

DISCUSSION

Swan Creek - Trend Study No. 2-21

Study Information

This study was established on DWR property in the Swan Creek drainage (elevation: 6,400 feet, slope: 30%, aspect: southeast). The property contains areas that receive significant use by wintering elk, deer, and moose. The study is located on a hillside dominated by curlleaf mountain mahogany with an associated understory of bitterbrush, serviceberry, mountain snowberry, and mountain big sagebrush. The DWR owns only a portion of the section; the remainder is privately owned and used for cabins, recreation, and limited agriculture. Deer and elk pellet groups were fairly abundant with quadrat frequencies of 32% and 27% in 1996, respectively. A pellet group transect read in 2001 estimated 47 deer and 36 elk days use/acre (116 ddu/ha and 89 edu/ha). Most of the pellet groups were from winter use, but about one-third appeared to be from spring. Pellet group data from 2006 was estimated at 56 deer, 80 elk, and 1 moose days use/acre (137 ddu/ha, 198 edu/ha, and 2 mdu/ha).

Soil

Soil is classified in the Agassiz series, which was formed in shallow material over weathered limestone. Precipitation is somewhat excessively drained with medium to rapid runoff and moderate permeability (USDA-NRCS 2006). The soil has a loam texture with a soil reaction that is slightly alkaline (pH of 7.5). Effective rooting depth only measured 10 inches in 1996. However, deeper rooted shrubs like curlleaf mountain mahogany are growing. This would suggest that the rooting depth is not restricted in some places. The soil is rocky on the surface and throughout the profile with bedrock layers exposed on the slope. The ratio of protective cover (vegetation, litter, and cryptograms) to bare ground was good at 5:1 in 2006, leaving little exposed bare soil. The erosion condition class was determined as stable in 2001 and slight in 2006.

Browse

The dominant browse species is curlleaf mountain mahogany. Curlleaf mahogany provided 22% overhead canopy cover in 2001 and 18% in 2006. Point-center quarter data from 1996 estimated 148 mahogany/acre with an average diameter of just over 4.5 inches. In 2006, mahogany was estimated at 126 trees/acre with an average diameter of 10 inches. Most of the mahogany sampled during all years were large mature plants which were mostly unavailable to browsing. Use of the available portions has been moderate to heavy and 37% of the population in 2006 were classified as decadent and dying.

Important understory shrubs include serviceberry, mountain big sagebrush, and bitterbrush. Serviceberry is moderately abundant and has steadily increased from 865 plants/acre in 1990 to 1,220 plants/acre in 2006. They have consistently displayed moderate to heavy use since 1990, but vigor has been good at each reading. Poor vigor was noted on 10% of the plants sampled in 1996 due to an infestation of rust. Recruitment from young plants has been excellent averaging 30% of the population. Mountain big sagebrush and bitterbrush occur in small numbers and sagebrush appears to be declining, while bitterbrush has maintained a stable population.

Herbaceous Understory

Bluebunch wheatgrass and Sandberg bluegrass are prominent in the understory and have increased from 8% cover in 1996 to 14% cover in 2006. Annual brome grasses (Japanese and cheatgrass brome) averaged 14% cover in 1996, but declined to less than 2% cover in 2001 and 2006. Bulbous bluegrass is not that abundant, but has been steadily increasing since 1996. Forbs are moderately diverse, but only a few species are abundant. The most common perennial forbs include arrowleaf balsamroot, rock goldenrod, and tapertip hawksbeard, which have provided over 75% of the forb cover.

1996 TREND ASSESSMENT

The browse trend appears stable for the key species, curlleaf mountain mahogany. Serviceberry, an important

understory shrub, also had a stable trend. Trend for grasses is stable. Sum on nested frequency for perennial grasses has remained similar to the 1990 reading. Annual grasses were included in the sample for the first time and they are abundant with 14% cover. Trend for forbs is down. The sum of nested frequency of perennial forbs decreased by 52%. Several species decreased significantly, include: longleaf phlox, tapertip hawksbeard, bastard toadflax, and sego lily. The Desirable Components Index rated this study as very poor due to low browse cover, but with fair perennial grass and forb cover. High annual grass cover was a negative factor on the score.

winter range condition (DC Index) - very poor (25) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - down (-2)

