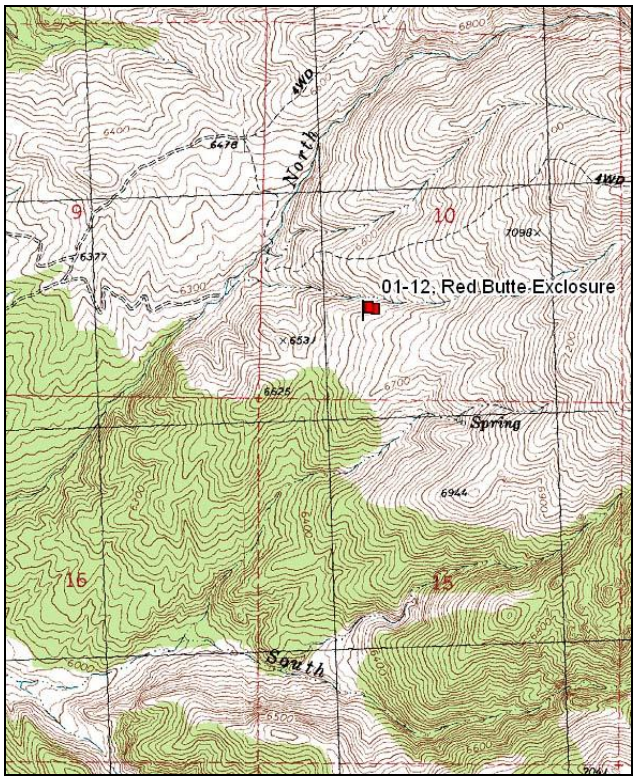
RED BUTTE EXCLOSURE - TREND STUDY NO. 1-12-11

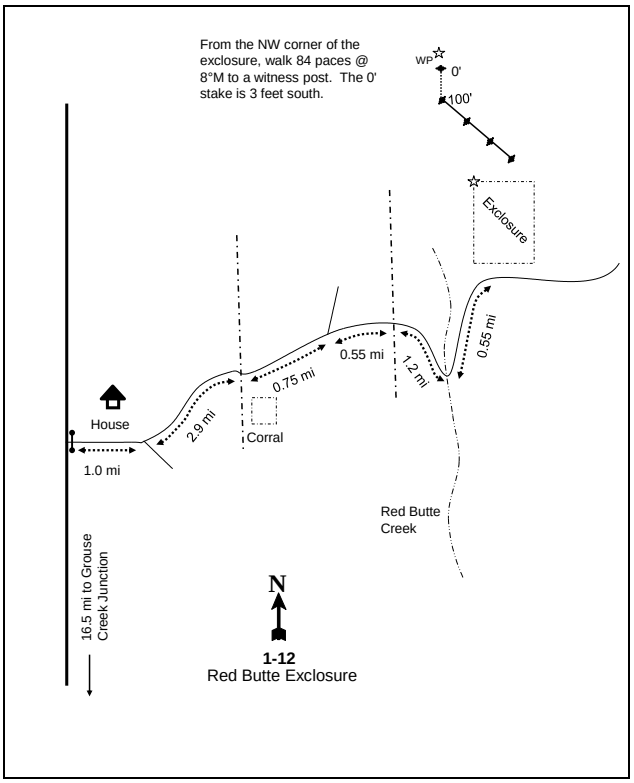
Vegetation Type: Mountain Brush
Range Type: Crucial Deer Winter, Crucial Elk Year-long
NRCS Ecological Site Description: Upland Loam (Browse), R025XY312UT
Land Ownership: BLM
Elevation: 6,590 ft. (2,009 m)
Aspect: West
Slope: 10%
Transect bearing: 165° magnetic
Belt placement: line 1 (11 &95 ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: belt 4 on 8ft.

Directions:
A four-wheel drive vehicle is needed to access this study. Proceed about 16.5 miles north from Grouse Creek Junction and turn right onto Ingham Canyon Road. Travel 1.0 miles to the first significant fork and turn left. Proceed 2.9 miles to a fence with a corral on the east side. Continue east and north for 0.75 miles to a fork and turn right. Proceed 0.55 miles to a fence. From the fence go 1.2 miles, staying right, to the bottom of the creek. From the creek, proceed up the dugway 0.55 miles to the southwest corner of the Red Butte exclosure. From the northwest corner of the exclosure, walk 84 paces at 8 degrees magnetic to the 0-foot stake of the baseline, this is marked by browse-tag #7915. Bearing of the baseline is 165 degrees magnetic and turns to 91 degrees magnetic after the100 foot stake.

