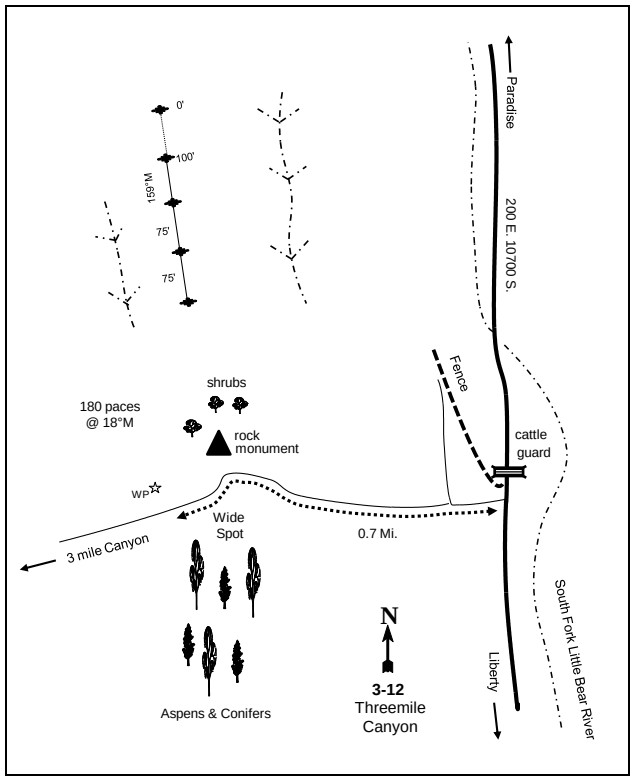
Vegetation Type: Bitterbrush
Range Type: Crucial Deer Winter, Crucial Elk Winter
NRCS Ecological Site Description: Mountain Stony Loam (Mountain Big Sagebrush), R047XA461UT
Land Ownership: USFS
Elevation: 6,100 ft (1,859 m)
Aspect: South
Slope: 45%
Transect bearing: 159° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 1 on 3ft.

Directions:
From 200 East and 10700 South in Avon, proceed south (towards Liberty) on a dirt road for 7.0 miles. Cross the cattle guard and turn immediately right (west). Travel 0.7 miles up Threemile Canyon and stop adjacent to a green and white witness post on the right side of road. Walk 180 paces at 18 degrees magnetic from the witness post to the last baseline stake. From the last baseline stake to the 0-foot baseline stake walk 400 feet at an azimuth 340 degrees magnetic. The 0-foot stake is marked by browse tag #7982.

Map Name: James Peak



Diagrammatic Sketch:



Township: 8N Range: 1E Section: 4

GPS: NAD 83, UTM 12S 429564 E 4589493 N

Site Information

Site Description: This study samples a sparse antelope bitterbrush (*Purshia tridentata*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community on a steep, south facing side hill in Threemile Canyon, a tributary of the South Fork of the Little Bear River. Deer and elk pellet groups have been sampled in low abundance since 2005 (Table - Pellet Group Data).

Browse: Browse composition primarily consists of a moderately dense stand of antelope bitterbrush, interspersed with a low density stand of mountain big sagebrush. Bitterbrush provides nearly all of the browse cover on the site (Table - Browse Trends). Utilization of bitterbrush has been mostly moderate, with some heavy use. Decadence of bitterbrush was high at the outset of the study, but decreased in 1996 and has been low since that time. Recruitment of young bitterbrush plants has been poor in most sample years. Mountain big sagebrush density steadily decreased from 1984 to 2006, with no sagebrush plants sampled in 2006. Decadence of sagebrush was high throughout those sample years. In 2011, a small population of mostly young sagebrush plants was sampled, and decadence was low. Utilization of sagebrush was moderate to heavy at the outset of the study, but has been mostly light since 1996. Mountain snowberry (*Symphoricarpos oreophilus*), Woods rose (*Rosa woodsii*), and Saskatoon serviceberry (*Amelanchier alnifolia*) are also present in low numbers (Table - Browse Characteristics).