2001 TREND ASSESSMENT

Trend for the key browse species, curlleaf mountain mahogany, is stable. Population density has remained similar, utilization is moderate to heavy, and vigor is normal. Serviceberry, a key understory species, displayed a slightly improved trend due to an increase in density, improved vigor, and a decline in percent decadence. In addition, young plants are more numerous and accounted for 38% of the population. Mountain big sagebrush and bitterbrush occur in limited numbers yet appear to have stable populations. Overall, the browse trend is slightly up due to the improvement in serviceberry, which provides a large proportion of the available browse forage. Trend for grasses is up. Sum of nested frequency of perennial grasses increased slightly. In addition, sum of nested frequency of Japanese brome and cheatgrass declined significantly. Annual grass cover also declined from 14% in 1996 to only 1%. Trend for forbs is stable. Perennial forbs sum of nested frequency did not change much, but annual forbs increased in nested frequency. Annual forb cover has remained low at 1%. The Desirable Components Index rated this study as poor due to low browse cover. Perennial grass and forb cover were fair. Annual grass cover decreased, which improved the score from 1996.

winter range condition (DC Index) - poor (38) Mid-level potential scale
browse - stable (0) grasses - up (+2) forbs - stable (0)

2006 TREND ASSESSMENT

Trend for key browse is slightly up. Curlleaf mahogany has maintained a fairly stable population. Most plants remain large and unavailable to browsing. Serviceberry is the most abundant available shrub and density has increased from 1,060 plants/acre in 2001 to 1,220 plants/acre in 2006. Young recruitment has remained excellent at 31% of the population. Mountain big sagebrush continues to decline, but it is not an abundant species. Bitterbrush has maintained a stable population. Trend for grasses is slightly down. Sum of nested frequency for perennial grasses has not changed much from 2001. However, Japanese brome and cheatgrass nested frequency both increased significantly, but combined cover averaged only 2%. Trend for forbs is slightly up. Perennial forb sum of nested frequency increased by 23%, but cover remained at 9%. The Desirable Components Index rated this study as poor due to low browse cover, but with fair perennial grass and forb cover. Annual grass cover remained similar to 2001.

winter range condition (DC Index) - poor (42) Mid-level potential scale
browse - slightly up (+1) grasses - slightly down (-1) forbs - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 21

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
G	<i>Agropyron spicatum</i>	_b 286	_a 222	_{ab} 241	_a 220	6.91	9.72	10.45
G	<i>Bromus japonicus</i> (a)	-	_c 162	_a 44	_b 89	5.26	.26	.57
G	<i>Bromus tectorum</i> (a)	-	_b 168	_a 75	_b 136	8.59	1.02	1.62
G	<i>Koeleria cristata</i>	-	-	-	2	-	-	.15
G	<i>Oryzopsis hymenoides</i>	-	4	1	2	.03	.06	.07
G	<i>Poa bulbosa</i>	_a -	_a 3	_{ab} 20	_b 39	.09	.69	1.32
G	<i>Poa pratensis</i>	-	1	1	7	.03	.01	.30
G	<i>Poa secunda</i>	_a 55	_b 105	_b 122	_b 125	1.46	1.46	3.18
Total for Annual Grasses		0	330	119	225	13.85	1.29	2.19
Total for Perennial Grasses		341	335	385	395	8.53	11.94	15.48
Total for Grasses		341	665	504	620	22.39	13.24	17.68
F	<i>Achillea millefolium</i>	6	7	1	9	.16	.03	.07
F	<i>Agoseris glauca</i>	25	26	23	25	.12	.06	.18
F	<i>Alyssum alyssoides</i> (a)	-	_b 183	_b 198	_a 131	.99	.76	.43
F	<i>Arabis</i> sp.	_b 10	_a -	_a -	_a -	-	-	-
F	<i>Balsamorhiza sagittata</i>	_b 76	_{ab} 52	_a 40	_a 31	3.67	4.35	2.85
F	<i>Castilleja linariaefolia</i>	4	-	2	-	-	.03	-
F	<i>Camelina microcarpa</i> (a)	-	_a 12	_b 43	_a 10	.06	.12	.05
F	<i>Calochortus nuttallii</i>	_b 19	_a -	_a 3	_a -	-	.00	-
F	<i>Cirsium undulatum</i>	7	4	2	6	.19	.15	.21
F	<i>Collomia linearis</i> (a)	-	-	7	-	-	.01	-
F	<i>Comandra pallida</i>	_b 26	_a 4	_a 2	_a 3	.01	.03	.06
F	<i>Collinsia parviflora</i> (a)	-	_a 9	_b 99	_b 85	.01	.19	.20
F	<i>Crepis acuminata</i>	_c 106	_a 16	_{ab} 33	_b 55	.19	.54	1.54
F	<i>Delphinium nuttallianum</i>	-	-	2	-	-	.01	-
F	<i>Descurainia pinnata</i> (a)	-	_a -	_b 13	_a 3	-	.03	.00
F	<i>Draba</i> sp. (a)	-	-	3	-	-	.03	-
F	<i>Epilobium brachycarpum</i> (a)	-	2	-	-	.01	-	-
F	<i>Eriogonum umbellatum</i>	5	-	-	-	-	-	.00
F	<i>Gayophytum ramosissimum</i> (a)	-	-	3	5	-	.01	.03
F	<i>Hackelia patens</i>	7	16	18	11	.19	.19	.14
F	<i>Lappula occidentalis</i> (a)	-	_a -	_b 25	_b 23	-	.19	.05
F	<i>Lactuca serriola</i>	3	-	3	-	-	.03	-
F	<i>Lomatium</i> sp.	5	-	1	-	-	.00	-
F	<i>Machaeranthera canescens</i>	-	-	-	2	-	.03	.01