Map Name: Ingham Canyon



Diagrammatic Sketch:



Township: 11N Range: 17W Section: 10

GPS: NAD 83, UTM 12S 268107 E 4618627 N

RED BUTTE EXCLOSURE - TREND STUDY NO. 1-12

Site Information

Site Description: This study is located on the west slope of the Grouse Creek Mountains, adjacent to the Red Butte exclosure. This area is considered preferred winter range. During most years, it is used as an area where deer remain in fall and winter, as long as snow conditions permit. As snow depths increase, deer migrate further south to lower elevations. This area is also important fawning habitat. The vegetation type is basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and grass, with a mixture of mountain brush. The area is managed by the Bureau of Land Management (BLM) as part of the Ingham Allotment. Deer pellet groups have been sampled in moderate abundance since 2001. The abundance of sampled cattle sign was low in 2001 and 2011, with more moderate abundance sampled in 2006 (Table - Pellet Group Data). Cattle were in the area in 1984 and 2006. Some sage-grouse and moose pellet groups have been seen on the site, but neither have been sampled within the pellet group transect.

Browse: Shrubs are abundant and provide the majority of the vegetation cover on the site. The key browse species are basin big sagebrush and antelope bitterbrush (*Purshia tridentata*), which combined provide the majority of browse cover (Table - Browse Trends). Big sagebrush appears to be a hybrid of both basin big sagebrush and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), but was all classified as basin big sagebrush for the purpose of this study. The sagebrush population is a moderately dense stand of lightly used plants. Decadence and poor vigor of sagebrush were high at the outset of the study, but have been more moderate since 1996. Recruitment of young sagebrush plants has fluctuated over the sample years, but has been good the majority of the time. The antelope bitterbrush population is less dense than sagebrush, but has displayed mostly moderate to heavy use. Recruitment of young bitterbrush plants has been poor over the course of the study. Decadence of bitterbrush was moderately high at the outset of the study, but has been mostly good since 1996. Vigor of bitterbrush has been mostly good. Poor vigor was high in 2011 because most plants were still dormant at the time of sampling due to the late, cold, and wet spring. A few Utah serviceberry (*Amelanchier utahensis*) plants are also scattered across the site. Mountain snowberry (*Symphoricarpos oreophilus*) is not considered to be a preferred browse species, but is as abundant as sagebrush and bitterbrush in the area. Stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) is also prevalent on the site (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses comprise an important part of the herbaceous understory. Thickspike wheatgrass (*Agropyron dasystachyum*) and Sandberg bluegrass (*Poa secunda*) provide nearly all of the perennial grass cover. Other perennial grass species occur much less frequently. The annual species cheatgrass (*Bromus tectorum*) is abundant, and dominated the herbaceous component early in the study. However, cheatgrass has steadily decreased in frequency and cover since 1996. The study area has a good mixture of forbs that includes a few conspicuous and desirable species in addition to larger numbers of less desirable ones. Showy forbs include arrowleaf balsamroot (*Balsamorhiza sagittata*), narrowleaf lomatium (*Lomatium triternatum*), tapertip hawksbeard (*Crepis acuminata*), and penstemon (*Penstemon sp.*) (Table - Herbaceous Trends).

Soil: The soil is part of the Bullump series, which occurs on valley sides and hills. The parent material consists of colluviums and alluvium derived from quartzite and mica schist (Soil Survey Staff 2011). The soil has a sandy loam texture with a neutral soil reaction (pH 6.8) (Table - Soil Analysis Data). Although numerous areas of bare ground are exposed, bare ground cover is moderately low. The thickness and permanence of vegetation and litter cover on the remaining area has prevented serious soil loss. There is also a moderate amount of surface rock and pavement cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2001 and 2011, but was slight in 2006 due to pedestalling, small rills, and flow patterns.

