

Trend Study 10R-10-05

Study site name: Winter Ridge Livestock Exclosure .

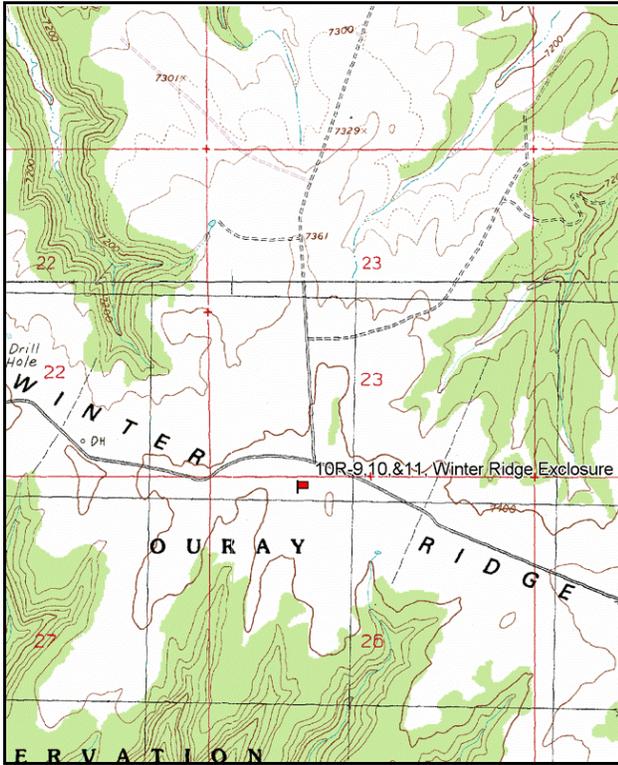
Vegetation Type: Mountain big sagebrush .

Compass bearing: Frequency baseline 275 degrees magnetic.

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

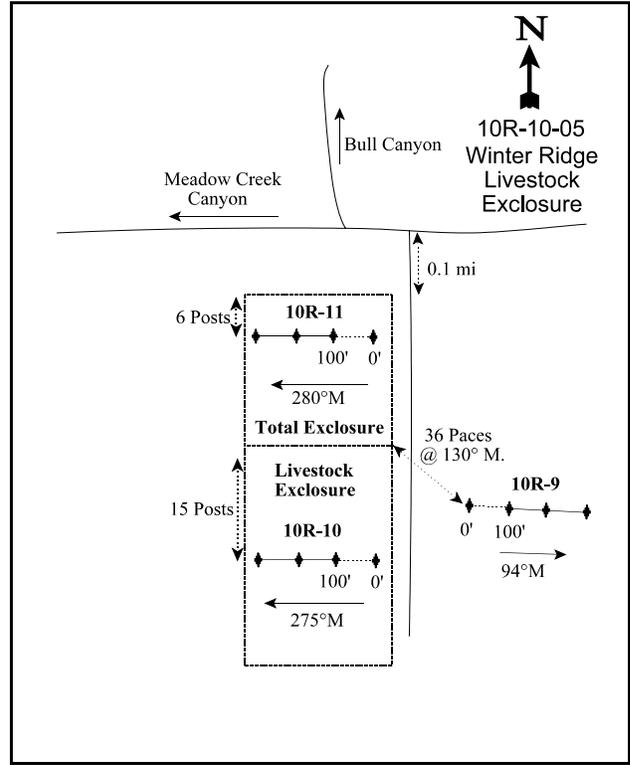
LOCATION DESCRIPTION

From the intersection of the Seep Ridge and Book Cliff Divide road, proceed west along the divide for 9.4 miles to the major Three Pines-Hay Canyon intersection. Drive west along the Winter Ridge Rd for 9.8 miles to a fork. From the intersection where Meadow Creek Canyon and Bull Canyon meet, take the road to the south. Go 0.1 miles to the Winter Ridge Exclosure. Go to the northwest corner of the livestock part of the exclosure. From here walk down 15 posts and the 300-foot stake is to the east. The 0-foot stake is on the east end and marked by browse tag number 76.



