

GREENDALE - TREND STUDY NO. 8B-4-10

Vegetation Type: Mountain Big Sagebrush-Grass

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: Not Available

Land Ownership: USFS

Elevation: 7100 ft. (2165 m)

Aspect: North

Slope: 7%

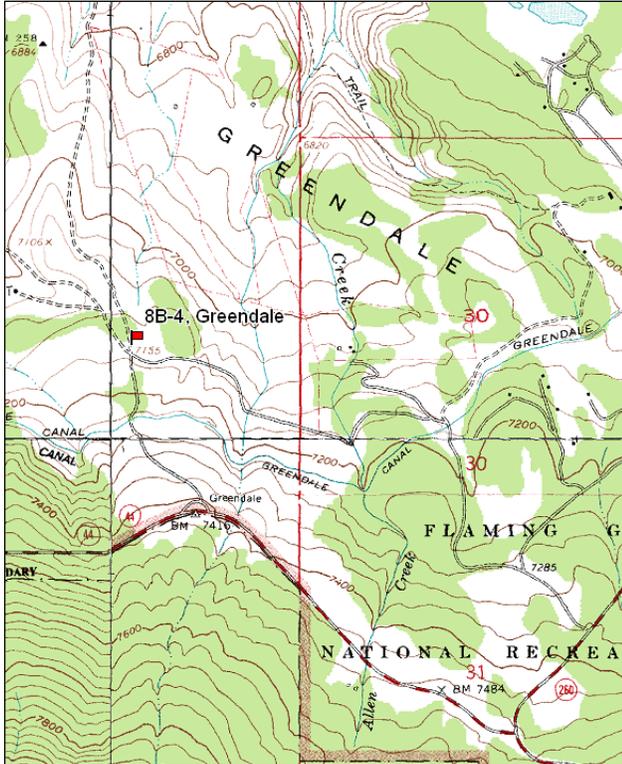
Transect bearing: 347° magnetic

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

Directions:

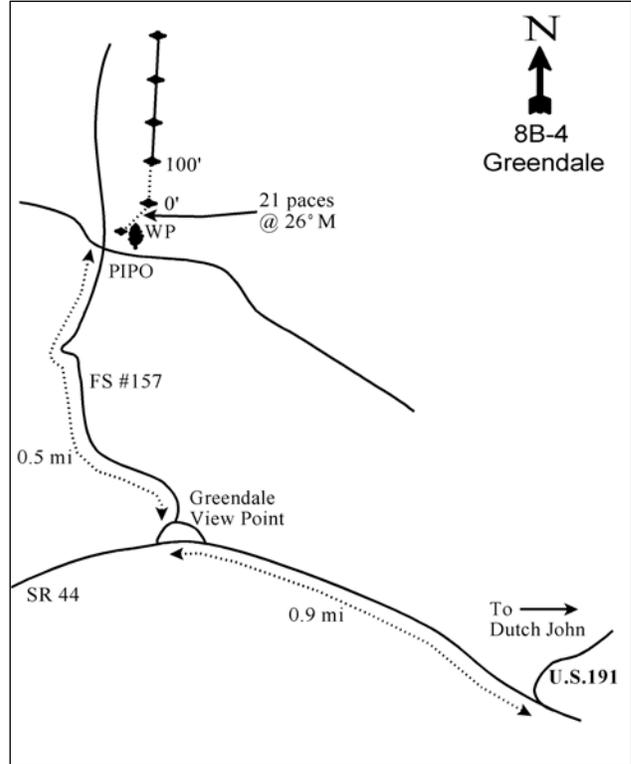
From the junction of Highways U-44 and U.S. 191, proceed toward Manila for 0.9 miles. Turn off at the Greendale view point. Take the dirt road (FS 157) to the north which goes to the Canyon Rim trail. Go 0.5 miles to an intersection. From the Ponderosa pine (*Pinus ponderosa*) northeast of the intersection, walk 21 paces at 26°M to the 0' stake.