Type	Species	Nested Frequency				Average Cover %		
		'90	'96	'01	'06	'96	'01	'06
F	<i>Microsteris gracilis</i> (a)	-	a-	b ⁴ 1	b ⁵ 9	-	.08	.16
F	<i>Penstemon humilis</i>	a-	a-	a ²	b ² 8	-	.04	.24
F	<i>Penstemon</i> sp.	b ² 5	ab ¹ 3	ab ⁹	a ⁸	.13	.10	.30
F	<i>Petradoria pumila</i>	58	58	50	46	3.01	3.36	2.84
F	<i>Phlox longifolia</i>	c ² 8	a-	ab ⁷	b ¹ 7	-	.02	.08
F	<i>Polygonum douglasii</i> (a)	-	-	-	1	-	-	.00
F	<i>Tragopogon dubius</i>	a ⁷	ab ⁹	ab ¹ 9	b ² 5	.02	.18	.14
F	<i>Veronica biloba</i> (a)	-	10	5	9	.07	.01	.01
F	<i>Zigadenus paniculatus</i>	9	-	5	8	-	.04	.08
Total for Annual Forbs		0	216	437	326	1.15	1.44	0.97
Total for Perennial Forbs		426	205	222	274	7.72	9.22	8.78
Total for Forbs		426	421	659	600	8.87	10.67	9.76

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

BROWSE TRENDS --

Management unit 02 , Study no: 21

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	<i>Amelanchier alnifolia</i>	26	23	27	2.77	2.39	2.18
B	<i>Artemisia tridentata vaseyana</i>	7	5	3	.30	.00	.03
B	<i>Cercocarpus ledifolius</i>	11	11	7	2.38	1.84	1.32
B	<i>Cercocarpus montanus</i>	1	1	0	-	-	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	9	12	12	.86	1.38	1.06
B	<i>Eriogonum microthecum</i>	23	23	15	.87	.66	.73
B	<i>Gutierrezia sarothrae</i>	32	44	33	.69	1.74	1.36
B	<i>Mahonia repens</i>	29	35	34	.40	.93	.70
B	<i>Purshia tridentata</i>	4	6	5	.06	.03	.30
B	<i>Symphoricarpos oreophilus</i>	22	19	23	.93	1.10	.86
Total for Browse		164	179	159	9.30	10.11	8.57

CANOPY COVER, LINE INTERCEPT --
 Management unit 02 , Study no: 21

Species	Percent Cover	
	'01	'06
Amelanchier alnifolia	-	2.84
Artemisia tridentata vaseyana	-	.61
Cercocarpus ledifolius	22.00	18.29
Chrysothamnus viscidiflorus viscidiflorus	-	1.11
Eriogonum microthecum	-	.58
Gutierrezia sarothrae	-	2.00
Mahonia repens	-	.66
Purshia tridentata	-	.40
Symphoricarpos oreophilus	-	.43

KEY BROWSE ANNUAL LEADER GROWTH --
 Management unit 02 , Study no: 21

Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	2.9	3.1
Cercocarpus ledifolius	4.1	3.0
Purshia tridentata	-	3.1

POINT-QUARTER TREE DATA --
 Management unit 02 , Study no: 21

Species	Trees per Acre	
	'01	'06
Cercocarpus ledifolius	-	126

Average diameter (in)	
'01	'06
-	10.1

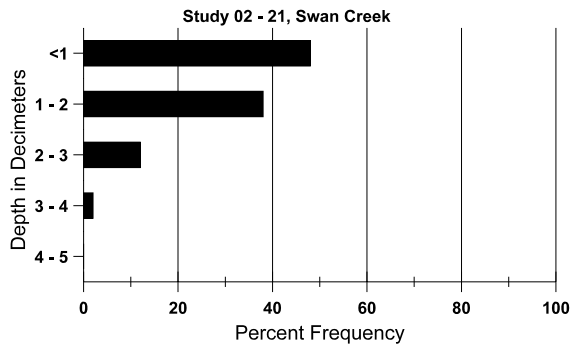
BASIC COVER --
 Management unit 02 , Study no: 21

