

Trend Study 10R-13-05

Study site name: Lower McCook Ridge Livestock Exclosure .

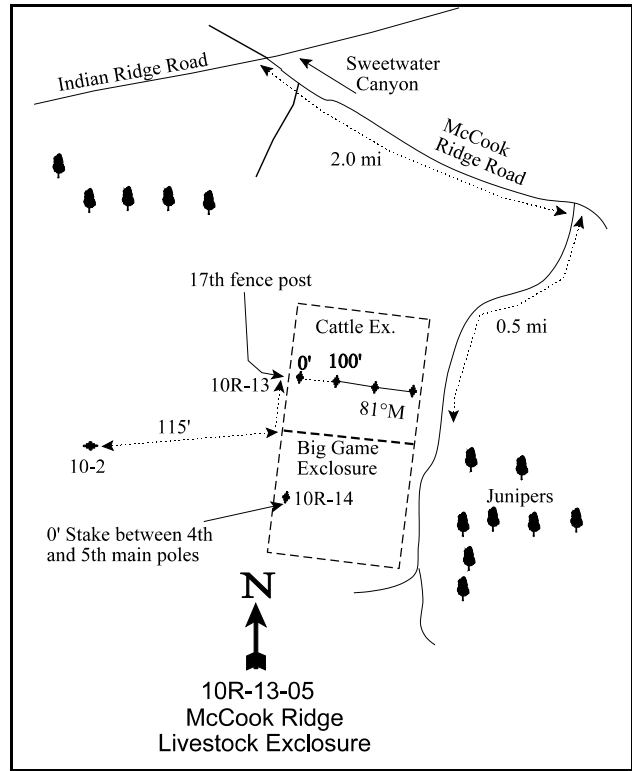
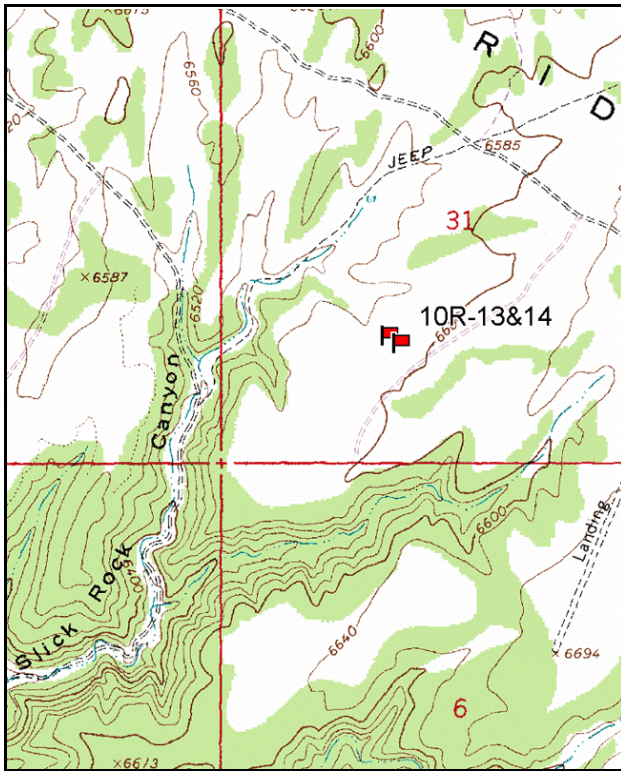
Vegetation Type: Desert Shrub .

Compass bearing: frequency baseline 81 degrees magnetic.

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

LOCATION DESCRIPTION

From Ouray, go 38 miles south to the McCook Ridge-Indian Ridge turnoff. Turn left (east) and travel on the Indian Ridge road towards Sweetwater Canyon and McCook Ridge 9.1 miles to the intersection of Cooper Canyon, Indian Ridge and McCook Ridge. From Indian Ridge road, turn southeast and proceed up McCook Ridge approximately 2 miles to road on the right (A large exclosure can be seen off the south side of the road.). Turn right and drive approximately 0.5 miles to the exclosure. From the southwest corner of the livestock exclosure count down 17 fenceposts to the 0-foot baseline stake. The frequency baseline is marked by green fenceposts, 12-18 inches tall.