Map Name: Dutch John



Township: 2N Range: 21E Section: 25

Diagrammatic Sketch:



GPS: NAD 83, UTM 12T 626438 E 4526365 N

Site Information

Site Description: The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass park surrounded by montane forest about a mile and a half northwest of the junction of Highway 44 and Highway 191. Due to the close proximity of the highway, the area receives a large amount of recreational use by campers and hunters. The area is classified as deer and elk winter range, but depending on the weather, it actually receives year-round use by big game. Cattle graze the area as part of the U.S. Forest Service Lewis/Allen allotment. Pellet group transect data estimated moderate deer use in 2000 and 2010, with heavier use in 2005. Estimated elk use has steadily decreased from heavy use in 2000 to light use in 2010. Estimated use by cattle has been light since 2000 (Table - Pellet Group Data). This area is also used by a few moose.

Browse: The key browse species on the site are mountain big sagebrush and antelope bitterbrush (*Purshia tridentata*). Sagebrush is more numerous and provides the majority of the browse cover (Table - Browse Trends). The sagebrush population is mostly mature with a moderate amount of decadence and mostly moderate use. Recruitment of young plants has been mostly good over the course of the study. Bitterbrush consists of a moderately to heavily utilized population of mostly mature plants. Decadence of bitterbrush has fluctuated from low to moderate and recruitment of young plants has been mostly good. The low growing Fendler ceanothus (*Ceanothus fendleri*) is also abundant and increased substantially in density in 2005, but receives mostly light use. Other browse species growing on the site include mountain low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*), broom snakeweed (*Gutierrezia sarothrae*), Wood's rose (*Rosa woodsii*) and snowberry (*Symphoricarpos oreophilus*). All of these species show little or no utilization, except mountain mahogany which had heavy use (Table - Browse Characteristics). Ponderosa pine (*Pinus ponderosa*) surrounds the site and a few mature and young trees are scattered on the site. Ponderosa trees appear to be increasing slowly with an increase in density (Table - Point-Quarter Tree Data) and canopy cover (Table - Canopy Cover) since 2000.

Herbaceous Understory: Grasses are abundant and fairly diverse, but are dominated by the introduced species Kentucky bluegrass (*Poa pratensis*). Kentucky bluegrass forms a dense sod over much of the area which tends to exclude other native grass and forb species. The only other common grass species is needle-and-thread (*Stipa comata*). Forbs are also diverse and abundant on the site. The most numerous perennial forb species include arrowleaf balsamroot (*Balsamorhiza sagittata*), rose pussytoes (*Antennaria rosea*), trailing fleabane (*Erigeron flagellaris*) and rock goldenrod (*Petradoria pumila*) (Table - Herbaceous Trends).

Soil: The soil has a sandy clay loam texture and is slightly acidic (pH 6.3). Phosphorus may have limited availability for plant growth and development at 3.3 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Bare ground cover is low with a large amount of vegetation and litter providing the majority of the protective ground cover (Table - Basic Cover). The soil erosion condition was classified as stable in 2005, but was slight in 2010 due to active gullies, flow patterns, and litter and soil movement.

Trend Assessments

Browse:

- **1982 to 1988 - up (+2):** Both of the preferred browse species, mountain big sagebrush and bitterbrush, had substantial increases in density, and both of the species populations remained healthy.
- **1988 to 1995 - stable (0):** Differences in density may be related to the larger sample area used in 1995; therefore, trend was determined using other parameters. Decadence of mountain big sagebrush and bitterbrush decreased slightly, but so did the recruitment of young plants.
- **1995 to 2000 - stable (0):** There was a slight increase in the density of mountain big sagebrush, but cover decreased slightly. Decadence of sagebrush also increased from 6% to 29%. The density of bitterbrush increased by 11% from 1,240 plants/acre to 1,380 plants/acre, but cover increased from 4% to 6%.

- **2000 to 2005 - stable (0):** There was a slight decrease in the density of mountain big sagebrush, returning to 1995 levels, but cover increased from 13% to 17%. Decadence of sagebrush remained moderate at 26% and recruitment of young plants increased slightly from 11% to 15% of the population. The density of bitterbrush increased by 14% to 1,580 plants/acre, but cover remained similar. Decadence of bitterbrush increased from 10% to 25% and poor vigor increased from 3% to 10%.
- **2005 to 2010 - stable (0):** There was a 25% decrease in the density of mountain big sagebrush from 4,520 plants/acre to 3,400 plants/acre, and cover decreased to 13%. However, the density of bitterbrush continued to increase by 18% to 1,860 plants/acre and decadence decreased to 9% of the population.

