

Trend Study 10R-11-05

Study site name: Winter Ridge Total Exclosure .

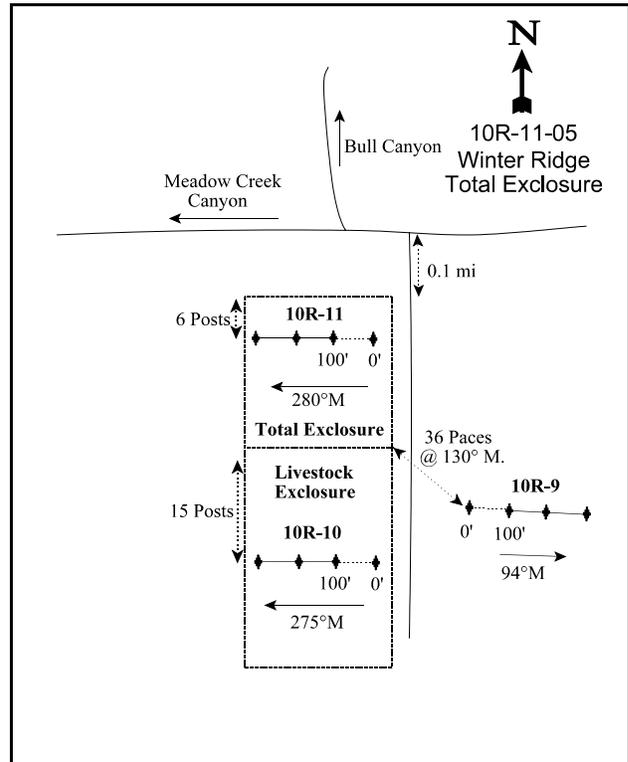
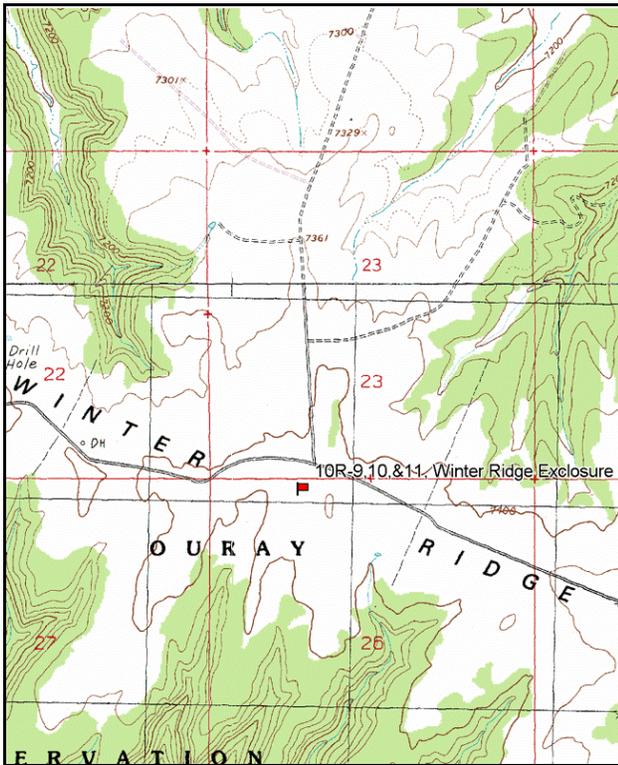
Vegetation Type: Mountain big sagebrush .

Compass bearing: Frequency baseline 280 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. From the northwest corner of the total exclosure, walk down six fenceposts. The 300-foot stake is just east of the sixth post. The 0-foot stake is on the east end and is marked by browse tag number 86.



Map name: Tenmile Canyon North

Diagrammatic Sketch

Township 15S, Range 21E, Section 26

GPS: NAD 27, UTM 12S 4372030 N, 625733 E

## DISCUSSION

### Winter Ridge Total Exclosure - Trend Study 10R-11

The Winter Ridge total exclosure study is found within the exclosure complex on Winter Ridge. The exclosure was constructed in 1964 and the trend study was established in 1997. The study samples the area of the total exclosure which excludes livestock and big game use. The site has a slope of 5% with a westerly aspect and an elevation of 7,200 feet.

Soil within the total exclosure is moderately deep with an effective rooting depth estimated at nearly 18 inches. There is a compacted layer at that depth. There is a slight soil depth gradient with more shallow soils near the west fence and deeper soils near the east end of the exclosure fence. It has a loam texture with a neutral soil reaction (7.2 pH). Phosphorus and potassium are 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). Cracks are apparent from the soil drying and shrinking. There is some pedestaling apparent around plants, but there is enough vegetation and litter cover to protect the soil.