Map Name: Cooper Canyon .

Diagrammatic Sketch

Township 13S , Range 24E , Section 31

GPS: NAD 27, UTM 12S 4389044 N, 648042 E

DISCUSSION

Lower McCook Ridge-Livestock Exclosure - Trend Study No. 10R-13

The Lower McCook Ridge-Livestock Exclosure study is located within the Lower McCook Ridge exclosure complex. The exclosure was constructed in 1964 and is approximately 300 feet by 500 feet. This trend study is located within the livestock exclosure and was established in 1997. This site has a slight southwest aspect and a 2-3% slope with an elevation of 6,600 feet. A pellet group transect in the livestock exclosure was estimated at 96 elk days use/acre (237 edu/ha) and 59 deer days use/acre (146 ddu/ha) in 1997. Pellet group data from 2000 were estimated at about the same level of deer use at 64 deer days use/acre (158 ddu/ha), but much lighter elk use at 12 elk days use/acre (30 edu/ha). This much lighter use by elk in 2000 is most likely due to several consecutive mild winters which did not force elk down onto this important wintering area. In 2005, deer use was much higher at an estimated 166 deer days use/acre (410 ddu/ha), while elk use was estimated at 26 elk days use/acre (65 edu/ha). Rabbit use was also very high in 2005 (quadrat frequency of 73%).

Vegetation cover is abundant with most being provided above the ground by the browse species (72% in both 1997 and 2000, 53% in 2005). Effective rooting depth was found to be nearly 15 inches with a majority of the rock (56%) in the soil profile found between 12 and 15 inches below the soil surface. Soil texture is clay loam. Phosphorus is marginal with only 7 ppm. This can limit plant growth and development (Tiedemann and Lopez 2004). Relative bare ground cover was about 21% in 1997 and 2000, but increased to 35% in 2005. Relative litter and vegetation cover were also slightly lower in 2005.

There are several important browse species on this site including: basin big sagebrush, fourwing saltbush, and winterfat. Sagebrush on the site has characteristics of both basin big sagebrush (*Artemisia tridentata tridentata*) and Wyoming big sagebrush (*Artemisia tridentata wyomingensis*). Identification was difficult due to the high level of hybridization, as a result, all sagebrush were classified as basin big sagebrush. The effects of drought were seen in 2005. Sagebrush is the dominant browse species and was estimated at 5,780 plants/acre in 1997, 6,900 plants/acre in 2000, and 6,060 plants/acre in 2005. These plants average nearly two feet in height with a two foot crown. Sagebrush cover was estimated at nearly 22% in 2000, but declined to 16% in 2005. Utilization has been moderate to heavy with each reading, but was heaviest in 2005. This level of use coupled with the smaller growth form is more indicative of Wyoming big sagebrush than basin big sagebrush. Percent decadence was quite low at 10% in 1997, but increased to 31% in 2000, and 44% in 2005. The proportion of plants classified as dying was low at 3% in 1997 and 2000, but increased to 26% in 2005. Young recruitment is moderate at 14% in 2000, but declined to only 4% in 2005.

Fourwing saltbush cover was 4% in 1997 and 6% in 2000, but declined to 1% in 2005 after years of drought. It has a relatively high density for fourwing saltbush at 1,100 plants/acre in 2000 and 900 plants/acre in 2005. This is an overly mature population with very high decadence each year it was sampled (61% in 1997, 67% in 2000, and 82% in 2005). In 2005, 47% of the population was classified as dying. Use was mostly light to moderate with only 13% showing heavy use in 2000. This increased to 38% in 2005. Fourwing was noted as having very few seed stalks in both 1997 and 2000. Recruitment and number of seedlings were very low each year it was sampled. Winterfat cover has been 2-3%, but was lowest in 2005. Density was 5,920 plants/acre in 2000 and declined to 4,900 plants/acre in 2005. The population has been mostly mature population with low percent decadence. Recruitment was fair in 2005 at 9%. Use is difficult to determine for winterfat as most of the plant is browsed away.