Map name: Tenmile Canyon North

Township 15S, Range 21E, Section 26



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4371940 N, 625695 E

DISCUSSION

Winter Ridge Livestock Exclosure - Trend Study 10R-10

This study is located within the Winter Ridge livestock exclosure which excludes livestock use. The exclosure was constructed in 1964 and the trend study was established in 1997. The site has a mild slope of 5% with a westerly aspect and an elevation of 7,400 feet. Pellet group data indicated high elk use within the livestock exclosure in 1997 with 100 elk days use/acre (247 edu/ha). Deer use was only 4 days use/acre (10 ddu/ha). Data from the 2000 reading were estimated at a lower use of 28 elk days use/acre (69 edu/ha). In 2005, 80 elk and 3 deer days use/acre (197 edu/ha and 8 ddu/ha) were estimated. There was also 2 cow days use/acre (5 cdu/ha) were estimated due to a part of the fence that was knocked over.

Soil in the exclosure is moderately deep with an effective rooting depth estimated at nearly 16 inches. It has a loam texture and neutral soil reaction (pH of 7.2). Phosphorus and potassium are both low at 5.4 and 3.2 ppm, respectively. Values less than 6 ppm for phosphorus and 60 ppm for potassium may limit normal plant growth and development (Tiedemann and Lopez 2004). Some soil pedestaling is evident in the shrub interspaces, although current erosion appears minimal and was rated as stable in 2005.

As with the surrounding mountain big sagebrush community outside of the exclosure, sagebrush within the exclosure has a mostly mature age structure. Sagebrush within the exclosure are noticeably larger than the plants sampled on the outside. They show light to moderate hedging. Sagebrush cover was nearly 15% in 2000, but declined to 10% in 2005. Decadence was estimated at 31% in 1997. In 2000, decadence declined to 23%, but then increased to 39% in 2005. Plants classified as dying increased from 15% to 23% in 2005. Sagebrush density increased to 5,600 plants/acre in 2005, which was about equal to density in 1997. Young plants have not been extremely abundant during any of the three sampling periods. A moderate amount of seedlings (280/acre) were sampled in 2005. Other common browse on the site include dwarf and stickleaf low rabbitbrush, and broom snakeweed. Broom snakeweed density increased by nearly four times in 2005.

Grasses are abundant and diverse. Thickspike wheatgrass, prairie Junegrass, mutton bluegrass, and Sandberg bluegrass are all abundant. Thickspike wheatgrass and needle-and-thread grass increased significantly in 2005. Forbs are diverse yet few species are very abundant. The most common forb is desert phlox. No annual grasses or forbs have ever been sampled on this site.

1997 APPARENT TREND ASSESSMENT

There is some slight rill erosion apparent in the shrub interspaces. As with most of the surrounding area, the soil is most vulnerable in the unprotected interspaces between the mountain big sagebrush. Cryptogams also help protect the soil. Mountain big sagebrush is the dominant browse with an overly mature age structure and very low number of seedlings. At this time there does not appear to be enough seedlings or young plants present to replace the decadent and/or dying population. Other browse are present but in low densities. Grass accounts for three-fourths of the herbaceous cover with muttongrass being the most abundant. No annual forbs are present and the perennial forbs consist of primarily low growing species that provide little forage. The Desirable Components Index (see methods) rated this site as good due to moderate browse cover and excellent perennial grass cover.

winter range condition (DC Index) - good (68) Mid-level potential scale

2000 TREND ASSESSMENT

Trend for soil is considered stable with similar amounts of bare ground estimated in 1997 and 2000. Vegetation and litter cover are abundant and adequate to protect the soil from significant erosion events.