Herbaceous Understory: Grasses are abundant on the site, but the grass composition is dominated by weedy species. The annual grass species Japanese chess (*Bromus japonicus*) and cheatgrass (*B. tectorum*) are prevalent. The weedy perennial species bulbous bluegrass (*Poa bulbosa*) was rare at the outset of the study, but has steadily increased over the course of the study and is now one of the dominant species on the site. The native perennial species bluebunch wheatgrass (*Agropyron spicatum*) is the only other grass species that provides substantial cover. Bluebunch wheatgrass has maintained a fairly stable frequency over the course of the study. Forbs are fairly diverse and abundant, but are dominated by annual or weedy species such as tall annual willowherb (*Epilobium brachycarpum*), prickly lettuce (*Lactuca serriola*), and yellow salsify (*Tragopogon dubius*). The noxious weed dyer's woad (*Isatis tinctoria*) is also found on the site. Arrowleaf balsamroot (*Balsamorhiza sagittata*) is perhaps the most desirable forb, but it occurs only occasionally (Table - Herbaceous Trends).

Soil: The soil is in the Sheep Creek series, which occurs on mountain slopes. Parent material consists of residuum and colluvium derived from limestone, sandstone, and quartzite. The soils are classified as moderately deep, well drained soils (Soil Survey Staff 2011). Soils have a clay loam texture with a neutral soil reaction (pH 7.2) (Table - Soil Analysis Data). This soil often has a calcareous accumulation at approximately 22 inches depth. Rocks are common on the surface and within the profile. Bare ground cover is low, with a large amount of vegetation and litter providing protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable since 2001.

Trend Assessments

Browse:

- **1984 to 1990 - down (-2):** Bitterbrush density decreased 22% from 599 plants/acre to 465 plants/acre, and sagebrush density decreased 67% from 999 plants/acre to 332 plants/acre. Decadence of bitterbrush and sagebrush remained high at 43% and 50%, respectively.
- **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 bitterbrush decreased to 5%, but decadence in the small population of sagebrush remained similar at 44%. Recruitment of young bitterbrush plants increased to 12% of the population.

- **1996 to 2001 - slightly down (-1):** Density of bitterbrush decreased 15% to from 820 plants/acre to 700 plants/acre, but cover remained similar at 8%. Decadence of bitterbrush increased to 17%, and recruitment of young plants decreased to 3%.
- **2001 to 2006 - slightly up (+1):** The density of bitterbrush increased 17% to 820 plants/acre, and cover remained similar at 8%. Decadence of bitterbrush decreased to 7%, but recruitment of young plants remained low at 5%.
- **2006 to 2011 - down (-2):** Bitterbrush density decreased 22% to 640 plants/acre, but cover increased slightly to 10%. Decadence decreased to 0%, and recruitment of young plants remained similar at 3%.

Grass:

- **1984 to 1990 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 10%. Bluebunch wheatgrass decreased significantly in nested frequency, while the weedy species bulbous bluegrass increased significantly.
- **1990 to 1996 - slightly down (-1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 19%. Annual grasses were included in the sample for the first time, and were shown to dominate the site providing 26% cover.
- **1996 to 2001 - slightly down (-1):** There was little change in the sum of nested frequency of perennial grasses, excluding bulbous bluegrass, though cover increased from 5% to 10%. The weedy species bulbous bluegrass increased significantly in nested frequency on the site, and cover increased from near 0% to 2%. Annual grasses still dominated the site, and increased in cover to 30%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, increased by 31%, but cover remained similar at 10%. Bluebunch wheatgrass increased significantly in nested frequency, and cover increased from 8% to 9%. However, bulbous bluegrass also increased significantly in nested frequency, and cover increased from 2% to 3%. Japanese chess decreased significantly in nested frequency, and cover decreased from 8% to 1%. Nested frequency of cheatgrass remained similar, but cover decreased from 22% to 10%.
- **2006 to 2011 - down (-2):** The sum of nested frequency of perennial grasses, excluding bulbous bluegrass, decreased by 26%, though cover remained similar. Bulbous bluegrass increased significantly in nested frequency, and cover increased to 9%.