Other browse species on the site include fringed sagebrush, broom snakeweed, and cactus. Fringed sagebrush had an estimated density of 6,260 plants/acre in 1997, this slightly increased to 6,500 plants/acre in 2000, and declined sharply to 1,120 plants/acre in 2005 after drought.

Cheatgrass appears in scattered dense patches throughout the area, with other bare interspaces between the basin big sagebrush. Cheatgrass is the dominant herbaceous species which provided 65% of the herbaceous cover and 18% of the total vegetation cover in 1997. Due to dry conditions in 2000, cheatgrass decreased in frequency and cover. In 2005, cheatgrass abundance did not increase, but due to wet spring conditions it was robust with over 10% cover (5-6% previously). Cheatgrass is the most abundant herbaceous species. Perennial grasses are few and consist of thickspike wheatgrass, Indian ricegrass, Sandberg bluegrass, and bottlebrush squirreltail. Sandberg bluegrass increased significantly in 2005. Forbs contribute very little to the herbaceous understory. Scarlet globemallow is the most abundant perennial forb. Annual stickseed and tansy mustard were more abundant in 2005.

1997 APPARENT TREND ASSESSMENT

Soils are alluvially deposited and loamy in texture, with some rock and pavement on the surface (<10%). There are signs of past soil movement, yet erosion is not severe at this time. Vegetation and litter cover values are high enough to protect the soil from most wind and water erosion events. Basin big sagebrush is moderately utilized and appears to have a good age structure. The basin big sagebrush shows more utilization than winterfat, probably due to its availability during periods of snow cover. Winterfat is only lightly hedged with a predominately mature age structure. Fourwing saltbush is light to moderately hedged with 61% of the population reported as decadent. Mature plants are relatively large (2½ feet by a 3 foot crown) with 16% of the fourwing saltbush population classified as dying. The herbaceous understory is dominated by cheatgrass. Cheatgrass is scattered throughout the site in dense patches, leaving few areas where perennial species may be able to withstand cheatgrass competition. The thickspike wheatgrass plants are small statured, usually containing only one culm with one or two leaves. Sandberg bluegrass appeared in small clumps with good vigor. Forbs are nearly nonexistent on this site. The herbaceous understory could be used as an indicator of trend in the future. The Desirable Components Index score was good due to excellent browse cover and good good recruitment.

winter range condition (DC Index) - good (53) Lower potential scale

2000 TREND ASSESSMENT

Trend for soil is stable. Average cover of vegetation and litter both increased and should counter the slight increase in bare soil. Sum of nested frequency for perennial herbaceous species increased in 2000 as well, which is a positive factor for holding soils in place. Trend for browse is stable. The key species, most likely a hybrid between basin big sagebrush and Wyoming big sagebrush, has shown a slight increase in heavy use and percent decadence has increased from 10% to 30%. However, vigor remains good and young recruitment is more than adequate to maintain the population. Trend for the herbaceous understory is up as perennial species increased in sum of nested frequency and cheatgrass decreased in frequency due to drought. The DCI score remained good.

TREND ASSESSMENT

soil - stable (0)

browse - stable (0)

herbaceous understory - up (+2)

winter range condition (DC Index) - good (53) Lower potential scale

2005 TREND ASSESSMENT

Trend for soil is slightly down. Relative bare ground cover increased from 21% to 35%. Much of this may be due to a decrease in litter cover after years of lower production due to drought. Erosion was rated as stable in an erosion condition class rating. The browse trend is slightly down as each of the three key species had

declines in density and cover. Percent decadence and percent dying increased for both sagebrush and fourwing saltbush. The herbaceous understory trend is stable. Perennial grasses increased slightly in nested frequency, while perennial forbs decreased substantially. Grasses make up a larger portion of the herbaceous understory. Cheatgrass remained stable in abundance, but was more robust in 2005. Annual forbs were also more abundant in 2005. The DCI score decreased to fair due to an increase in browse decadence and decrease in browse recruitment.

