

Trend Study 10R-14-05

Study site name: Lower McCook Ridge Total Enclosure .

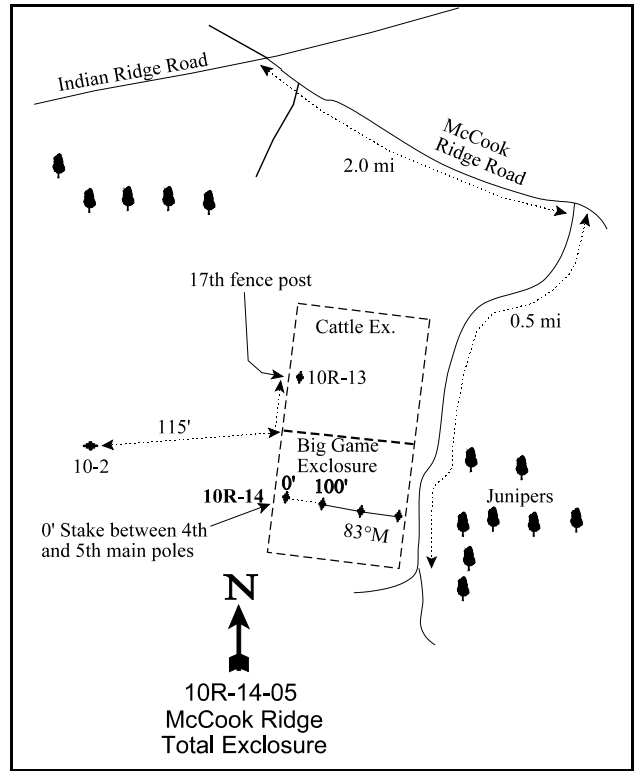
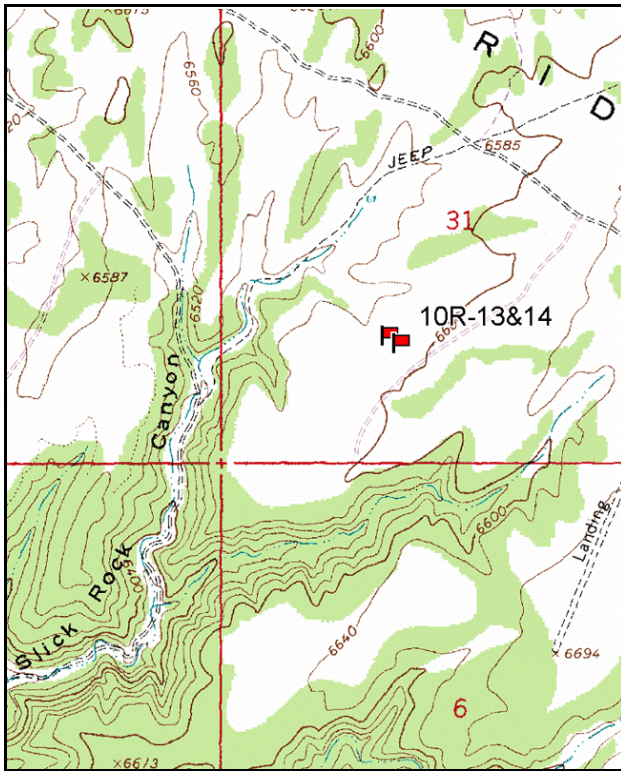
Vegetation Type: Desert Shrub .

Compass bearing: frequency baseline 83 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 enclosure can be seen off the south side of the road.). Turn right and drive approximately 0.5 miles to the enclosure. Go inside the total enclosure. The 0-foot stake is on the west side between the 4th and 5th main poles of the fence. The 0-foot stake is marked with browse tag number 78. 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 4388946 N, 648035 E

DISCUSSION

Lower McCook Ridge Total Exclosure - Trend Study No. 10R-14

The Lower McCook Ridge Total Exclosure study is located within the Lower McCook Ridge exclosure complex. The exclosure was constructed in 1964 and is approximately 300 feet by 125 feet. The trend study was established in 1997. It samples inside of the total exclosure, which excludes grazing. The site has a slight southwest aspect with a 2-3% slope and an elevation of 6,600 feet. Parts of the exclosure were in poor repair in 2005, but were repaired as much as possible as we visited the site. As a result, evidence of deer entering the exclosure was noted. Deer pellet groups were sampled in 16% of the quadrats. Rabbit use was also very high with an 82% quadrat frequency.