Trend Assessments

Browse:

- **1984 to 1990 - stable (0):** There was little change in either the sagebrush or bitterbrush density. Decadence of sagebrush remained high at 53%, but decadence of bitterbrush decreased from 50% to 25%.
- **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 sagebrush decreased to 24%, and decadence of bitterbrush decreased to 5%. Recruitment of young sagebrush plants increased from 11% to 15%.
- **1996 to 2001 - stable (0):** The density of sagebrush decreased slightly from 1,440 plants/acre to 1,320 plants/acre, and cover decreased from 10% to 8%. Decadence increased slightly to 35%, and poor vigor increased slightly from 8% to 12%. Recruitment of young sagebrush plants decreased to 5%. Density of bitterbrush remained similar at 720 plants/acre, but cover increased from 7% to 11%. Decadence of bitterbrush increased to 31%, but poor vigor remained low.
- **2001 to 2006 - stable (0):** Sagebrush density remained similar at 1,400 plants/acre, and cover remained similar at 8%. Decadence decreased slightly to 29%, and poor vigor remained similar at 14%. Recruitment of young sagebrush plants increased slightly to 9%. Bitterbrush density increased by 19% to 860 plants/acre, but cover decreased slightly to 10%. Decadence of bitterbrush decreased to 0%.
- **2006 to 2011 - slightly up (+1):** Density of sagebrush increased by 24% to 1,740 plants/acre, but cover decreased slightly to 7%. Most of the increase in density was due to an increase in the recruitment of young plants to 24% of the population. Decadence of sagebrush decreased to 15%, but poor vigor remained similar at 15%. Bitterbrush decreased in density 21% to 680 plants/acre, and cover decreased to 4%. Bitterbrush plants displaying poor vigor increased to 56% of the population because most plants were still dormant at the time of sampling due to the late, cold, and wet spring. Stickyleaf low rabbitbrush has steadily decreased in density over the course of the study, from 3,640 plants/acre in 1996 to 1,380 plants/acre. Cover also decreased from 6% in previous years to just over 2%.

Grass:

- **1984 to 1990 - up (+2):** The perennial grass sum of nested frequency increased 43%.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial grasses decreased 23%. Cheatgrass was included in the sample for the first time, and was the dominant grass species.
- **1996 to 2001 - stable (0):** There was a 13% decrease in the sum of nested frequency of perennial grasses, but cheatgrass also decreased significantly in nested frequency. Cover of perennial grasses remained similar, but cheatgrass cover decreased from 15% to 11%.
- **2001 to 2006 - slightly up (+1):** The sum of nested frequency and cover of perennial grasses remained similar, but cheatgrass decreased significantly in nested frequency. Cover of cheatgrass decreased to 4%.
- **2006 to 2011 - slightly up (+1):** The sum of nested frequency of perennial grasses changed little, but cover increased from 5% to 8%. Cheatgrass decreased significantly in nested frequency, and cover decreased to 3%.

Forb:

- **1984 to 1990 - stable (0):** There was little change in the sum of nested frequency of perennial forbs.
- **1990 to 1996 - down (-2):** The sum of nested frequency of perennial forbs decreased by 33%.
- **1996 to 2001 - stable (0):** The sum of nested frequency of perennial forbs remained similar, though cover increased slightly from 7% to 9%.