Trend for the key browse species, mountain big sagebrush, is stable. Use of sagebrush is similar to 1997 levels. Percent decadence declined slightly, however the proportion of plants displaying poor vigor increased from 10% to 23% due to drought conditions. Density of young plants increased, although there are currently not enough to replace decadent sagebrush that appear to be dying. Another unfavorable factor is the increase in broom snakeweed which occurred rarely in 1997. Now it numbers 1,240 plants/acre and 44% of these are young plants. Trend for the herbaceous understory is down slightly due to a decline in the sum of nested frequency of perennial grasses and forbs. Mutton bluegrass was the most abundant grass on the site in 1997 with a quadrat frequency of 93% and a cover value of 8%. It has since declined significantly to a quadrat frequency of 56% and a cover value of less than 5%. All other grass frequencies remained similar. Sum of nested frequency of perennial forbs declined to less than half of the 1997 level. The DCI score continued to rate this site as good.

TREND ASSESSMENT

soil - stable (0)

browse - stable (0)

herbaceous understory - slightly down (-1)

winter range condition (DC Index) - good (70) Mid-level potential scale

2005 TREND ASSESSMENT

Trend for soil is considered stable as there was not enough change to warrant a change in trend. Relative percent bare soil has increased from 28% to 34%. Vegetation cover and litter cover decreased slightly after drought. The browse trend is stable. Mountain big sagebrush density increased to the same density as 1997, but percent decadence also increased from 23% to 39% in 2005. The number of plants classified as dying increased to 23%. Sagebrush cover decreased from 15% to 10%. Broom snakeweed density increased by four times. Utilization has been light to moderate. The herbaceous understory trend is slightly up. Sum of nested frequency for grasses and forbs combined increased 20%. Needle-and-thread and thickspike wheatgrass each significantly increased. Forb nested frequency increased 40% from 2000, which was a very dry year. The DCI score rated this site as fair due to a decrease in browse cover and an increase in browse decadence.

TREND ASSESSMENT

soil - stable (0)

browse - stable (0)

herbaceous understory - slightly up (+1)

winter range condition (DC Index) - fair (57) Mid-level potential scale

HERBACEOUS TRENDS --
Management unit 10R, Study no: 10

Type	Species	Nested Frequency			Average Cover %		
		'97	'00	'05	'97	'00	'05
G	Agropyron dasystachyum	_a 226	_a 227	_b 282	.86	3.01	4.45
G	Bouteloua gracilis	17	15	21	.28	.51	1.08
G	Koeleria cristata	230	255	262	3.71	10.16	8.50
G	Oryzopsis hymenoides	-	6	5	-	.30	.03
G	Poa fendleriana	_b 299	_a 158	_a 177	7.85	3.38	5.25
G	Poa secunda	99	99	92	1.83	1.02	1.29

Type	Species	Nested Frequency			Average Cover %		
		'97	'00	'05	'97	'00	'05
		G	<i>Stipa comata</i>	_a 6	_a 10	_b 58	.06
G	<i>Stipa lettermani</i>	3	-	-	.15	-	-
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		880	770	897	14.76	18.53	22.74
Total for Grasses		880	770	897	14.76	18.53	22.74
F	<i>Agoseris glauca</i>	-	-	4	-	-	.09
F	<i>Antennaria rosea</i>	15	18	10	.15	.11	.10
F	<i>Arabis</i> sp.	_b 11	_{ab} 2	_a -	.03	.01	-
F	<i>Astragalus convallarius</i>	_{ab} 18	_a 5	_b 27	.06	.01	.64
F	<i>Castilleja linariaefolia</i>	_b 41	_a 7	_a -	.69	.01	.00
F	<i>Crepis acuminata</i>	_b 22	_a 10	_a 10	.33	.25	.27
F	<i>Cryptantha</i> sp.	5	14	5	.01	.07	.01
F	<i>Erigeron eatonii</i>	_b 35	_a 13	_a 10	.22	.05	.10
F	<i>Erigeron pumilus</i>	-	8	8	-	.07	.10
F	<i>Lesquerella</i> sp.	_{ab} 1	_a -	_b 13	.00	-	.19
F	<i>Machaeranthera canescens</i>	-	2	-	-	.06	-
F	<i>Machaeranthera grindelioides</i>	13	6	4	1.38	.06	.06
F	<i>Penstemon caespitosus</i>	_b 31	_a 4	_a 6	.58	.15	.06
F	<i>Phlox austromontana</i>	_c 174	_a 55	_b 101	2.32	1.12	1.10
F	<i>Phlox longifolia</i>	_b 28	_a -	_a 3	.09	-	.01
F	<i>Senecio multilobatus</i>	-	3	8	-	.01	.18
F	<i>Sphaeralcea coccinea</i>	11	12	12	.02	.10	.18
F	<i>Townsendia</i> sp.	-	-	1	-	-	.00
Total for Annual Forbs		0	0	0	0	0	0
Total for Perennial Forbs		405	159	222	5.92	2.13	3.14
Total for Forbs		405	159	222	5.92	2.13	3.14