Grass:

- **1982 to 1988 - no trend (NT):** Only quadrat frequency data for grasses are available from 1982, so no trend was given.
- **1988 to 1995 - up (+2):** The sum of nested frequency of perennial grasses increased by 35%.
- **1995 to 2000 - down (-2):** The perennial grass sum of nested frequency decreased by 21%, but cover increased from 13% to 25%. There was a significant increase in the nested frequency of Kentucky bluegrass with a subsequent increase in cover from 10% to 21%.
- **2000 to 2005 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 14%, although cover decreased to 17%. There was a significant increase in the nested frequency of bottlebrush squirreltail (*Sitanion hystrix*) and needle-and-thread. The nested frequency of Kentucky bluegrass decreased significantly with a subsequent decrease in cover.
- **2005 to 2010 - slightly down (-1):** There was a 14% decrease in the nested frequency of perennial grasses, though cover once again increased to 25%. The Kentucky bluegrass nested frequency increased significantly with a large increase in cover.

Forb:

- **1982 to 1988 - no trend (NT):** Only quadrat frequency data for forbs are available from 1982, so no trend was given.
- **1988 to 1995 - up (+2):** The perennial forb sum of nested frequency increased by 28%.
- **1995 to 2000 - down (-2):** The sum of nested frequency of perennial forbs decreased by 24%, returning to 1988 levels, but cover remained similar.
- **2000 to 2005 - slightly up (+1):** The perennial forb sum of nested frequency increased by 12% and cover increased from 10% to 13%.
- **2005 to 2010 - slightly down (-1):** There was an 18% decrease in the sum of nested frequency of perennial forbs and cover decreased to 9%.

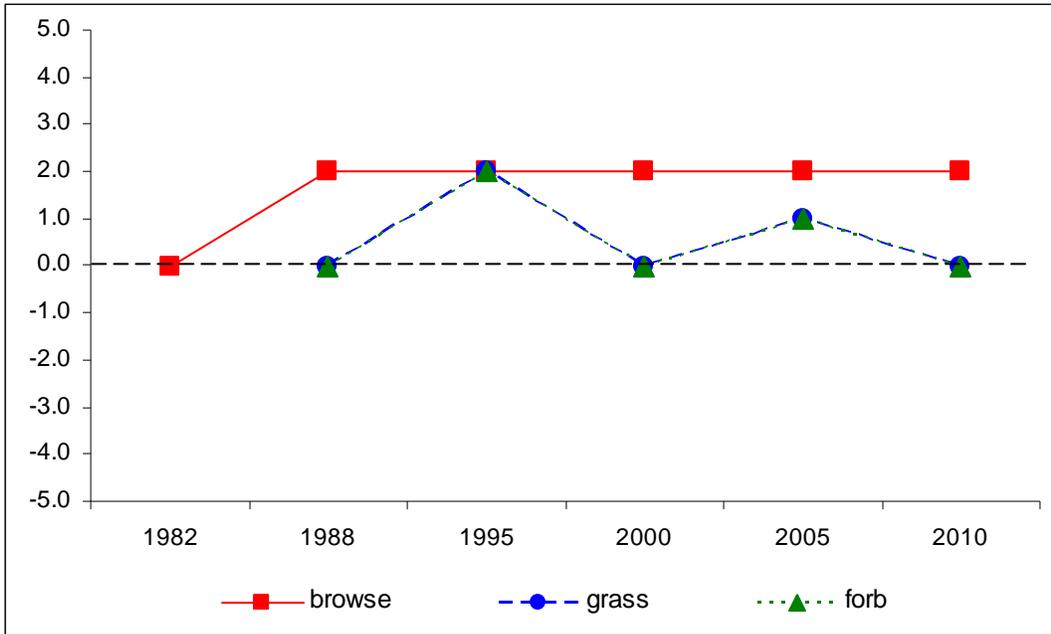
DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --