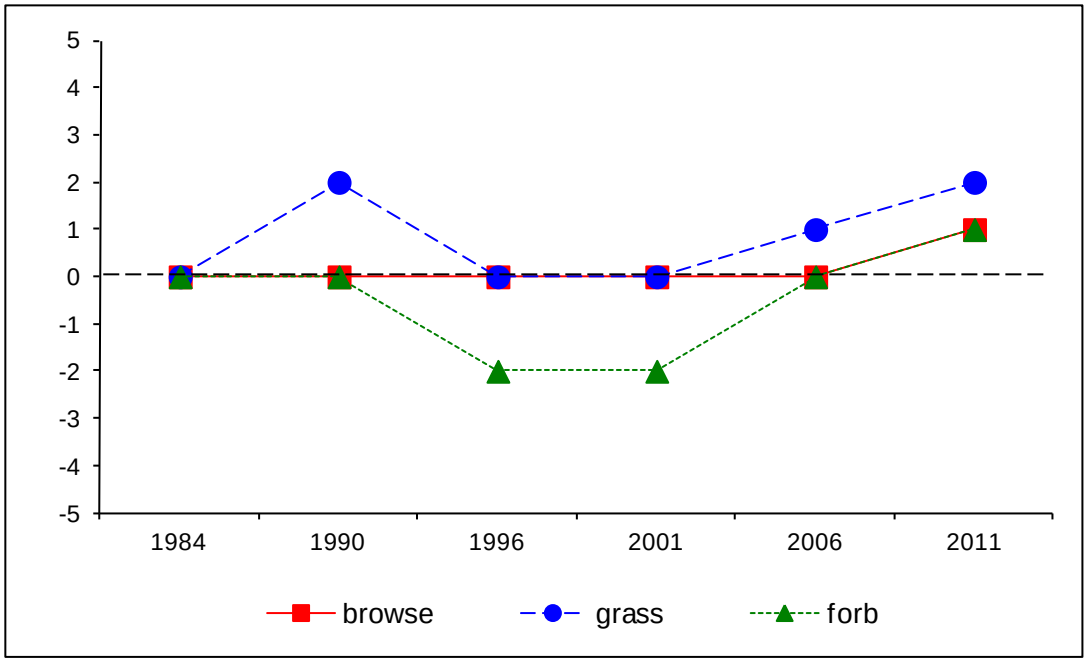
- **2001 to 2006 - up (+2):** The sum of nested frequency of perennial forbs increased by 48%, and cover increased to 14%.
- **2006 to 2011 - slightly up (+1):** There was a 19% increase in the sum of nested frequency of perennial forbs, though cover decreased slightly to 9%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 1, study no: 12

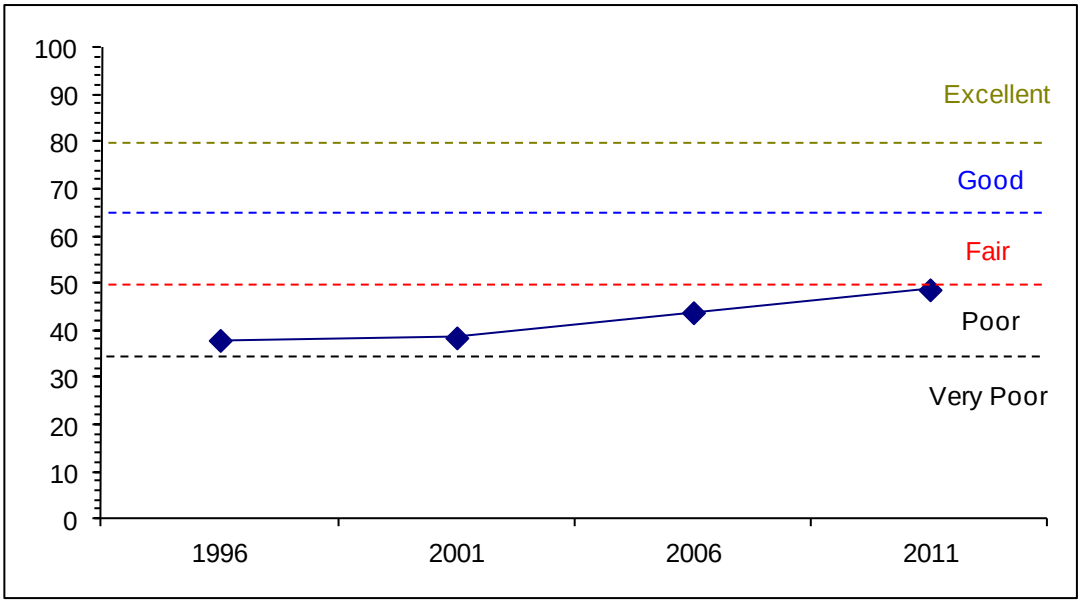
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
96	22.6	9.9	5.9	10.9	-11.5	0.0	0.0	**37.9**	Poor
01	26.9	5.3	3.3	11.1	-8.1	0.0	0.0	**38.4**	Poor
06	23.9	11.2	2.0	9.6	-2.9	0.0	0.0	**43.8**	Poor
11	15.0	11.6	7.8	16.3	-2.0	0.0	0.0	**48.6**	Poor-Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 1 Study no: 12



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
Management unit 1, Study no: 12