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

BROWSE TRENDS --

Management unit 10R, Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'97	'00	'05	'97	'00	'05
B	<i>Artemisia tridentata vaseyana</i>	96	93	99	13.12	14.75	10.43
B	<i>Ceratoides lanata</i>	1	1	1	.03	-	.00
B	<i>Chrysothamnus depressus</i>	34	34	37	1.22	1.37	2.07
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	4	17	14	.09	.53	.51
B	<i>Gutierrezia sarothrae</i>	2	21	65	.03	.04	3.01
B	<i>Opuntia sp.</i>	4	1	6	.00	-	.00
B	<i>Pediocactus simpsonii</i>	0	1	0	.00	.00	-
B	<i>Pinus edulis</i>	0	0	1	.15	.00	.03
B	<i>Sclerocactus sp.</i>	0	0	0	-	.00	-
Total for Browse		141	168	223	14.66	16.71	16.08

CANOPY COVER, LINE INTERCEPT --

Management unit 10R, Study no: 10

Species	Percent Cover
	'05
<i>Artemisia tridentata vaseyana</i>	14.39
<i>Ceratoides lanata</i>	.03
<i>Chrysothamnus depressus</i>	1.48
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.51
<i>Gutierrezia sarothrae</i>	2.86

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 10R, Study no: 10

Species	Average leader growth (in)
	'05
<i>Artemisia tridentata vaseyana</i>	1.3

BASIC COVER --

Management unit 10R, Study no: 10

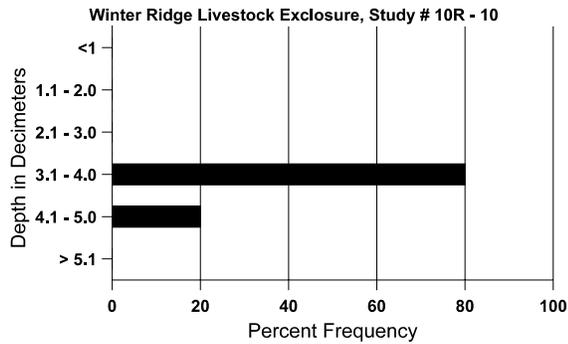
Cover Type	Average Cover %		
	'97	'00	'05
Vegetation	33.37	47.15	43.04
Rock	.04	0	.01
Pavement	.18	.04	.05
Litter	29.62	30.74	27.72
Cryptogams	16.89	2.14	5.28
Bare Ground	30.52	31.20	38.77

SOIL ANALYSIS DATA --

Herd Unit 10R, Study no: 10, Study Name: Winter Ridge Livestock Exclosure

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
15.8	61.2 (15.6)	7.2	35.6	38.8	25.6	1.4	5.4	3.2	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 10R, Study no: 10

Type	Quadrat Frequency		
	'97	'00	'05
Rabbit	9	4	4
Elk	49	22	52
Deer	-	3	6
Cattle	-	1	4

Days use per acre (ha)	
'00	'05
-	-
28 (70)	80 (197)
1 (4)	3 (8)
-	2 (5)