Management unit 8B, study no: 4

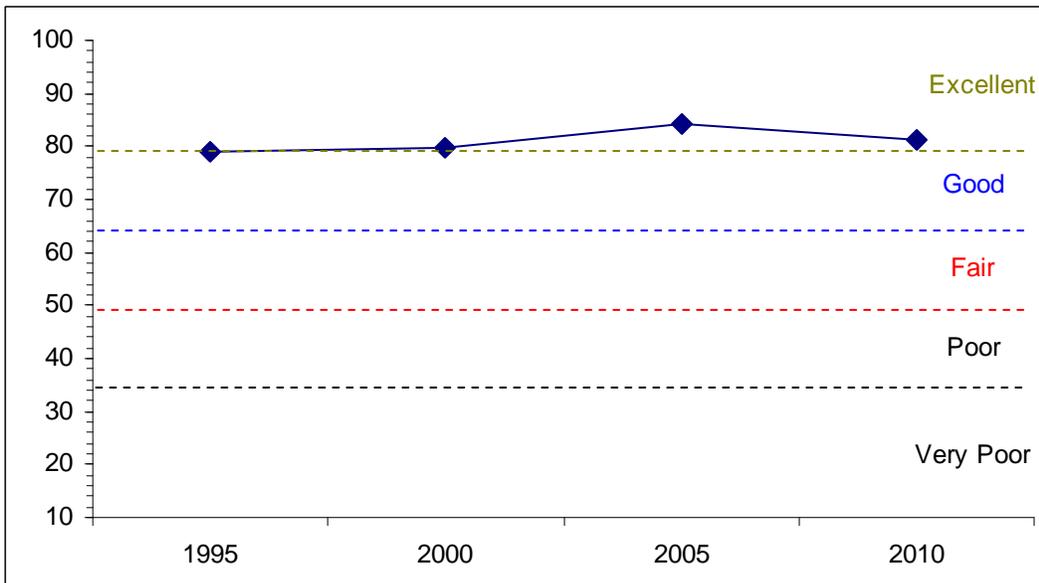
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
95	23.7	13.6	5.6	26.4	-0.1	10.0	0.0	79.1	Good-Excellent
00	26.4	8.2	5.1	30.0	0.0	10.0	0.0	79.7	Good-Excellent
05	30.0	7.6	6.7	30.0	0.0	10.0	0.0	84.3	Excellent
10	26.4	8.6	6.7	30.0	-0.4	10.0	0.0	81.3	Good-Excellent