Mountain big sagebrush is the dominant browse within the exclosure. Sagebrush cover has averaged about 21% cover over the three sampling readings. Sagebrush density was estimated at 5,740 plants/acre. In 2000 density was higher with an estimated 7,460 plants/acre. After many drought years density declined to 5,360 plants/acre in 2005. There have been few seedlings and young plants, especially in 2005. Mature plants are large and vigorous averaging 29 inches in height. Nearly one-quarter of the population was classified as decadent in 1997, which increased to 51% in 2000. Decadence in 2000 may have been estimated too high due to leaf drop in a drought year. Only 6% of the population was classified as dying in 2000, while 18% were classified as dying in 2005. Decadence was 37% in 2005. The plants on the east side of the exclosure (deeper soils) appear to be in better vigor than the plants further west. Other browse species are scattered throughout the area, although none are very abundant. Other species sampled include: winterfat, dwarf and stickyleaf low rabbitbrush, broom snakeweed, and cactus.

Grasses are abundant and vigorous with six species providing about 35% cover in 2000 and 2005. Mutton bluegrass dominates the composition by providing over half of the grass cover. Thickspike wheatgrass, blue grama, prairie Junegrass, and Sandberg bluegrass are also common. Forbs are fairly diverse but provide only about 4% cover. The only common forbs are desert phlox and scarlet globemallow.

### 1997 APPARENT TREND ASSESSMENT

The soil within the total exclosure shows little erosion but there are signs of past erosion events. Some of the plants are pedestaled, although it appears that this has not occurred recently. Vegetation, litter, and cryptogams help protect the soil adequately to prevent runoff, except in severe cases. Mountain big sagebrush does not have residual seed heads and there are very few seedling or young plants present. Although percent decadence is not overly high at this time, the lack of seedlings and young should be monitored as there are probably not enough now to replace the dying plants. Grasses dominate the herbaceous understory, specifically muttongrass. Forbs are not very abundant, but Indian paintbrush appears at a higher density within the exclosure than outside. The Desirable Components Index (see methods) rated this site as good due to excellent browse and perennial grass cover.

winter range condition (DC Index) - good (78) Mid-level potential scale

2000 TREND ASSESSMENT

Trend for soil is up slightly due to a decline in percent bare ground, an increase vegetation cover, and an increase in herbaceous cover. Trend for the key browse, mountain big sagebrush, appears stable. Percent decadence increased from 24% to 51%, even though the number of plants classified as dying declined. The number of young plants appear abundant enough to replace those currently being lost. The proportion of sagebrush in poor vigor and the number of dead plants remains the same as before. It is apparent, however, that the sagebrush are stressed from intraspecific competition (high densities) combined with drought. Trend for the herbaceous understory is stable with an increase in the sum of nested frequency of perennial grasses being offset by losses to the forbs. Mutton bluegrass, the dominant species, increased significantly since 1997. Thickspike wheatgrass and Sandberg bluegrass also increased significantly. Sum of nested frequency of perennial forbs declined slightly but the most abundant species, desert phlox and scarlet globemallow, remained stable. The DCI score was rated as good.

TREND ASSESSMENT

soil - slightly up (+1)

browse - stable (0)

herbaceous understory - stable (0)

winter range condition (DC Index) - good (71) Mid-level potential scale

2005 TREND ASSESSMENT

The soil trend is considered slightly down. Relative bare ground increased, this can be partially explained by the drop of cryptogams. Cryptogams are likely still in the soil, but were not as visible as they were in previous readings. However, vegetative cover dropped and litter cover also decreased substantially. The browse trend is stable. Mountain big sagebrush density declined, but percent decadence improved. Sagebrush cover has remained unchanged at about 22%. Recruitment is poor and needs to improve as young and seedlings are rare. Broom snakeweed density decreased and was only half of the 2000 density. The herbaceous understory trend is stable. Nested frequency for perennial grasses and forbs declined slightly, but not enough to warrant a downward trend. Mutton bluegrass and thickspike wheatgrass declined significantly, but prairie junegrass and needle-and-thread increased significantly. The DCI score remained good.