Cover Type	Average Cover %			
	'90	'96	'01	'06
Vegetation	7.50	39.27	33.79	34.61
Rock	21.25	21.62	23.00	28.97
Pavement	3.00	1.18	2.80	2.49
Litter	53.25	48.38	45.56	42.52
Cryptogams	0	.50	.99	.85
Bare Ground	15.00	5.15	9.51	8.11

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 21, Swan Creek

Effective rooting depth (in)	Temp °F (depth)	PH	Clay loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
10.3	58.0 (11.9)	7.5	34.6	38.1	27.4	6.6	9.6	230.4	0.7

Stoniness Index



PELLET GROUP DATA --
Management unit 02, Study no: 21

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	2	1	1
Moose	-	-	1
Elk	27	13	34
Deer	32	29	38
Cattle	-	-	1

Days use per acre (ha)	
'01	'06
-	-
-	1 (2)
36 (89)	80 (198)
47 (116)	56 (137)
-	-

BROWSE CHARACTERISTICS --
Management unit 02, Study no: 21

		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												
90	865	66	466	333	66	-	58	12	8	-	4	28/17
96	840	-	200	500	140	20	55	17	17	7	10	18/31
01	1060	20	400	660	-	-	49	19	0	-	0	18/28
06	1220	60	380	780	60	20	33	39	5	2	7	17/29

		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)
<i>Artemisia tridentata vaseyana</i>												
90	99	33	-	33	66	-	33	33	67	-	0	26/17
96	180	-	40	60	80	280	44	0	44	-	11	10/22
01	100	-	-	60	40	160	0	0	40	-	0	16/32
06	60	-	-	60	-	80	0	0	0	-	0	12/24
<i>Cercocarpus ledifolius</i>												
90	166	33	33	133	-	-	0	20	0	-	0	157/152
96	280	-	40	240	-	20	29	36	0	-	0	11/24
01	220	-	100	100	20	-	18	27	9	-	0	20/22
06	380	80	60	180	140	60	0	11	37	37	37	-/-
<i>Cercocarpus montanus</i>												
90	0	-	-	-	-	-	0	0	-	-	0	-/-
96	20	-	-	20	-	-	0	100	-	-	0	36/54
01	20	-	-	20	-	-	100	0	-	-	0	32/59
06	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
90	66	-	-	33	33	-	0	50	50	-	0	10/10
96	300	-	20	280	-	-	7	0	0	-	0	14/24
01	500	-	-	500	-	-	0	0	0	-	0	12/25
06	440	-	20	420	-	-	0	0	0	-	36	10/16
<i>Eriogonum microthecum</i>												
90	0	-	-	-	-	-	0	0	0	-	0	-/-
96	540	-	-	460	80	-	7	0	15	4	4	14/19
01	760	-	-	760	-	40	0	0	0	-	0	12/16
06	480	-	-	480	-	-	0	0	0	-	0	11/17
<i>Gutierrezia sarothrae</i>												
90	2199	66	333	1800	66	-	0	0	3	-	2	11/16
96	1100	-	100	1000	-	20	0	0	0	-	0	8/10
01	1600	20	40	1540	20	20	0	0	1	1	1	10/15
06	1080	80	20	960	100	-	0	0	9	4	4	8/14
<i>Mahonia repens</i>												
90	2900	-	900	2000	-	-	2	0	-	-	0	4/4
96	2380	-	1020	1360	-	-	0	0	-	-	0	5/6
01	4360	-	200	4160	-	-	0	0	-	-	0	3/5
06	5020	-	-	5020	-	-	0	0	-	-	0	4/4

		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)
Purshia tridentata												
90	133	-	33	100	-	-	25	0	-	-	0	11/12
96	80	-	-	80	-	-	100	0	-	-	0	7/20
01	120	-	20	100	-	-	33	33	-	-	0	19/41
06	100	-	-	100	-	-	0	80	-	-	0	9/22
Symphoricarpos oreophilus												
90	932	66	166	666	100	-	7	0	11	-	14	19/17
96	600	-	180	400	20	-	0	0	3	-	0	14/23
01	600	-	20	540	40	-	3	0	7	3	3	14/23
06	620	-	-	480	140	-	0	0	23	13	42	15/24