TREND ASSESSMENT

soil - slightly down (-1)

browse - slightly down (-1)

herbaceous understory - stable (0)

winter range condition (DC Index) - fair (36) Lower potential scale

HERBACEOUS TRENDS --

Management unit 10R, Study no: 13

Type	Species	Nested Frequency			Average Cover %		
		'97	'00	'05	'97	'00	'05
G	Agropyron dasystachyum	18	28	24	.49	2.15	.16
G	Bromus tectorum (a)	_b 339	_a 241	_a 221	5.82	4.84	10.17
G	Oryzopsis hymenoides	1	1	-	.15	.18	.00
G	Poa secunda	_{ab} 131	_a 116	_b 162	1.31	2.68	3.20
G	Sitanion hystrix	_a 43	_b 107	_b 91	.44	2.74	1.45
Total for Annual Grasses		339	241	221	5.82	4.84	10.17
Total for Perennial Grasses		193	252	277	2.40	7.75	4.81
Total for Grasses		532	493	498	8.22	12.59	14.99
F	Arabis sp.	2	-	-	.00	-	-
F	Castilleja sp.	-	6	-	.03	.01	-
F	Descurainia pinnata (a)	_b 23	_a 3	_c 46	.07	.00	1.14
F	Draba sp. (a)	_a -	_a -	_b 13	-	-	.05
F	Erigeron pumilus	_b 25	_b 42	_a -	.15	.22	-
F	Lappula occidentalis (a)	_a 8	_a 6	_b 72	.02	.03	.52
F	Phlox longifolia	-	1	-	-	.00	-
F	Schoenocrambe linifolia	_b 19	_a -	_a -	.04	-	-
F	Sphaeralcea coccinea	57	63	45	.41	.53	.45
F	Tragopogon dubius	_a -	_b 17	_a -	-	.08	-
Total for Annual Forbs		31	9	131	0.09	0.03	1.73
Total for Perennial Forbs		103	129	45	0.63	0.85	0.45
Total for Forbs		134	138	176	0.73	0.89	2.18

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

BROWSE TRENDS --

Management unit 10R, Study no: 13

Type	Species	Strip Frequency			Average Cover %		
		'97	'00	'05	'97	'00	'05
B	Artemisia frigida	66	69	28	2.56	3.62	.21
B	Artemisia tridentata tridentata	75	78	79	13.35	21.68	15.86
B	Atriplex canescens	35	36	29	3.79	5.64	1.32
B	Ceratoides lanata	61	66	58	3.03	2.51	1.57
B	Gutierrezia sarothrae	7	19	9	.15	.19	.03
B	Juniperus osteosperma	0	0	1	-	-	-
B	Opuntia sp.	5	5	1	.15	.38	.03
B	Sclerocactus sp.	0	1	0	-	-	-
Total for Browse		249	274	205	23.06	34.05	19.03

CANOPY COVER, LINE INTERCEPT --

Management unit 10R, Study no: 13

Species	Percent Cover
	'05
Artemisia frigida	.23
Artemisia tridentata tridentata	14.00
Atriplex canescens	.85
Ceratoides lanata	.86
Gutierrezia sarothrae	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 10R, Study no: 13

Species	Average leader growth (in)
	'05
Artemisia tridentata tridentata	2.1
Atriplex canescens	4.4
Ceratoides lanata	3.2