Forb:

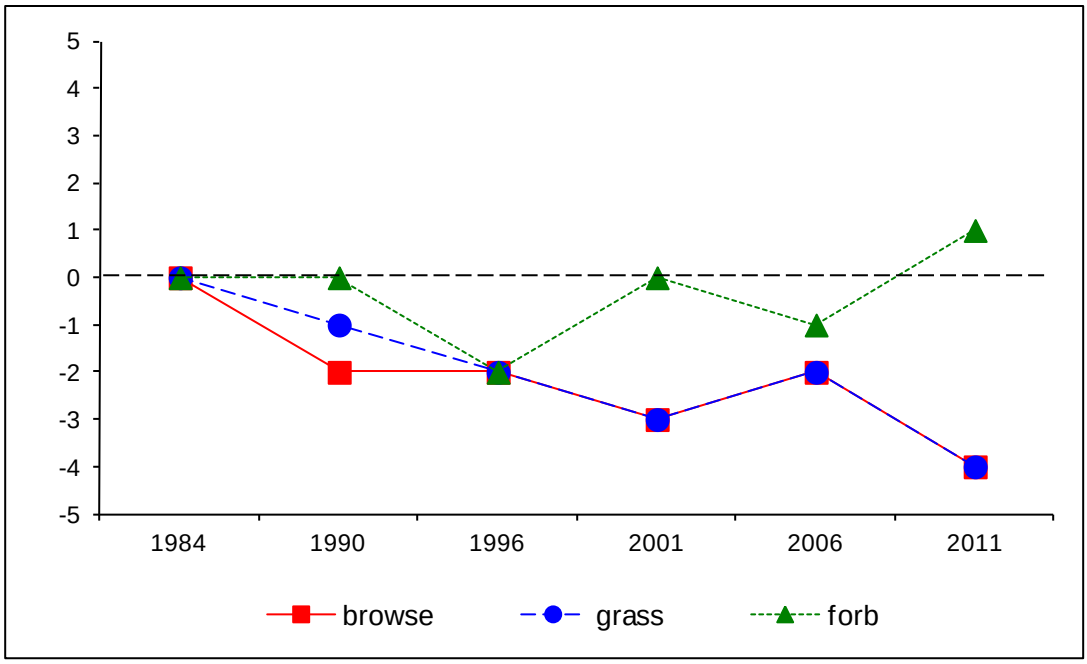
- **1984 to 1990 - stable (0):** The sum of nested frequency of perennial forbs remained similar. The annual forb sum of nested frequency increased substantially.
- **1990 to 1996 - down (-2):** There was a 27% decrease in the sum of nested frequency of perennial forbs. The sum of nested frequency of annual forbs again increased markedly.
- **1996 to 2001 - up (+2):** The sum of nested frequency of perennial forbs increased 36%, and cover increased from 5% to 7%.
- **2001 to 2006 - slightly down (-1):** The sum of nested frequency of perennial forbs increased 25%, and cover increased to 9%. However, much of this increase was due to an increase in the nested frequency of the noxious weed, dyer's woad, and the weedy species stickseed (*Hackelia patens*). The sum of nested frequency of annual forbs increased substantially, and cover increased from 7% to 13%.
- **2006 to 2011 - up (+2):** The sum of nested frequency of perennial forbs increased by 31%, and cover increased to 11%. There was a significant decrease in the noxious weed dyer's woad. The sum of nested frequency of annual forbs remained similar, but cover increased to 30%. The increase in cover of annual forbs is primarily due to a large increase in cover of tall annual willowherb.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 3, study no: 12