TREND ASSESSMENT

soil - slightly down (-1)

browse - stable (0)

herbaceous understory - stable (0)

winter range condition (DC Index) - good (72) Mid-level potential scale

HERBACEOUS TRENDS --

Management unit 10R, Study no: 11

T y p e	Species	Nested Frequency			Average Cover %		
		'97	'00	'05	'97	'00	'05
G	Agropyron dasystachyum	<sub>a</sub> 259	<sub>b</sub> 287	<sub>a</sub> 227	1.82	4.11	3.15
G	Bouteloua gracilis	30	42	35	.95	2.17	1.01
G	Koeleria cristata	<sub>b</sub> 195	<sub>a</sub> 114	<sub>b</sub> 211	4.24	3.57	10.11
G	Poa fendleriana	<sub>a</sub> 290	<sub>b</sub> 352	<sub>a</sub> 266	10.91	24.99	14.99

Type	Species	Nested Frequency			Average Cover %		
		'97	'00	'05	'97	'00	'05
		G	<i>Poa secunda</i>	<sub>b</sub> 47	<sub>c</sub> 99	<sub>a</sub> 7	.54
G	<i>Stipa comata</i>	<sub>a</sub> 21	<sub>a</sub> 17	<sub>b</sub> 108	.16	.13	4.51
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		842	911	854	18.64	36.21	33.95
Total for Grasses		842	911	854	18.64	36.21	33.95
F	<i>Antennaria rosea</i>	<sub>b</sub> 18	<sub>a</sub> 6	<sub>a</sub> 2	.08	.06	.01
F	<i>Arabis</i> sp.	19	14	5	.11	.05	.01
F	<i>Astragalus convallarius</i>	27	19	38	.19	.10	.50
F	<i>Castilleja linariaefolia</i>	<sub>b</sub> 32	<sub>a</sub> 6	<sub>a</sub> 17	.64	.01	.56
F	<i>Calochortus nuttallii</i>	-	-	4	-	-	.00
F	<i>Crepis acuminata</i>	7	-	4	.16	-	.15
F	<i>Cryptantha</i> sp.	4	-	3	.01	-	.00
F	<i>Erigeron eatonii</i>	<sub>ab</sub> 5	<sub>b</sub> 15	<sub>a</sub> -	.01	.03	-
F	<i>Erigeron pumilus</i>	-	-	1	-	-	.03
F	<i>Lesquerella</i> sp.	-	3	3	-	.00	.03
F	<i>Lygodesmia grandiflora</i>	8	3	-	.04	.00	-
F	<i>Machaeranthera grindelioides</i>	-	-	4	-	-	.03
F	<i>Penstemon caespitosus</i>	8	3	8	.30	.03	.09
F	<i>Phlox austromontana</i>	<sub>b</sub> 125	<sub>b</sub> 119	<sub>a</sub> 65	1.69	3.45	.77
F	<i>Phlox longifolia</i>	<sub>b</sub> 54	<sub>a</sub> 14	<sub>a</sub> 19	.14	.03	.06
F	<i>Senecio multilobatus</i>	-	-	1	-	-	.00
F	<i>Sphaeralcea coccinea</i>	52	58	64	.44	.35	1.23
F	Unknown forb-annual (a)	-	4	-	-	.15	-
Total for Annual Forbs		0	4	0	0	0.15	0
Total for Perennial Forbs		359	260	238	3.83	4.14	3.50
Total for Forbs		359	264	238	3.83	4.29	3.50

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

BROWSE TRENDS --

Management unit 10R, Study no: 11

Type	Species	Strip Frequency			Average Cover %		
		'97	'00	'05	'97	'00	'05
B	<i>Artemisia tridentata vaseyana</i>	96	97	96	19.43	20.13	21.98
B	<i>Ceratoides lanata</i>	5	6	5	.15	.03	.15
B	<i>Chrysothamnus depressus</i>	3	1	2	.03	.00	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	6	6	6	.45	.33	.81
B	<i>Gutierrezia sarothrae</i>	6	30	34	.06	.61	1.76
B	<i>Juniperus osteosperma</i>	0	0	0	-	.00	-
B	<i>Pediocactus simpsonii</i>	5	11	15	.11	.16	.21
B	<i>Pinus edulis</i>	0	2	2	-	.03	.03
Total for Browse		121	153	160	20.25	21.31	24.94

CANOPY COVER, LINE INTERCEPT --

Management unit 10R, Study no: 11

Species	Percent Cover
	'05
<i>Artemisia tridentata vaseyana</i>	20.50
<i>Ceratoides lanata</i>	.01
<i>Chrysothamnus depressus</i>	.05
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.50
<i>Gutierrezia sarothrae</i>	2.81
<i>Pinus edulis</i>	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 10R, Study no: 11