BROWSE CHARACTERISTICS --
Management unit 10R, Study no: 10

		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>												
97	5740	20	340	3600	1800	1500	36	1	31	10	10	48/54
00	4720	-	540	3100	1080	1020	38	7	23	15	23	30/33
05	5600	280	240	3160	2200	1960	46	16	39	23	23	22/26
<i>Ceratoides lanata</i>												
97	20	-	-	20	-	-	0	0	-	-	0	5/11
00	20	-	-	20	-	-	0	0	-	-	0	-/-
05	20	-	-	20	-	-	0	100	-	-	0	7/12
<i>Chrysothamnus depressus</i>												
97	2140	-	80	2060	-	-	0	0	-	-	0	5/9
00	1900	20	20	1880	-	-	0	0	-	-	0	5/7
05	1620	-	-	1620	-	-	26	14	-	-	0	5/11
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
97	100	-	20	80	-	-	0	0	-	-	0	13/23
00	500	-	100	400	-	-	8	0	-	-	0	7/9
05	420	-	100	320	-	-	5	0	-	-	0	9/13
<i>Gutierrezia sarothrae</i>												
97	40	-	20	20	-	-	0	0	0	-	0	6/7
00	1240	-	540	680	20	-	0	0	2	-	0	5/5
05	4940	-	1080	3840	20	-	0	0	0	.40	.40	7/9
<i>Opuntia sp.</i>												
97	80	-	40	40	-	-	0	0	-	-	0	2/6
00	20	-	-	20	-	-	0	0	-	-	100	1/6
05	240	-	40	200	-	-	0	0	-	-	0	2/6
<i>Pediocactus simpsonii</i>												
97	0	-	-	-	-	-	0	0	-	-	0	-/-
00	20	-	-	20	-	-	0	0	-	-	0	-/-
05	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Pinus edulis</i>												
97	0	-	-	-	-	-	0	0	-	-	0	-/-
00	0	-	-	-	-	-	0	0	-	-	0	-/-
05	20	-	20	-	-	-	0	0	-	-	0	-/-

WINTER RIDGE EXCLOSURE COMPARISON SUMMARY

Trend Study No. 10R-9 (outside), 10R-10 (livestock), and 10R-11 (total)

Ground cover characteristics are similar between the livestock enclosure and outside of the enclosure where percent bare ground is relatively high, yet litter and vegetation cover are abundant and appear adequate to protect the soil. Inside the total enclosure, herbaceous cover is more abundant and percent bare ground lower.

The key browse for this study area is mountain big sagebrush (Tables 1 and 2). Sagebrush density decreased outside the enclosure and inside the total enclosure in 2005. Sagebrush density was nearly equal for each study in 2005 at about 5,400 plants/acre. Sagebrush cover was much higher in the total enclosure where no browsing takes place. Cover was 22% in 2005 in the total enclosure, compared to 9% outside and 10% in the livestock enclosure. Plants in the total enclosure were on average much larger (28 inches tall, 32 inches crown width) than those that can be browsed outside the enclosure (19/23 inches) or in the livestock enclosure (22/26 inches). Percent decadence and percent dying were similar for each study. Decadency and plants classified as dying increased in 2005 compared to 2000. This shows the impact of the recent drought as each study was similarly effected. Percent young was also similar for each study in 2005.

	<u>Outside Enclosure</u>	<u>Livestock Enclosure</u>	<u>Total Enclosure</u>
Mountain big sagebrush			
Average Cover %	15.6	14.8	20.1
Density (plants/acre)	7,960	4,720	7,460
% young	8% (660/acre)	11% (540cre)	6% (460/acre)
% decadent	51% (4,080/acre)	23% (1,080/acre)	51% (3,840/acre)
% dying	20% (1,560/acre)	15% (720/acre)	6% (460/acre)
% heavy use	30% (2,360/acre)	7% (320/acre)	0% (0/acre)
Average height/crown	20/22	30/33	30/31

Table 1. Mountain big sagebrush data comparisons for Winter Ridge Enclosure complex in 2000.