HERBACEOUS TRENDS--
Management unit 01, Study no: 12

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	cd237	d267	bc185	ab176	ab150	a131	2.44	3.51	1.66	2.61
G	Agropyron spicatum	a-	a-	b21	a-	a4	a5	.56	-	.06	.15
G	Bromus anomalus	-	-	-	3	-	-	-	.03	-	-
G	Bromus tectorum (a)	-	-	d320	c273	b224	a100	15.28	10.79	3.85	2.67
G	Koeleria cristata	2	-	5	-	2	-	.18	-	.04	-
G	Oryzopsis hymenoides	-	-	8	4	-	-	.04	.03	-	-
G	Poa fendleriana	a7	b102	a-	a-	a1	a5	-	-	.03	.06
G	Poa secunda	a47	a47	b91	b92	b126	b124	2.19	1.93	2.92	5.25
G	Sitanion hystrix	-	1	13	5	12	12	.04	.03	.07	.04
G	Stipa comata	-	1	-	-	-	-	-	-	-	-
Total for Annual Grasses		0	0	320	273	224	100	15.28	10.79	3.85	2.67
Total for Perennial Grasses		293	418	323	280	295	277	5.47	5.54	4.79	8.13
Total for Grasses		293	418	643	553	519	377	20.75	16.34	8.65	10.80
F	Agoseris glauca	b66	ab43	ab57	a31	c125	ab44	.15	.17	1.56	.33
F	Allium acuminatum	b94	a36	a21	b107	a29	b127	.06	.42	.06	1.08
F	Antennaria rosea	-	8	3	-	3	3	.15	-	.03	.03
F	Arabis sp.	a-	a1	ab10	a-	b17	a-	.02	-	.12	-
F	Artemisia ludoviciana	-	-	-	-	-	2	-	-	-	.00
F	Astragalus beckwithii	13	-	5	8	6	18	.03	.21	.03	.35
F	Astragalus cibarius	ab16	b26	ab25	a7	ab17	a-	.18	.07	.31	-
F	Astragalus convallarius	-	2	-	-	-	-	-	-	-	-
F	Balsamorhiza sagittata	60	60	56	45	42	45	5.59	6.66	8.22	2.74
F	Camelina microcarpa (a)	-	-	1	3	3	-	.00	.00	.00	-