BASIC COVER --

Management unit 10R, Study no: 13

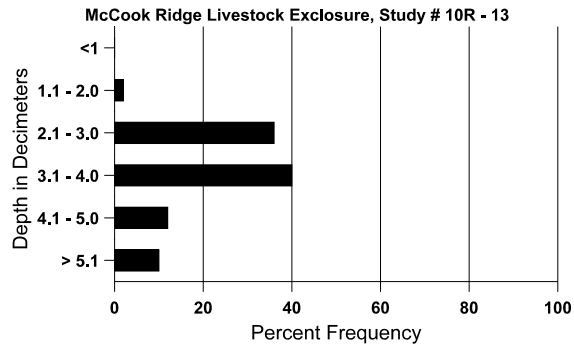
Cover Type	Average Cover %		
	'97	'00	'05
Vegetation	32.47	45.88	33.21
Rock	.75	.20	.25
Pavement	8.74	3.42	3.87
Litter	35.06	51.30	35.02
Cryptogams	3.60	1.75	2.04
Bare Ground	21.07	27.85	39.18

SOIL ANALYSIS DATA --

Herd Unit 10R, Study no: 13, Study Name: McCook Ridge Livestock Exclosure

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
14.6	61.4 (20.0)	6.7	31.0	37.8	31.2	5.0	7.2	153.6	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 10R, Study no: 13

Type	Quadrat Frequency		
	'97	'00	'05
Rabbit	10	12	73
Elk	18	16	13
Deer	36	41	85

Days use per acre (ha)	
'00	'05
-	-
12 (30)	26 (65)
64 (158)	166 (410)

BROWSE CHARACTERISTICS --
Management unit 10R, Study no: 13

		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 frigida</i>												
97	6260	100	780	5440	40	-	.31	0	1	.31	.31	13/10
00	6500	10620	380	5900	220	20	17	.61	3	-	0	5/8
05	1120	140	280	840	-	-	11	5	0	-	0	5/5
<i>Artemisia tridentata tridentata</i>												
97	5780	400	1820	3380	580	540	36	25	10	3	3	24/29
00	6900	-	1000	3760	2140	520	44	30	31	3	3	20/26
05	6060	-	260	3140	2660	1360	27	66	44	26	27	21/27
<i>Atriplex canescens</i>												
97	880	-	60	280	540	80	34	9	61	16	16	30/35
00	1100	-	-	360	740	-	25	13	67	13	13	31/38
05	900	-	40	120	740	140	33	38	82	47	47	22/20
<i>Ceratoides lanata</i>												
97	4960	20	420	4380	160	20	34	17	3	-	.40	10/11
00	5920	20	140	4960	820	20	33	3	14	3	3	8/8
05	4900	-	420	3920	560	220	5	91	11	7	7	5/6
<i>Gutierrezia sarothrae</i>												
97	300	-	-	300	-	-	0	0	-	-	0	8/8
00	840	80	60	780	-	20	0	0	-	-	0	5/7
05	180	20	-	180	-	-	0	0	-	-	0	6/6
<i>Juniperus osteosperma</i>												
97	0	-	-	-	-	-	0	0	-	-	0	-/-
00	0	20	-	-	-	-	0	0	-	-	0	-/-
05	20	-	20	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
97	180	-	-	180	-	-	0	0	-	-	0	5/9
00	180	20	20	160	-	-	0	0	-	-	0	3/9
05	20	-	-	20	-	-	0	0	-	-	0	4/8
<i>Sclerocactus sp.</i>												
97	0	-	-	-	-	-	0	0	-	-	0	-/-
00	20	-	-	20	-	-	0	0	-	-	0	-/-
05	0	-	-	-	-	-	0	0	-	-	0	-/-

LOWER MCCOOK RIDGE EXCLOSURE COMPARISON SUMMARY

Trend Study No. 10-2 (Outside), 10R-13 (Livestock), and 10R-14 (Total)

The Lower McCook Ridge area is important big game winter range. Several important key browse species are present in the area including: big sagebrush, winterfat, and fourwing saltbush. The table below compares some of the key browse parameters for these three species. Differences in densities for these species, especially sagebrush, may be the result of several factors including: grazing regimes, interspecific and intraspecific competition, small sampled area, timing of precipitation, and a non-homogeneous landscape.