	<u>Outside Enclosure</u>	<u>Livestock Enclosure</u>	<u>Total Enclosure</u>
Mountain big sagebrush			
Average Cover %	9.2	10.4	22.0
Density (plants/acre)	5,140	5,600	5,360
% young	3% (140/acre)	4% (240/acre)	2% (120/acre)
% decadent	42% (2,140/acre)	39% (2,200/acre)	37% (2,000/acre)
% dying	20% (1,380/acre)	23% (1,260/acre)	18% (980/acre)
% heavy use	9% (480/acre)	16% (900/acre)	0% (0/acre)
Average height/crown	19/23	22/26	28/32

Table 2. Mountain big sagebrush data comparisons for Winter Ridge Enclosure complex in 2005.

The herbaceous understories are relatively abundant and diverse on all treatment effects with perennial grasses dominating the herbaceous understory. Six grass species are common to each study site, but vary in their abundance (Tables 3 and 4). The most common species include: thickspike wheatgrass, blue grama, prairie Junegrass, mutton bluegrass, Sandberg bluegrass, and needle-and-thread grass. A major difference between the three site treatment effects is the abundance of mutton bluegrass in the total enclosure. In 2000, it provided 69% of the grass cover in the total enclosure with a cover value nearly 4 times more than outside of the enclosure and 7 times more than the livestock enclosure. In 2005, mutton bluegrass declined, but was still the most abundant species in the total enclosure. Prairie junegrass was much more abundant in the livestock and total enclosure, which shows its sensitivity to spring grazing. The only warm season species, blue grama, was slightly more abundant outside the enclosure where cool season species are grazed in the spring. Forbs are diverse on all sites, but only provided about 3-4% cover in 2005. The most common forb for all sites is desert phlox.

Species	Nested Frequency 2000			Average Cover % 2000		
	<i>Outside</i>	<i>Livestock</i>	<i>Total Ex.</i>	<i>Outside</i>	<i>Livestock</i>	<i>Total Ex.</i>
G Agropyron dasystachyum	400	227	287	5.98	3.01	4.11
G Bouteloua gracilis	50	15	42	2.45	.51	2.17
G Koeleria cristata	56	255	114	.84	10.16	3.57
G Poa fendleriana	271	158	352	6.46	3.38	24.99
G Poa secunda	286	99	99	4.77	1.02	1.23
G Stipa comata	14	10	17	.10	.13	.13
Total for Grasses	1077	770	911	20.63	18.53	36.21

Table 3. Comparisons of grass abundance by species for Winter Ridge outside enclosure, livestock enclosure, and total enclosure in 2000.

Species	Nested Frequency 2005			Average Cover % 2005		
	<i>Outside</i>	<i>Livestock</i>	<i>Total Ex.</i>	<i>Outside</i>	<i>Livestock</i>	<i>Total Ex.</i>
G Agropyron dasystachyum	296	282	227	4.88	4.45	3.15
G Bouteloua gracilis	39	21	35	2.40	1.08	1.01
G Koeleria cristata	84	262	211	1.77	8.50	10.11
G Poa fendleriana	184	177	266	3.26	5.25	14.99
G Poa secunda	43	92	7	.50	1.29	.16
G Stipa comata	177	58	108	4.30	2.11	4.51
Total for Grasses	823	897	854	17.12	22.74	33.95

Table 4. Comparisons of grass abundance by species for Winter Ridge outside enclosure, livestock enclosure, and total enclosure in 2005.

It is difficult much of the time to determine which of many factors may be the most influential in effecting the trend for a key species. Transects were established in 1997 and read again in 2000 and 2005 for this relatively

high elevation three-way enclosure. When comparing the effects of the different grazing treatments on this area it appears that drought has the biggest effect on the sagebrush population as sagebrush density for each treatment was similar in 2005 and had declined after drought. Browsing does appear to have an effect on sagebrush cover as the unbrowsed plants were on average larger and provided more cover. Grazing has appeared to effect the abundance of some of the grass species. Mutton bluegrass and prairie junegrass decreased when grazed and were more abundant when protected from grazing.