

DISCUSSION

Pole Hollow Spring - Trend Study No. 2-39

Study Information

This study is located 4 miles northeast of Hardware Ranch on land administered by the DWR (elevation: 6,200 feet, slope: 15%, aspect: southwest). The study monitors a mountain brush community and is best classified as summer/transitional range for wildlife. Elk and deer use was minimal in 1996 and 2001. Cattle use the area in summer. It was also in an area that might have been intensively grazed as part of the Hardware grazing study. A control study, temporarily surrounded by an electric fence, is located 300 feet to the northeast. Sheep may have also grazed here in past years. A pellet group transect read in 2001 estimated 13 deer and 2 cow days use/acre (32 ddu/ha and 4 cdu/ha). No elk pellets were sampled in 2001. Pellet group data from 2006 was estimated at 3 elk, 7 deer, 8 cow and 1 moose days use/acre (7edu/ha, 17ddu/ha, 20 cdu/ha, and 2 mdu/ha). A grouse pellet group was also sampled in the transect.

Soil

Soil is moderately deep with an estimated effective rooting depth of nearly 20 inches. It has a clay texture and organic matter is high at 5.1%. Some gravel occurs in the profile and on the soil surface. Average relative cover of bare soil has remained near 14% since 1996 and protective cover (vegetation, litter, and cryptogams) to bare ground is good at 3.7 or above. Vegetation and litter cover are abundant and well dispersed, resulting in only limited erosion. Terracing and bare trails were noted in 2001, along with soil movement in small areas. An erosion condition class determined soils to be slightly eroding in 2001, but stable in 2006.

Browse

The mixed mountain brush community has several important browse species. The key species are mountain big sagebrush and bitterbrush. Mountain big sagebrush density has estimated about 3,400-3,600 mature-decadent plants/acre since 1996. Cover has increased as the plants have grown larger; from 12% in 1996 to 20% in 2006. Young recruitment was good in 1996 and 2001, but decreased to 1% of the population in 2006. Utilization has been light to moderate with vigor being generally good. Decadence has generally been low, ranging from 7-16%. Annual leader growth was relatively low, averaging about 2 inches in 2001 and 2006.

The bitterbrush population has fluctuated slightly, but has averaged just under 600 plants/acre. Cover has averaged about 7-9% since 1996. Utilization was light to moderate in 1996 and 2001, but increased in 2006 to moderate to heavy. There were no decadent plants sampled in 1996, but 21% of the population was classified as decadent in 2001 and 11% were decadent in 2006. Recruitment was low, but with no dead plants in the population, the number of young are adequate to maintain the population. Bitterbrush annual leader growth averaged 3.5 inches in 2001 and 2006.

Serviceberry is not abundant. Density was 500 plants/acre in 1996 and declined to 180 plants/acre in 2001 and 140 in 2006. Cover has continually increased as the plants have increased in size. Utilization was light to moderate in 1996 and 2001, but increased to moderate to heavy in 2006. Snowberry is abundant and has averaged 12% cover since 1996. The snowberry population is mostly mature and showed very little utilization by wildlife.

Herbaceous Understory

The herbaceous understory is dominated by perennial grasses, but the nested frequency has steadily declined since 1996. Shrubs are very thick and are most likely out competing the grasses for resources. The most numerous species was Kentucky bluegrass, an increaser, which decreased significantly from 12% cover in 2001 to 3% in 2006. Bluebunch wheatgrass was the most abundant grass with 4% cover in 2006. Cheatgrass and Japanese brome combined, averaged 4% cover in 1996. Nested frequency of both species decreased significantly in 2001 and have remained under 1% cover since. Smooth brome, Prairie junegrass, mutton bluegrass, Sandberg bluegrass, squirreltail, and Letterman needlegrass are all present but in relatively low

numbers. When the study was established in 1996, field notes stated that areas dominated by bluebunch wheatgrass were less heavily grazed. Those places dominated by Kentucky bluegrass were more heavily used and contained a higher number of weedy forbs. It was also noted that nearby meadow areas contained large amounts of tarweed, mulesears, and curlycup gumweed. Forbs are fairly abundant and diverse, but most are weedy increaser species. Western yarrow, pacific aster, and silver lupine accounted for 77% of the forb cover in 1996 and 65% in 2001 and 2006. Other perennial forbs include yellow salsify and bastard toadflax.

2001 TREND ASSESSMENT

Trend for browse is stable. The key species, mountain big sagebrush and bitterbrush, show light to moderate use and normal vigor. Percent decadence increased for both species, but remains within normal limits for these species, especially during consecutive dry years. Trend for grasses is stable. Sum of nested frequency for perennial grasses decreased slightly, but annual grasses also decreased significantly and averaged less than 1% cover in 2001. Trend for forbs is slightly up. Perennial forb sum of nested frequency increased by 21%, mostly due to a significant increase in wild onion and bastard toadflax. Species classified as weedy and/or increasers are still abundant. The Desirable Components Index rated this study as excellent due to high browse cover and excellent perennial grass and forb cover.