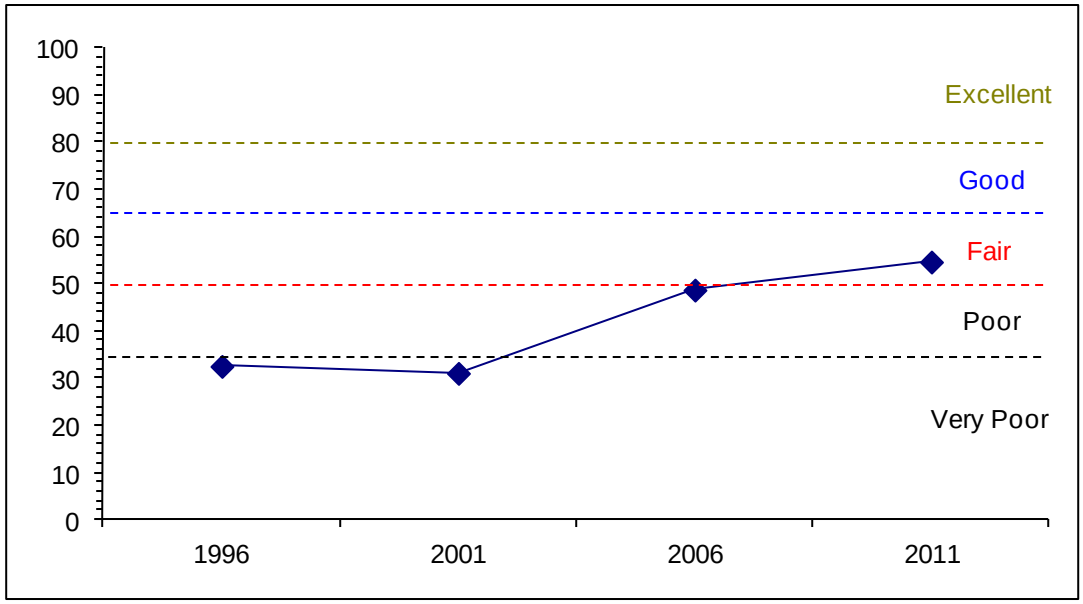
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
96	12.8	13.0	6.3	13.0	-19.8	9.2	-2.0	**32.5**	Very Poor
01	11.6	9.9	1.6	19.9	-20.0	10.0	-2.0	**31.0**	Very Poor
06	12.5	13.0	2.4	20.6	-7.8	10.0	-2.0	**48.7**	Poor-Fair
11	15.2	14.9	1.8	21.6	-7.0	10.0	-2.0	**54.6**	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 3 Study no: 12



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 3, Study no: 12



HERBACEOUS TRENDS--
Management unit 03, Study no: 12

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron intermedium	-	-	-	-	-	2	-	-	-	.03
G	Agropyron spicatum	c220	ab164	a120	a131	bc178	ab151	4.64	7.90	9.40	10.60
G	Bromus japonicus (a)	-	-	c354	b205	a90	a128	20.07	8.06	.52	1.87
G	Bromus tectorum (a)	-	-	a209	b276	b300	a192	6.28	22.38	9.89	7.45
G	Carex sp.	-	-	-	3	-	2	-	.00	-	.00
G	Elymus cinereus	a-	a1	b22	ab13	ab8	a-	1.63	1.83	.36	-
G	Poa bulbosa	a-	b18	b11	c75	d121	e178	.12	1.57	2.61	8.46
G	Poa secunda	a-	b32	ab18	ab18	b30	a4	.20	.20	.55	.15
Total for Annual Grasses		0	0	563	481	390	320	26.36	30.44	10.41	9.32
Total for Perennial Grasses		220	215	171	240	337	337	6.60	11.52	12.92	19.26
Total for Grasses		220	215	734	721	727	657	32.96	41.97	23.34	28.59
F	Achillea millefolium	a-	a-	ab6	ab6	a2	b11	.03	.06	.15	.30
F	Agoseris glauca	bc34	abc19	a5	a1	ab17	c46	.01	.01	.10	.63
F	Allium acuminatum	a17	a-	a-	a-	a4	b26	-	-	.01	.36
F	Alyssum alyssoides (a)	-	-	ab88	ab109	a50	b97	.30	1.23	.18	1.76
F	Artemisia ludoviciana	25	30	29	56	31	52	.88	3.27	1.70	3.44
F	Aster chilensis	-	-	1	1	-	3	.06	.00	-	.21
F	Balsamorhiza sagittata	14	16	6	14	11	16	1.75	2.82	2.75	3.09
F	Calochortus nuttallii	-	8	-	2	9	7	-	.00	.04	.04
F	Camelina microcarpa (a)	-	-	1	5	6	4	.00	.04	.02	.00
F	Chaenactis douglasii	-	-	-	-	-	3	-	-	-	.00
F	Cirsium sp.	a1	b29	a13	a2	a5	a2	.37	.06	.42	.03
F	Collinsia parviflora (a)	-	-	a3	a1	b54	a3	.00	.00	.13	.03