Past erosion is apparent with pedestaling around shrubs, yet there are no signs of recent erosion events. Most of the protective ground cover comes from vegetation and litter, with much of this coming from cheatgrass. Soil texture is clay loam. Phosphorus is marginal with only 7 ppm, which can limit plant growth and development (Tiedemann and Lopez 2004). There is a soil gradient with deeper soils down slope (west) and more shallow soils up slope (east). Average effective rooting depth down slope was 32 inches, while up slope average rooting depth was 15 inches. Coinciding with the average rooting depth is the amount of rock found within the soil profile. A stony profile was encountered at an average of 27 inches down slope and 11 inches up slope. It was observed that less cheatgrass and more young basin big sagebrush plants were associated with the more shallow soils, while the opposite was observed with the deeper soils. Relative bare ground was low in 1997 and 2000 (6% and 9%), but increased in 2005 (25%).

Winterfat has the highest browse density in the total exclosure with an estimated 8,020 plants/acre in 1997, 9,060 plants/acre in 2000, and 7,020 plants/acre in 2005. These plants are larger than the plants in the adjacent livestock exclosure and outside the exclosure sites. However in 2005, winterfat plants in the total exclosure were much smaller than they previously had been. Cover was down to 4% from 14% in 2000. This is likely due to drought conditions and possibly browsing by deer that got into the exclosure. This population has a mostly mature age structure with low recruitment from young plants. Decadence was low in 1997 at 8%, but increased to 37% in 2000. With no use inside the total exclosure, this increase in decadence could be due to drought and/or old age in a mostly mature population. In 2005, decadence was low at 5% with some light to moderate use noted. Vigor for these plants has been good with only 2% of the population classified as dying at each reading.

Fourwing saltbush had an estimated density of 1,280 plant/acre in 1997, 1,160 plants/acre in 2000, and dropped to 920 plants/acre in 2005. Decadence had been moderately high in 1997 and 2000 at about 40%. Decadence increased sharply to 91% in 2005, while 72% of the population was classified as dying. Recruitment has been very low with each reading. Cover decreased from 12% to only 2% by 2005. Fringed sagebrush was also encountered and had an estimated density of 4,620 plants/acre in 2000, which declined to 3,140 plants/acre in 2005.

Sagebrush on the site has characteristics of basin big sagebrush (*Artemisia tridentata tridentata*) and Wyoming big sagebrush (*Artemisia tridentata wyomingensis*). Identification was difficult due to the level of hybridization resulting in all sagebrush being classified as basin big sagebrush. Basin big sagebrush had an estimated density of 1,200 plants/acre in 2000. This declined to 700 plants/acre in 2005. While cover decreased for other species it remained stable at about 3% for sagebrush. Inside the total exclosure, basin big sagebrush is found mainly along the fence line on the more shallow soils along the east fence where cheatgrass is less dense. Other basin big sagebrush plants were observed along the fence on deep and shallow soils with the deeper soils having a lower abundance of seedlings compared to the more shallow soils. In 1997, the seedlings (2,480 plants/acre) were encountered only under three mature shrubs. Seedlings were estimated at only 80 per acre in 2000. Recruitment of young plants was high at 81% in 1997 and 68% in 2000.

Recruitment was very low in 2005 (6%) with no seedlings sampled. The sagebrush population has had good vigor with each reading.

In 1997, cheatgrass provided nearly 29% average cover, had a nested frequency of 473 out of a possible 500, and was found in 99% of the quadrats. Due to drought in 2000, cheatgrass was much less abundant and decreased to only 2% cover, and had a nested frequency of 178. It was sampled in only 61% of the quadrats. Cheatgrass increased again in 2005 with the wet weather. Cover was 24%, nested frequency increased to 369, and quadrat frequency was 94%. Perennial herbaceous species are found sporadically on this site with only three perennial grasses and five perennial forbs ever sampled. Perennial grasses include: thickspike wheatgrass, Sandberg bluegrass, and bottlebrush squirreltail. These species combined for just over 1% cover in 2000 and contributed to less than 1% cover in 1997 and 2005.

1997 APPARENT TREND ASSESSMENT

Soils are alluvially deposited, loamy in texture, with some rock and pavement on the surface (~2%). There are signs of past soil movement, but movement is not severe at this time. Vegetation and litter cover values are high enough to protect the soil from both wind and water erosion. This site exhibits the effects of a soil depth gradient. It was observed that areas with more shallow soil on the site did not support as dense a stand of cheatgrass as do the areas with deeper soils. It was also observed that basin big sagebrush was basically restricted to the edge of the enclosure with none found in the middle. The middle of the enclosure was dominated by fringed sagebrush, winterfat, and a few scattered fourwing saltbush plants. Winterfat accounts for 54% of the browse cover and has the highest density with 8,020 plants/acre. The herbaceous understory is of extremely poor composition with cheatgrass dominating. With such a dense stand of cheatgrass, shrub recruitment will be suppressed and will be detrimental to the reproductive success of the shrub populations. The Desirable Components Index score is fair due to excellent browse cover, but high annual grass cover.