Species	Average leader growth (in)
	'05
<i>Artemisia tridentata vaseyana</i>	1.2

BASIC COVER --

Management unit 10R, Study no: 11

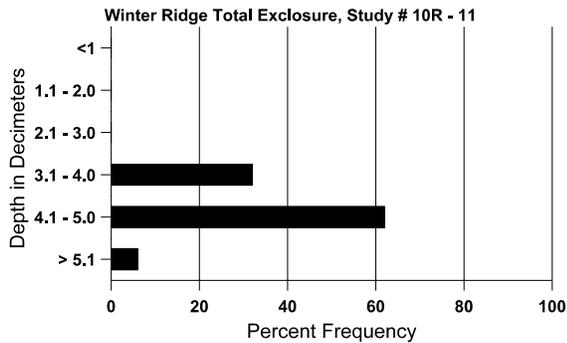
Cover Type	Average Cover %		
	'97	'00	'05
Vegetation	40.81	58.45	54.51
Rock	.07	.06	.09
Pavement	.19	.15	.02
Litter	33.62	42.13	32.40
Cryptogams	13.07	20.97	3.95
Bare Ground	21.73	15.06	25.02

SOIL ANALYSIS DATA --

Herd Unit 10R, Study no: 11, Study Name: Winter Ridge Total Exclosure

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
17.7	59.0 (16.5)	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: 11

Type	Quadrat Frequency		
	'97	'00	'05
Rabbit	5	3	15
Grouse	-	2	-

Days use per acre (ha)	
'00	'05
-	-
-	-

BROWSE CHARACTERISTICS --  
Management unit 10R, Study no: 11

		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	<b>5740</b>	40	340	4020	1380	1520	.69	0	24	11	11	28/35
00	<b>7460</b>	60	460	3160	3840	1520	.53	0	51	6	11	30/31
05	<b>5360</b>	-	120	3240	2000	1660	.74	0	37	18	19	28/32
<i>Ceratoides lanata</i>												
97	<b>160</b>	-	-	160	-	-	0	0	0	-	0	14/13
00	<b>200</b>	-	-	180	20	-	0	0	10	-	0	17/11
05	<b>120</b>	-	-	60	60	-	50	0	50	17	17	10/9
<i>Chrysothamnus depressus</i>												
97	<b>60</b>	-	-	60	-	-	0	0	-	-	0	5/9
00	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
05	<b>40</b>	-	-	40	-	-	0	0	-	-	0	6/10
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
97	<b>280</b>	-	20	240	20	20	0	0	7	-	0	14/16
00	<b>220</b>	20	60	40	120	-	0	0	55	9	9	16/19
05	<b>300</b>	-	20	280	-	-	0	0	0	-	0	13/18
<i>Gutierrezia sarothrae</i>												
97	<b>200</b>	-	-	200	-	-	0	0	-	-	0	5/5
00	<b>4400</b>	40	980	3420	-	20	0	0	-	-	0	4/6
05	<b>2080</b>	60	-	2080	-	20	0	0	-	-	0	7/10
<i>Juniperus osteosperma</i>												
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
00	<b>0</b>	20	-	-	-	-	0	0	-	-	0	-/-
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
<i>Pediocactus simpsonii</i>												
97	<b>100</b>	-	-	100	-	20	0	0	0	-	0	3/4
00	<b>220</b>	-	40	180	-	-	0	0	0	-	0	2/3
05	<b>340</b>	-	60	260	20	20	0	0	6	6	6	2/3
<i>Pinus edulis</i>												
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
00	<b>40</b>	-	40	-	-	-	0	0	-	-	0	-/-
05	<b>40</b>	-	40	-	-	-	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>
<b>Mountain big sagebrush</b>			
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>
<b>Mountain big sagebrush</b>			
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	<b>50</b>	15	42	2.45	.51	2.17
G Koeleria cristata	56	<b>255</b>	<b>114</b>	.84	<b>10.16</b>	<b>3.57</b>
G Poa fendleriana	271	158	<b>352</b>	6.46	3.38	<b>24.99</b>
G Poa secunda	286	99	99	4.77	1.02	1.23
G Stipa comata	14	10	17	.10	.13	.13
<b>Total for Grasses</b>	<b>1077</b>	<b>770</b>	<b>911</b>	<b>20.63</b>	<b>18.53</b>	<b>36.21</b>

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	<b>39</b>	21	35	<b>2.40</b>	1.08	1.01
G Koeleria cristata	84	<b>262</b>	<b>211</b>	1.77	<b>8.50</b>	<b>10.11</b>
G Poa fendleriana	184	177	<b>266</b>	3.26	5.25	<b>14.99</b>
G Poa secunda	43	92	7	.50	1.29	.16
G Stipa comata	177	58	108	4.30	2.11	4.51
<b>Total for Grasses</b>	<b>823</b>	<b>897</b>	<b>854</b>	<b>17.12</b>	<b>22.74</b>	<b>33.95</b>

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.