1996 winter range condition (DC Index) - good (86) Mid-level potential scale
2001 winter range condition (DC Index) - good (86) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - slightly up (+1)

2006 TREND ASSESSMENT

Trend for key browse, mountain big sagebrush and bitterbrush, is slightly down. The density of mature/decadent plants of both species did not change, but the density of young sagebrush decreased in 2006 to less than 1% of the population. The large loss of young could lead to less future recruitment. Decadence is low and vigor is good. Trend for grasses is down slightly. Perennial grass sum of nested frequency decreased by 13%, due mainly to a significant decrease in Kentucky bluegrass. Cover also decreased from 12% to 3%. Bluebunch wheatgrass nested frequency actually increased significantly, but cover only increased from 2% to 4%. Trend for forbs is slightly up. Perennial forb sum of nested frequency increased by 19% and cover increased from 9% in 2001 to 12% in 2006. The Desirable Components Index rated this study as good due to high browse cover, although the perennial grass cover decrease lowered the score slightly.

winter range condition (DC Index) - good (72) Mid-level potential scale
browse - slightly down (-1) grasses - slightly down (-1) forbs - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 02 , Study no: 39

T y p e	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
G	Agropyron spicatum	b ₂ 14	a ₁ 09	b ₁ 64	6.75	2.46	3.77
G	Agropyron trachycaulum	a ⁻	a ⁻	b ₂ 3	-	-	.21
G	Bromus inermis	a ₃	b ₁ 6	b ₁ 5	.03	.48	.09
G	Bromus japonicus (a)	c ₁ 44	b ₁ 66	a ₁ 0	2.54	.29	.02
G	Bromus tectorum (a)	b ₁ 32	a ₁	a ₂	1.62	.03	.01
G	Elymus cinereus	-	1	-	-	.00	-
G	Koeleria cristata	29	32	27	.26	.49	.52

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
		G	<i>Poa fendleriana</i>	_a 13	_b 41	_b 52	.12
G	<i>Poa pratensis</i>	_b 279	_b 251	_a 141	8.06	11.56	3.34
G	<i>Poa secunda</i>	8	21	11	.19	.51	.18
G	<i>Sitanion hystrix</i>	_{ab} 14	_b 14	_a 2	.10	.48	.00
G	<i>Stipa lettermani</i>	42	50	28	.40	1.45	.75
Total for Annual Grasses		176	67	12	4.17	0.32	0.03
Total for Perennial Grasses		602	535	463	15.94	18.54	9.47
Total for Grasses		778	602	475	20.11	18.87	9.51
F	<i>Achillea millefolium</i>	98	77	95	1.71	.91	3.14
F	<i>Agoseris glauca</i>	5	-	2	.01	-	.00
F	<i>Alyssum alyssoides</i> (a)	-	-	1	-	-	.00
F	<i>Allium</i> sp.	_a -	_b 47	_c 90	-	.33	.41
F	<i>Artemisia ludoviciana</i>	6	7	3	.30	.30	.03
F	<i>Astragalus beckwithii</i>	-	-	4	-	-	.06
F	<i>Aster chilensis</i>	166	170	168	2.75	3.96	3.47
F	<i>Astragalus cibarius</i>	-	-	5	-	-	.18
F	<i>Astragalus convallarius</i>	_a 9	_a 16	_b 47	.04	.16	.49
F	<i>Balsamorhiza macrophylla</i>	5	-	3	.03	.03	.03
F	<i>Calochortus nuttallii</i>	-	3	2	-	.03	.00
F	<i>Cirsium undulatum</i>	_b 19	_{ab} 14	_a 3	.49	.21	.18
F	<i>Collomia linearis</i> (a)	-	_b 48	_a 12	-	.18	.02
F	<i>Comandra pallida</i>	_a 4	_b 54	_b 44	.07	.90	.68
F	<i>Collinsia parviflora</i> (a)	_a 3	_b 27	_{ab} 9	.01	.10	.02
F	<i>Cordylanthus ramosus</i> (a)	_a 1	_a 21	_b 73	.03	.72	1.70
F	<i>Crepis acuminata</i>	-	-	2	-	-	.03
F	<i>Cryptantha</i> sp.	1	-	-	.00	-	-
F	<i>Eriogonum umbellatum</i>	7	-	6	.06	-	.15
F	<i>Geranium richardsonii</i>	-	-	-	.03	-	-
F	<i>Geranium viscosissimum</i>	_a -	_a 2	_b 13	-	.03	.19
F	<i>Hackelia patens</i>	-	2	2	-	.00	.03
F	<i>Helianthella uniflora</i>	2	-	7	.06	-	.01
F	<i>Holosteum umbellatum</i> (a)	-	-	5	-	-	.00
F	<i>Ipomopsis aggregata</i>	2	-	1	.03	-	.03
F	<i>Lappula occidentalis</i> (a)	3	-	-	.00	-	-
F	<i>Lactuca serriola</i>	-	-	5	-	-	.03
F	<i>Lupinus argenteus</i>	50	63	66	1.12	1.74	2.38