Big sagebrush was classified as basin big sagebrush, but is most likely a hybrid between basin big sagebrush and Wyoming big sagebrush. Density and cover varies between the exclosures with the total exclosure having the lowest density of sagebrush plants, the livestock exclosure having the highest, and outside the exclosure being intermediate. Recruitment from the young age class was high in 2000, but was much lower in 2005. The rate of decadence is highest in the livestock exclosure, slightly lower outside the exclosure, with no decadence found in the total exclosure. There are several possible explanations for the differences in population parameters for sagebrush between exclosures. The highest level of recruitment occurs in the total exclosure where the sagebrush density is lowest, but with no use, each plant has more seed from year to year which increases the probability of young plants becoming established from seed. Also, with a lower density of sagebrush, there is less intraspecific competition with young plants to become established. The lowest recruitment is found in the livestock exclosure which also has the highest sagebrush density and average cover. Competition is greatest here with high density and cover which would appear to more negatively affect the establishment of younger plants. Drought adds to the problem with less resources being available and more stress being placed on individual plants.

Conversely, winterfat has the highest density and cover inside the total exclosure, is intermediate outside the exclosure, and is lowest inside the livestock exclosure. Recruitment from young plants is low on all three transects. Winterfat cover was about 6 times greater in the total exclosure than in both the livestock exclosure and outside the exclosure in 2000. Average height and crown measurements in 2000 show winterfat inside the total exclosure to be twice that of winterfat in either of the other two transects. With the highest density, highest cover, and largest individuals occurring inside the total exclosure, it is likely that competition is greater here and may be responsible for the highest rate of decadence inside the total exclosure. Drought is the likely cause for the decline of winterfat in 2005.

Fourwing saltbush has similar densities in the total and livestock exclosures, with a lower density outside the exclosure. Percent decadence has been high for each transect in each reading. The percent of the population classified as dying was very high in 2005 for each exclosure transect. As with winterfat, the high decadence of fourwing saltbush is likely due more to drought and/or competition rather than utilization.

The herbaceous understories have been similar for each transect.

Trend Data Comparisons for key browse species for Lower McCook Ridge Exclosure transects in 2000 and 2005.

2000				2005		
	Outside	Livestock	Total	Outside	Livestock	Total
Big sagebrush						
Average Cover	12.0	21.7	2.6	10.6	15.9	2.5
Density (plants/acre)	3,980	6,900	1,200	3,500	6,060	700
% young (plants/acre)	32 (1,260)	14 (1,000)	68 (820)	5 (180)	4 (260)	6 (40)
% decadent (plants/acre)	26 (1,020)	31 (2,140)	0	35 (1,240)	31 (2,140)	9 (60)
% dying (plants/acre)	24 (360)	3 (220)	0	24 (840)	26 (1,600)	0
% heavy use	13	30	0	37	66	0
Winterfat						
Average Cover	2.2	2.5	13.8	2.4	1.6	3.8
Density (plants/acre)	7,020	5,920	9,060	4,860	4,900	7,020
% young (plants/acre)	3 (200)	2 (140)	3 (240)	6 (280)	9 (420)	7 (520)
% decadent (plants/acre)	10 (720)	14 (820)	37 (3,340)	2 (120)	11 (560)	5 (340)
% dying (plants/acre)	1 (40)	3 (180)	2 (200)	0 (20)	7 (360)	2 (160)
% heavy use	21	3	0	77	91	13
Fourwing saltbush						
Average Cover	2.6	5.6	12.5	2.6	1.3	2.0
Density (plants/acre)	700	1,100	1,160	640	900	920
% young (plants/acre)	0	0	0	6 (40)	4 (40)	2 (20)
% decadent (plants/acre)	40 (280)	67 (740)	40 (460)	66 (420)	82 (740)	91 (840)
% dying (plants/acre)	0	13 (140)	5 (60)	25 (160)	47 (420)	72 (660)
% heavy use	3	13	0	56	38	2