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 8B, Study no: 4



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 8B, Study no: 4



HERBACEOUS TRENDS--
Management unit 08B, Study no: 4

Type	Species	Nested Frequency					Average Cover %			
		'88	'95	'00	'05	'10	'95	'00	'05	'10
G	Agropyron dasystachyum	a37	b110	a19	a22	a28	.88	.12	.08	.18
G	Agropyron spicatum	-	4	3	-	-	.03	.00	-	.00
G	Agropyron trachycaulum	-	-	4	-	-	-	.03	-	-
G	Bromus tectorum (a)	-	a5	a-	a3	b33	.15	-	.03	.52
G	Carex sp.	20	17	18	23	13	.08	.16	.65	.42
G	Dactylis glomerata	a-	b25	a4	ab11	ab8	.07	.18	.22	.21
G	Danthonia unispicata	-	-	1	-	-	-	.00	-	-
G	Koeleria cristata	ab18	ab18	a3	b28	b24	.11	.03	1.07	.67
G	Poa fendleriana	a-	b28	b11	c66	bc37	.25	.08	.65	.30
G	Poa pratensis	c303	c287	d352	a203	b259	10.21	21.30	6.65	18.53
G	Poa secunda	ab8	b33	a11	ab23	a9	.26	.04	.15	.01
G	Sitanion hystrix	c54	bc40	a3	bc41	b26	.28	.00	.51	.73
G	Stipa comata	a36	b82	b82	c154	b94	.97	3.17	6.43	4.27
G	Stipa lettermani	1	-	-	11	-	-	-	.05	-
Total for Annual Grasses		0	5	0	3	33	0.15	0	0.03	0.52
Total for Perennial Grasses		477	644	511	582	498	13.18	25.17	16.48	25.37
Total for Grasses		477	649	511	585	531	13.33	25.17	16.52	25.90
F	Achillea millefolium	-	1	11	9	9	.00	.09	.18	.09
F	Agoseris glauca	a-	b27	a-	b41	a-	.09	-	.23	-
F	Allium sp.	a-	c46	a-	b15	ab2	.18	-	.04	.01
F	Antennaria rosea	a6	b37	b35	b38	b47	1.11	.92	1.43	1.08
F	Arabis sp.	a-	ab5	a2	b13	ab5	.01	.00	.03	.01
F	Artemisia ludoviciana	-	-	4	-	3	-	.18	-	.03
F	Aster chilensis	a4	b24	c17	c26	b15	.26	.32	.93	.29
F	Astragalus sp.	-	-	2	-	-	-	.00	-	-
F	Balsamorhiza sagittata	a8	bc57	c59	c62	b36	3.67	3.95	5.40	3.46
F	Calochortus nuttallii	-	7	-	3	-	.01	-	.00	-
F	Castilleja sp.	-	1	-	-	-	.00	-	-	-
F	Collinsia parviflora (a)	-	d255	a3	c67	b21	2.95	.01	.21	.06
F	Collomia linearis (a)	-	c195	a3	ab18	b30	1.56	.00	.05	.07
F	Comandra pallida	54	72	66	67	84	.39	.65	.66	.62
F	Crepis acuminata	-	-	-	2	-	-	-	.03	-
F	Cymopterus longipes	ab8	ab20	ab19	b20	a4	.66	.07	.05	.03
F	Erigeron divergens	b28	a-	a-	a-	a-	-	-	-	-
F	Erigeron eatonii	a12	ab11	b28	a8	a8	.02	.45	.04	.21
F	Erigeron flagellaris	a-	a3	b36	b38	b39	.03	.93	1.16	.84
F	Eriogonum alatum	b45	a6	a4	a6	a-	.07	.01	.31	-
F	Eriogonum umbellatum	6	6	4	6	5	.03	.15	.21	.06
F	Gayophytum ramosissimum(a)	-	2	-	1	1	.00	-	.00	.00
F	Heterotheca villosa	c110	b39	ab17	a4	ab	.29	.46	.48	.45
F	Holosteum umbellatum (a)	-	-	1	2	-	-	.03	.00	-
F	Ipomopsis aggregata	a-	a-	ab7	ab2	b13	.00	.01	.03	.10
F	Lepidium sp. (a)	-	ab5	a-	b15	ab9	.01	-	.05	.02

T y p e	Species	Nested Frequency					Average Cover %			
		'88	'95	'00	'05	'10	'95	'00	'05	'10
F	<i>Linum lewisii</i>	40	35	35	39	30	.10	.24	.21	.15
F	<i>Lithospermum ruderales</i>	a ⁻	a ²	b ¹²	ab ⁹	ab ⁷	.03	.10	.37	.18
F	<i>Lupinus argenteus</i>	1	-	-	-	-	-	-	-	-
F	<i>Lychnis drummondii</i>	-	-	-	5	-	-	-	.01	-
F	<i>Microsteris gracilis</i> (a)	-	a ⁻	a ⁻	b ¹⁵	a ¹	-	-	.04	.00
F	<i>Oenothera pallida</i>	b ²⁶	a ⁶	a ⁻	a ⁵	a ⁻	.01	-	.03	-
F	<i>Penstemon humilis</i>	a ²	b ¹⁸	ab ⁹	a ⁻	a ¹	.14	.04	-	.15
F	<i>Penstemon</i> sp.	-	-	-	1	4	-	-	.03	.01
F	<i>Petradoria pumila</i>	b ⁴⁰	ab ²⁷	ab ²³	a ¹⁷	ab ¹⁹	.92	1.00	1.19	.58
F	<i>Phlox hoodii</i>	a ⁻	b ⁸	ab ³	a ⁻	a ⁻	.51	.00	-	-
F	<i>Phlox longifolia</i>	-	7	6	-	-	.01	.04	-	-
F	<i>Phlox</i> sp.	a ⁻	b ²¹	a ⁻	a ⁻	a ⁻	.03	-	-	-
F	<i>Polygonum douglasii</i> (a)	-	c ⁵¹	a ¹⁴	bc ³⁶	ab ²⁹	.19	.03	.11	.15
F	<i>Sedum lanceolatum</i>	b ²³	ab ¹³	a ⁻	a ⁷	a ³	.02	-	.04	.00
F	<i>Solidago sparsiflora</i>	b ¹⁷	b ²⁷	b ¹⁰	a ⁻	b ¹²	.51	.24	-	.45
F	<i>Taraxacum officinale</i>	a ⁻	b ¹¹	ab ⁶	a ⁻	a ⁻	.05	.01	-	-
F	<i>Tragopogon dubius</i>	5	8	5	6	1	.02	.04	.03	.00
F	<i>Trifolium gymnocarpon</i>	a ⁻	b ¹⁰	ab ⁶	c ²²	bc ¹⁶	.03	.02	.13	.13
F	<i>Zigadenus paniculatus</i>	-	3	-	6	-	.00	-	.06	-
Total for Annual Forbs		0	508	21	154	91	4.72	0.08	0.48	0.31
Total for Perennial Forbs		435	558	426	477	390	9.28	10.01	13.39	8.99
Total for Forbs		435	1066	447	631	481	14.00	10.09	13.88	9.31