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Collomia linearis (a)	-	-	$_{b}$44	$_{a}$10	$_{b}$67	$_{a}$11	.18	.02	.28	.02
F	Crepis acuminata	$_{a}$-	$_{b}$29	$_{ab}$21	$_{a}$6	$_{ab}$7	$_{ab}$18	.22	.09	.45	.97
F	Epilobium brachycarpum (a)	-	-	$_{b}$104	$_{a}$18	$_{c}$166	$_{c}$193	.91	.04	3.18	11.44
F	Erodium cicutarium (a)	-	-	$_{a}$-	$_{b}$10	$_{c}$83	$_{b}$34	-	.13	1.60	.21
F	Galium aparine (a)	-	-	$_{a}$3	$_{a}$-	$_{b}$34	$_{b}$48	.03	-	.20	1.88
F	Hackelia patens	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$6	$_{b}$41	$_{a}$8	-	.06	.80	.33
F	Holosteum umbellatum (a)	-	-	$_{a}$7	$_{b}$77	$_{b}$104	$_{a}$11	.02	.33	.35	.45
F	Isatis tinctoria	$_{a}$-	$_{a}$4	$_{a}$7	$_{ab}$16	$_{b}$32	$_{a}$13	.16	.22	1.38	.35
F	Lactuca serriola (a)	$_{a}$-	$_{a}$43	$_{b}$99	$_{bc}$113	$_{c}$133	$_{d}$254	1.13	2.82	2.46	9.07
F	Lappula occidentalis (a)	-	-	$_{a}$2	$_{b}$18	$_{ab}$12	$_{b}$18	.00	.06	.03	.14
F	Lesquerella sp.	-	-	-	2	-	-	-	.00	-	-
F	Lithospermum ruderale	-	-	12	6	5	1	1.06	.45	.93	.03
F	Lomatium grayi	-	1	-	-	6	1	-	-	.16	.03
F	Madia glomerata (a)	-	-	-	-	17	8	-	-	1.14	.19
F	Melilotus officinalis	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$13	-	-	-	.66
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{a}$-	$_{c}$41	$_{b}$22	-	-	.15	.09
F	Polygonum douglasii (a)	-	-	-	1	6	6	.00	.00	.01	.01
F	Ranunculus testiculatus (a)	-	-	-	3	4	-	-	.00	.00	-
F	Senecio multilobatus	$_{b}$41	$_{a}$-	$_{a}$-	$_{a}$2	$_{a}$-	$_{a}$3	-	.00	-	.15
F	Sisymbrium altissimum (a)	-	-	-	-	5	3	-	-	.48	.03
F	Tragopogon dubius (a)	$_{a}$32	$_{d}$185	$_{d}$195	$_{b}$76	$_{bc}$95	$_{c}$139	5.07	2.05	2.01	2.11
F	Unknown forb-perennial	-$_{a}$	$_{a}$-	$_{a}$-	$_{b}$16	$_{a}$-	$_{a}$-	-	.13	-	-
F	Veronica biloba (a)	-	-	$_{a}$21	$_{a}$45	$_{c}$170	$_{b}$102	.70	.14	1.11	2.74
Total for Annual Forbs		32	228	567	486	1047	953	8.38	6.90	13.40	30.22
Total for Perennial Forbs		132	136	100	136	170	223	4.57	7.21	8.94	10.66
Total for Forbs		164	364	667	622	1217	1176	12.96	14.11	22.34	40.89