Type	Species	Nested Frequency						Average Cover %			
		'84	'90	'96	'01	'06	'11	'96	'01	'06	'11
F	Chaenactis douglasii	-	-	-	-	-	3	-	-	-	.30
F	Chenopodium fremontii (a)	-	-	-	1	-	-	-	.00	-	-
F	Collinsia parviflora (a)	-	-	$_{a}$217	$_{a}$230	$_{a}$223	$_{b}$304	1.45	5.28	.90	10.89
F	Collomia linearis (a)	-	-	$_{ab}$15	$_{ab}$19	$_{b}$32	$_{a}$2	.04	.04	.14	.03
F	Comandra pallida	2	7	1	7	2	-	.00	.18	.00	-
F	Cordylanthus ramosus (a)	-	-	-	3	-	-	-	.15	-	-
F	Crepis acuminata	$_{b}$56	$_{b}$70	$_{a}$9	$_{a}$17	$_{a}$16	$_{a}$34	.02	.48	.55	.68
F	Cryptantha sp.	$_{a}$-	$_{a}$-	$_{b}$27	$_{a}$-	$_{b}$49	$_{a}$2	.08	-	.12	.03
F	Cryptantha sp.(a)	-	-	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$33	-	-	-	1.20
F	Cymopterus sp.	-	-	-	-	-	2	-	-	-	.03
F	Delphinium nuttallianum	$_{b}$22	$_{b}$18	$_{a}$-	$_{b}$21	$_{b}$17	$_{c}$54	-	.06	.04	.58
F	Descurainia pinnata (a)	-	-	-	2	-	6	-	.00	-	.01
F	Eriogonum umbellatum	-	6	6	4	3	3	.18	.03	.15	.01
F	Gayophytum ramosissimum(a)	-	-	1	12	8	1	.00	.04	.02	.00
F	Gilia sp. (a)	-	-	-	-	7	-	-	.00	.01	-
F	Hackelia patens	$_{ab}$11	$_{ab}$13	$_{ab}$16	$_{a}$1	$_{b}$19	$_{ab}$6	.14	.03	.62	.33
F	Haplopappus acaulis	-	-	7	-	2	7	.03	-	.03	.06
F	Holosteum umbellatum (a)	-	-	3	-	-	-	.00	-	-	-
F	Lappula occidentalis (a)	-	-	-	2	3	-	-	.00	.00	-
F	Lithophragma parviflora	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$11	$_{b}$87	-	-	.05	.93
F	Lithospermum ruderale	-	-	-	3	-	-	-	.01	-	-
F	Lomatium triternatum	$_{ab}$21	$_{ab}$24	$_{a}$3	$_{ab}$24	$_{ab}$23	$_{b}$27	.01	.22	.32	.14
F	Lupinus argenteus	-	-	-	1	-	3	-	.03	-	.00
F	Machaeranthera spp	-	-	4	-	-	-	.01	-	-	-
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{c}$92	$_{b}$61	$_{a}$10	-	.72	.13	.07
F	Nemophila breviflora (a)	-	-	-	-	3	-	-	-	.03	-
F	Orogenia linearifolia	-	-	-	-	-	1	-	-	-	.03
F	Phlox longifolia	$_{d}$154	$_{e}$217	$_{bc}$81	$_{ab}$54	$_{cd}$122	$_{a}$40	.56	.46	1.25	.26
F	Polygonum douglasii (a)	-	-	$_{b}$46	$_{a}$-	$_{b}$46	$_{a}$-	.10	-	.17	-
F	Ranunculus inamoenus	-	-	-	-	-	80	-	-	-	.91
F	Ranunculus testiculatus (a)	-	-	$_{a}$2	$_{a}$-	$_{a}$3	$_{b}$18	.00	-	.00	.43
F	Sedum lanceolatum	-	-	6	-	1	-	.01	-	.00	-
F	Senecio integerrimus	-	-	-	-	-	6	-	-	-	.06
F	Tragopogon dubius (a)	-	-	-	3	-	-	.00	.03	-	-
F	Unknown forb-perennial	$_{a}$4	$_{a}$-	$_{b}$13	$_{a}$-	$_{a}$-	$_{a}$3	.07	-	-	.01
F	Veronica biloba (a)	-	-	$_{a}$3	$_{a}$8	$_{b}$42	$_{a}$16	.00	.06	.46	.11
F	Viguiera multiflora	-	-	8	11	-	-	.04	.04	-	-
Total for Annual Forbs		0	0	288	375	431	390	1.63	6.37	1.89	12.76
Total for Perennial Forbs		519	531	358	341	504	597	7.39	9.12	13.50	8.95
Total for Forbs		519	531	646	716	935	987	9.02	15.50	15.40	21.72

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

BROWSE TRENDS--
Management unit 01, Study no: 12

Type	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Amelanchier utahensis	3	1	1	1	.30	.00	-	.03
B	Artemisia tridentata tridentata	48	51	51	51	9.52	8.38	7.52	6.68
B	Chrysothamnus nauseosus consimilis	2	1	1	3	.15	-	.15	.18
B	Chrysothamnus viscidiflorus viscidiflorus	76	73	62	45	6.46	6.42	5.61	2.45
B	Eriogonum microthecum	2	2	2	0	.15	.15	-	-
B	Opuntia sp.	49	45	52	36	3.35	2.71	2.36	1.76
B	Purshia tridentata	31	31	31	25	6.71	10.81	9.68	4.39
B	Symphoricarpos oreophilus	53	50	51	46	6.17	8.47	8.93	9.11
Total for Browse		264	254	251	207	32.82	36.95	34.27	24.62

CANOPY COVER, LINE INTERCEPT--
Management unit 01, Study no: 12

Species	Percent Cover	
	'06	'11
Artemisia tridentata tridentata	11.23	8.63
Chrysothamnus nauseosus consimilis	-	.38
Chrysothamnus viscidiflorus viscidiflorus	7.50	1.93
Opuntia sp.	1.70	.90
Purshia tridentata	11.16	8.73
Symphoricarpos oreophilus	14.63	9.05

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 01, Study no: 12

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata tridentata	2.9	1.5	0.9
Purshia tridentata	0.9	0.6	0.2

BASIC COVER--
Management unit 01, Study no: 12

Cover Type	Average Cover %					
	'84	'90	'96	'01	'06	'11
Vegetation	3.00	11.50	56.69	62.91	51.35	57.49
Rock	1.75	1.00	4.32	3.58	3.66	4.11
Pavement	3.00	2.50	4.30	4.63	8.68	5.50
Litter	59.25	54.25	59.50	47.27	36.26	44.75
Cryptogams	2.50	.75	.34	.25	.76	.59
Bare Ground	30.50	30.00	6.39	10.42	17.04	10.04