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

BROWSE TRENDS--

Management unit 08B, Study no: 4

T y p e	Species	Strip Frequency				Average Cover %			
		'95	'00	'05	'10	'95	'00	'05	'10
B	<i>Amelanchier utahensis</i>	0	1	1	1	-	.38	.85	.63
B	<i>Artemisia tridentata vaseyana</i>	84	90	86	82	14.17	13.44	16.73	13.18
B	<i>Ceanothus fendleri</i>	23	32	38	36	6.81	3.92	3.00	2.52
B	<i>Cercocarpus montanus</i>	0	0	0	1	-	-	-	-
B	<i>Chrysothamnus viscidiflorus lanceolatus</i>	26	21	23	20	.71	.33	.72	.42
B	<i>Gutierrezia sarothrae</i>	3	1	3	6	.03	.15	.15	.15
B	<i>Mahonia repens</i>	10	13	13	11	.45	.16	.22	.42
B	<i>Pinus ponderosa</i>	0	2	3	1	-	1.23	2.11	2.39
B	<i>Purshia tridentata</i>	52	46	49	52	3.98	6.00	5.82	6.00
B	<i>Rosa woodsii</i>	2	0	0	0	-	-	-	-
B	<i>Symphoricarpos oreophilus</i>	4	2	3	5	.79	.21	.21	.45
Total for Browse		204	208	219	215	26.97	25.85	29.83	26.19

CANOPY COVER, LINE INTERCEPT--

Management unit 08B, Study no: 4

Species	Percent Cover		
	'00	'05	'10
Amelanchier utahensis	-	.68	.81
Artemisia tridentata vaseyana	-	19.70	21.00
Ceanothus fendleri	-	4.50	5.48
Chrysothamnus viscidiflorus lanceolatus	-	.91	.31
Gutierrezia sarothrae	-	.01	.16
Mahonia repens	-	.26	.45
Pinus ponderosa	2.40	2.83	4.51
Purshia tridentata	-	7.59	10.53
Symphoricarpos oreophilus	-	1.04	1.08

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 08B, Study no: 4

Species	Average leader growth (in)	
	'05	'10
Artemisia tridentata vaseyana	2.3	2.2
Purshia tridentata	2.8	3.8

POINT-QUARTER TREE DATA--

Management unit 08B, Study no: 4

Species	Trees per Acre			
	'95	'00	'05	'10
Pinus ponderosa	24	21	35	40

Average diameter (in)			
'95	'00	'05	'10
9.6	3.4	5.9	5.6

BASIC COVER--

Management unit 08B, Study no: 4

Cover Type	Average Cover %					
	'82	'88	'95	'00	'05	'10
Vegetation	9.25	10.75	46.69	59.22	53.50	57.98
Rock	2.25	4.00	2.57	1.79	1.85	1.24
Pavement	0	7.00	1.43	1.28	1.60	2.26
Litter	51.25	53.25	55.45	65.27	36.88	60.79
Cryptogams	1.25	0	.57	.75	.12	.24
Bare Ground	36.00	25.00	16.99	11.93	21.40	12.93

SOIL ANALYSIS DATA --

Management unit 8B, Study no: 4, Study Name: Greendale

Effective rooting depth (in)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
19.9	6.3	61.4	21.7	16.9	2.5	3.3	227.2	0.6