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

BROWSE TRENDS--
Management unit 03, Study no: 12

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Artemisia tridentata vaseyana	8	5	0	3	.41	-	-	.15
B	Mahonia repens	2	2	2	2	.15	.03	.18	.18
B	Purshia tridentata	25	27	26	25	8.01	7.73	8.06	9.63
B	Rosa woodsii	5	4	5	6	.24	.03	.30	.48
Total for Browse		40	38	33	36	8.81	7.79	8.55	10.44

CANOPY COVER, LINE INTERCEPT--
Management unit 03, Study no: 12

Species	Percent Cover	
	'06	'11
Artemisia tridentata vaseyana	-	.38
Mahonia repens	.18	-
Purshia tridentata	11.78	14.78
Rosa woodsii	.43	.33

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 03, Study no: 12

Species	Average leader growth (in)		
	'01	'06	'11
Purshia tridentata	3.9	3.1	2.9

BASIC COVER--
Management unit 03, Study no: 12

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.50	9.00	56.96	62.90	55.22	75.00
Rock	15.25	12.75	5.47	8.76	14.80	8.39
Pavement	10.25	17.00	.50	5.16	3.67	8.97
Litter	49.75	40.50	64.06	33.45	35.54	41.84
Cryptogams	.75	0	0	0	.03	0
Bare Ground	20.50	20.75	4.86	7.33	14.36	3.37

SOIL ANALYSIS DATA --
Management unit 03, Study no: 12, Study Name: Threemile Canyon

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
16.1	7.2	27.3	40.7	32.0	3.1	15.8	201.6	0.6

PELLET GROUP DATA--
Management unit 03, Study no: 12

Type	Quadrat Frequency			
	'96	'01	'06	'11
Elk	1	-	-	-
Deer	5	13	5	1
Cattle	-	1	-	-
Grouse	-	-	-	-

Days use per acre (ha)		
'01	'06	'11
2 (5)	1 (2)	-
26 (65)	13 (33)	2 (5)
-	-	-
-	-	9 Groups/Acre

BROWSE CHARACTERISTICS--
Management unit 03, Study no: 12

		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	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**0**	0	0	-	-	0	0	0	29/34
01	**0**	0	0	-	-	0	0	0	-/-
06	**0**	0	0	-	-	0	0	0	42/42
11	**0**	0	0	-	-	0	0	0	44/48
Artemisia tridentata vaseyana									
84	**999**	0	57	43	-	13	87	0	26/32
90	**332**	0	50	50	-	70	10	30	21/17
96	**180**	11	44	44	-	22	0	0	18/22
01	**100**	0	60	40	-	0	0	20	19/22
06	**0**	0	0	0	-	0	0	0	28/43
11	**100**	60	40	0	20	0	0	0	20/29
Mahonia repens									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**320**	0	100	-	-	0	0	0	6/6
01	**440**	5	95	-	-	0	0	0	-/-
06	**620**	0	100	-	-	0	0	0	3/5
11	**40**	50	50	-	-	0	0	0	5/6
Purshia tridentata									
84	**599**	0	56	44	-	0	100	0	30/48
90	**465**	0	57	43	-	21	36	7	25/48
96	**820**	12	83	5	20	51	15	0	32/59
01	**700**	3	80	17	-	37	17	0	34/57
06	**820**	5	88	7	-	61	22	2	32/53
11	**640**	3	97	0	-	50	6	3	30/62
Rosa woodsii									
84	**332**	50	50	0	-	0	0	0	7/4
90	**1099**	100	0	0	-	0	0	0	-/-
96	**420**	38	62	0	-	33	0	0	12/11
01	**340**	41	59	0	-	0	0	0	17/12
06	**400**	0	100	0	-	0	0	0	23/23
11	**320**	0	94	6	-	0	0	0	20/15

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Symphoricarpos oreophilus									
84	**231**	43	43	14	-	14	29	0	18/43
90	**99**	100	0	0	-	33	0	0	-/-
96	**0**	0	0	0	-	0	0	0	-/-
01	**0**	0	0	0	-	0	0	0	-/-
06	**0**	0	0	0	-	0	0	0	37/51
11	**0**	0	0	0	-	0	0	0	41/81