SOIL ANALYSIS DATA --

Management unit 01, Study no: 12, Study Name: Red Butte Exclosure

Effective rooting depth (in)	pH	Sandy-Loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
20.3	6.8	68.6	15.4	16.0	2.6	20.7	201.6	0.5

PELLET GROUP DATA--

Management unit 01, Study no: 12

Type	Quadrat Frequency			
	'96	'01	'06	'11
Rabbit	-	2	12	1
Elk	-	-	-	1
Deer	6	7	11	5
Cattle	4	4	7	6

Days use per acre (ha)		
'01	'06	'11
-	-	-
-	-	-
21 (53)	18 (45)	32 (79)
2 (4)	31 (75)	7 (16)

BROWSE CHARACTERISTICS--

Management unit 01, 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 utahensis									
84	**0**	0	0	0	-	0	0	0	-/-
90	**266**	100	0	0	-	0	0	0	-/-
96	**60**	0	33	67	-	0	33	0	24/26
01	**20**	0	100	0	-	100	0	0	27/26
06	**20**	0	100	0	-	0	0	0	32/33
11	**20**	0	100	0	-	0	0	0	31/32
Artemisia tridentata tridentata									
84	**2331**	11	29	60	666	43	6	23	33/33
90	**2532**	11	37	53	-	13	3	3	24/30
96	**1440**	15	61	24	80	15	0	8	28/35
01	**1320**	5	61	35	-	2	0	12	28/37
06	**1400**	9	63	29	2700	11	4	14	32/43
11	**1740**	24	61	15	40	5	0	15	32/39
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	**0**	0	0	-	-	0	0	0	30/52

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus consimilis									
84	**0**	0	0	0	-	0	0	0	-/-
90	**0**	0	0	0	-	0	0	0	-/-
96	**100**	0	100	0	-	0	0	0	21/20
01	**40**	0	100	0	-	0	0	0	21/30
06	**20**	0	0	100	-	0	0	100	26/27
11	**60**	0	33	67	-	0	0	100	16/23
Chrysothamnus viscidiflorus viscidiflorus									
84	**4065**	28	39	33	133	20	0	2	11/10
90	**3931**	42	31	27	266	12	7	5	15/17
96	**3640**	9	91	0	-	2	0	0	17/27
01	**2940**	4	82	14	20	1	0	5	15/19
06	**2240**	5	87	8	-	0	0	.89	17/25
11	**1380**	6	67	28	-	7	0	39	14/21
Eriogonum microthecum									
84	**0**	0	0	-	-	0	0	0	-/-
90	**0**	0	0	-	-	0	0	0	-/-
96	**60**	0	100	-	-	33	0	0	10/11
01	**40**	0	100	-	-	0	0	0	10/17
06	**40**	0	100	-	-	50	0	0	11/16
11	**0**	0	0	-	-	0	0	0	-/-
Opuntia sp.									
84	**1599**	0	100	0	-	0	0	0	4/3
90	**798**	33	42	25	199	8	0	33	4/10
96	**1820**	5	91	3	-	0	0	5	5/16
01	**2080**	10	86	5	-	0	0	4	4/12
06	**2140**	2	94	4	-	0	0	2	5/16
11	**1140**	7	86	7	-	0	0	47	3/15
Purshia tridentata									
84	**266**	0	50	50	-	25	75	25	11/13
90	**265**	0	75	25	-	0	0	0	13/17
96	**780**	8	87	5	-	36	3	3	24/47
01	**720**	8	61	31	-	53	17	0	30/62
06	**860**	0	100	0	480	35	40	0	31/53
11	**680**	3	91	6	-	12	53	56	26/47
Symphoricarpos oreophilus									
84	**4465**	85	15	0	-	0	0	0	17/46
90	**532**	12	88	0	266	25	0	0	10/15
96	**3820**	40	59	2	140	2	1	.52	17/38
01	**2820**	16	84	1	-	.70	0	.70	19/38
06	**2960**	23	74	3	-	0	3	0	19/36
11	**3160**	32	67	1	160	2	0	.63	17/32