Type	Species	Nested Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
F	<i>Microsteris gracilis</i> (a)	_a 10	_{ab} 23	_b 40	.01	.05	.09
F	<i>Penstemon humilis</i>	4	4	6	.01	.00	.06
F	<i>Phlox hoodii</i>	-	-	2	-	-	.00
F	<i>Phlox longifolia</i>	5	-	-	.01	-	-
F	<i>Potentilla diversifolia</i>	1	-	4	.15	-	.15
F	<i>Polygonum douglasii</i> (a)	14	20	6	.02	.03	.03
F	<i>Senecio multilobatus</i>	3	4	-	.00	.06	-
F	<i>Taraxacum officinale</i>	3	7	6	.00	.01	.04
F	<i>Tragopogon dubius</i>	_{ab} 19	_b 28	_a 8	.20	.41	.10
F	<i>Veronica biloba</i> (a)	12	13	15	.01	.04	.02
F	<i>Viguiera multiflora</i>	3	-	-	.04	-	-
F	<i>Wyethia amplexicaulis</i>	3	3	-	.00	.00	-
F	<i>Zigadenus paniculatus</i>	2	2	3	.00	.00	.06
Total for Annual Forbs		43	152	161	0.10	1.13	1.91
Total for Perennial Forbs		417	503	597	7.17	9.13	11.98
Total for Forbs		460	655	758	7.27	10.27	13.89

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

BROWSE TRENDS --

Management unit 02 , Study no: 39

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	<i>Amelanchier alnifolia</i>	12	7	6	.18	.97	1.08
B	<i>Artemisia tridentata vaseyana</i>	83	87	81	12.31	16.63	19.53
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	72	54	65	2.93	2.71	3.27
B	<i>Eriogonum heracleoides</i>	2	1	0	-	-	-
B	<i>Juniperus osteosperma</i>	0	0	1	-	-	-
B	<i>Mahonia repens</i>	28	37	38	1.49	1.11	1.90
B	<i>Purshia tridentata</i>	23	30	25	7.86	9.56	7.24
B	<i>Symphoricarpos oreophilus</i>	53	58	58	11.23	11.42	12.08
Total for Browse		273	274	274	36.02	42.42	45.13

CANOPY COVER, LINE INTERCEPT --
Management unit 02 , Study no: 39

Species	Percent Cover
	'06
Amelanchier alnifolia	1.10
Artemisia tridentata vaseyana	26.31
Chrysothamnus viscidiflorus viscidiflorus	5.08
Mahonia repens	1.10
Purshia tridentata	9.68
Symphoricarpos oreophilus	17.29

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 02 , Study no: 39

Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	-	2.9
Artemisia tridentata vaseyana	1.6	1.9
Purshia tridentata	3.5	3.7

BASIC COVER --
Management unit 02 , Study no: 39

Cover Type	Average Cover %		
	'96	'01	'06
Vegetation	55.67	61.97	61.25
Rock	.50	.19	.09
Pavement	1.85	1.89	.37
Litter	56.73	41.05	47.43
Bare Ground	14.36	15.38	22.48

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 39, Pole Hollow Spring

Effective rooting depth (in)	Temp °F (depth)	PH	Clay			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
19.5	52.8 (18.1)	7.0	28.6	27.4	44.0	5.1	28.8	249.6	1.3

		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)
Eriogonum heracleoides												
96	60	-	-	60	-	-	0	0	-	-	0	7/19
01	20	-	-	20	-	-	100	0	-	-	0	6/9
06	0	-	-	-	-	-	0	0	-	-	0	-/-
Juniperus osteosperma												
96	0	-	-	-	-	-	0	0	-	-	0	-/-
01	0	-	-	-	-	-	0	0	-	-	0	-/-
06	20	-	20	-	-	-	0	0	-	-	0	-/-
Mahonia repens												
96	5640	40	1160	4480	-	-	0	0	-	-	0	4/5
01	6080	-	20	6060	-	-	0	0	-	-	0	3/4
06	6900	40	20	6880	-	-	0	0	-	-	0	3/5
Purshia tridentata												
96	500	-	60	440	-	-	40	0	0	-	0	35/62
01	660	-	40	480	140	-	30	9	21	3	3	34/47
06	560	20	40	460	60	20	29	50	11	4	4	32/61
Quercus gambelii												
96	0	-	-	-	-	-	0	0	-	-	0	-/-
01	0	-	-	-	-	-	0	0	-	-	0	36/43
06	0	-	-	-	-	-	0	0	-	-	0	-/-
Symphoricarpos oreophilus												
96	2140	100	260	1820	60	-	.93	0	3	2	2	32/51
01	1820	-	60	1620	140	40	0	0	8	1	2	32/51
06	2280	-	120	2160	-	-	3	0	0	-	0	32/49