PELLET GROUP DATA--

Management unit 08B, Study no: 4

Type	Quadrat Frequency			
	'95	'00	'05	'10
Rabbit	-	11	20	9
Elk	2	6	8	-
Deer	8	35	56	42
Cattle	1	3	2	1

Days use per acre (ha)		
'00	'05	'10
-	-	-
62 (152)	25 (61)	13 (31)
28 (69)	96 (236)	42 (104)
10 (25)	4 (9)	5 (13)

BROWSE CHARACTERISTICS--

Management unit 08B, Study no: 4

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Amelanchier utahensis									
82	0	0	0	-	-	0	0	0	-/-
88	0	0	0	-	-	0	0	0	-/-
95	0	0	0	-	-	0	0	0	29/45
00	20	0	100	-	-	0	0	0	26/35
05	20	0	100	-	-	0	100	0	32/41
10	20	0	100	-	-	100	0	0	33/44
Artemisia tridentata vaseyana									
82	1732	0	81	19	133	12	0	0	24/31
88	4397	32	55	14	866	38	5	0	26/26
95	4440	12	82	6	20	60	12	1	19/30
00	4800	11	60	29	-	35	2	6	19/27
05	4520	15	59	26	1080	34	21	9	23/34
10	3440	7	66	27	160	47	23	28	24/34
Ceanothus fendleri									
82	66	100	0	0	-	0	0	0	-/-
88	0	0	0	0	-	0	0	0	-/-
95	780	0	100	0	-	0	0	0	9/49
00	900	9	91	0	-	0	0	0	8/37
05	4680	8	92	0	-	31	14	0	5/12
10	3120	7	93	0	-	13	0	0	8/16
Chrysothamnus viscidiflorus lanceolatus									
82	399	0	100	0	-	0	0	0	10/9
88	466	0	100	0	-	0	0	0	12/10
95	840	5	95	0	-	2	0	0	14/16
00	620	3	94	3	-	0	0	0	10/12
05	620	16	81	3	-	0	0	0	12/15
10	580	0	100	0	-	7	0	0	13/16

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Gutierrezia sarothrae										
82	0	0	0	-	-	0	0	0	-/-	
88	66	0	100	-	-	0	0	0	6/10	
95	80	0	100	-	-	0	0	0	7/7	
00	40	0	100	-	-	0	0	0	-/-	
05	120	0	100	-	-	0	0	0	8/9	
10	320	31	69	-	-	0	0	0	9/12	
Mahonia repens										
82	0	0	0	-	-	0	0	0	-/-	
88	0	0	0	-	-	0	0	0	-/-	
95	4880	0	100	-	-	0	0	0	3/4	
00	1740	82	18	-	-	0	0	0	2/2	
05	2900	12	88	-	-	0	0	0	3/4	
10	4160	24	76	-	-	0	0	0	3/4	
Pinus ponderosa										
82	0	0	0	-	-	0	0	0	-/-	
88	0	0	0	-	-	0	0	0	-/-	
95	0	0	0	-	-	0	0	0	-/-	
00	60	33	67	-	-	0	0	0	-/-	
05	60	0	100	-	20	0	0	0	-/-	
10	20	100	0	-	20	0	0	0	-/-	
Purshia tridentata										
82	1399	5	95	0	-	86	14	0	22/26	
88	2198	21	67	12	-	42	27	12	19/25	
95	1240	8	92	0	40	81	8	0	14/33	
00	1380	9	81	10	20	51	1	3	17/35	
05	1580	11	63	25	40	15	81	10	15/34	
10	1860	29	62	9	40	57	9	6	18/38	
Rosa woodsii										
82	0	0	0	-	-	0	0	0	-/-	
88	0	0	0	-	-	0	0	0	-/-	
95	180	89	11	-	20	0	0	0	7/8	
00	0	0	0	-	-	0	0	0	-/-	
05	0	0	0	-	-	0	0	0	13/13	
10	0	0	0	-	-	0	0	0	15/14	
Symphoricarpos oreophilus										
82	66	0	100	-	-	0	0	0	9/17	
88	66	0	100	-	-	0	0	0	10/19	
95	100	0	100	-	-	0	0	0	17/53	
00	40	50	50	-	-	0	0	0	20/66	
05	80	0	100	-	-	0	0	0	20/50	
10	100	20	80	-	-	0	0	0	24/53	