winter range condition (DC Index) - fair (28) Lower potential scale

2000 TREND ASSESSMENT

Trend for soil is stable. Bare ground only slightly increased with drought, while vegetation and litter cover combined remain very high and adequate to prevent serious erosion. Trend for browse is stable overall. The main negative factor is the increased decadence in winterfat from 8% to 37%. Vigor remains generally good and very few of the decadent plants are classified as dying. With normal precipitation, decadence will most likely decrease. Fourwing saltbush shows a stable, but overly mature population with decadence staying nearly the same at 41%. No seedling or young plants were sampled in 2000. A hybrid of basin big sagebrush and Wyoming big sagebrush shows increased density and high recruitment. Vigor is good and no decadent plants were sampled in either 1997 or 2000. Trend for the herbaceous understory is up with perennial species increasing in sum of nested frequency. Cheatgrass was also greatly reduced due to drought. The DCI score increased with the reduction of cheatgrass.

TREND ASSESSMENT

soil - stable (0)

browse - stable (0)

herbaceous understory - up (+2)

winter range condition (DC Index) - fair (43) Lower potential scale

2005 TREND ASSESSMENT

Trend for soil is down. The ratio of bare ground to protective ground cover (vegetation, litter, and cryptogams) decreased substantially and relative bare ground increased from 9% in 2000 to 25% in 2005.

Relative litter cover declined from 60% to 41% in 2005 after many years of drought. The browse trend is down. Winterfat and fourwing saltbush density and cover declined substantially. Drought and browsing from deer may have caused this decline. Fourwing saltbush vigor worsened as 91% of the population was decadent and 72% were dying. Sagebrush density declined, but the number of mature plants has increased with each reading. It appears many of the young plants from 1997 and 2000 have been successfully recruited into the population, but in 2005 there were very few young plants to continue to expand the population. The herbaceous understory trend is down. Cheatgrass increased with the wet conditions of 2005 and there was not enough of a perennial component to compete with it. Perennial forbs declined substantially in 2005. The DCI score declined with the reduced amount of preferred browse and the increase of cheatgrass.

TREND ASSESSMENT

soil - down (-2)

browse - down (-2)

herbaceous understory - down (-2)

winter range condition (DC Index) - very poor (8) Lower potential scale

HERBACEOUS TRENDS --

Management unit 10R, Study no: 14

Type	Species	Nested Frequency			Average Cover %		
		'97	'00	'05	'97	'00	'05
G	Agropyron dasystachyum	a5	b23	b26	.15	.84	.31
G	Bromus tectorum (a)	c473	a178	b369	28.89	2.16	23.75
G	Poa secunda	9	11	15	.36	.12	.13
G	Sitanion hystrix	1	6	4	.03	.18	.06
Total for Annual Grasses		473	178	369	28.89	2.16	23.75
Total for Perennial Grasses		15	40	45	0.54	1.14	0.49
Total for Grasses		488	218	414	29.44	3.30	24.24
F	Descurainia pinnata (a)	a16	a25	b52	.23	.13	.92
F	Draba sp. (a)	-	2	-	-	.00	-
F	Lappula occidentalis (a)	a3	a5	b137	.01	.01	2.61
F	Lactuca serriola	a-	b61	a-	-	.88	-
F	Schoenrambe linifolia	-	-	4	-	-	.01
F	Sisymbrium altissimum (a)	-	1	1	-	.00	.03
F	Sphaeralcea coccinea	25	31	16	.31	.36	.06
F	Taraxacum officinale	-	-	-	.00	-	-
F	Tragopogon dubius	b9	c45	a-	.07	.61	-
Total for Annual Forbs		19	33	190	0.24	0.15	3.56
Total for Perennial Forbs		34	137	20	0.38	1.85	0.07
Total for Forbs		53	170	210	0.63	2.01	3.64

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

BROWSE TRENDS --

Management unit 10R, Study no: 14

Type	Species	Strip Frequency			Average Cover %		
		'97	'00	'05	'97	'00	'05
B	Artemisia frigida	41	58	44	2.42	5.33	.59
B	Artemisia tridentata tridentata	7	6	7	1.33	2.62	2.53
B	Atriplex canescens	45	44	32	7.39	12.48	2.00
B	Ceratoides lanata	94	93	88	13.34	13.75	3.83
Total for Browse		187	201	171	24.50	34.18	8.96

CANOPY COVER, LINE INTERCEPT --

Management unit 10R, Study no: 14

Species	Percent Cover
	'05
Artemisia frigida	.61
Artemisia tridentata tridentata	3.04
Atriplex canescens	3.56
Ceratoides lanata	4.43

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 10R, Study no: 14

Species	Average leader growth (in)
	'05
Artemisia tridentata tridentata	3.6
Atriplex canescens	5.2
Ceratoides lanata	5.2

BASIC COVER --

Management unit 10R, Study no: 14

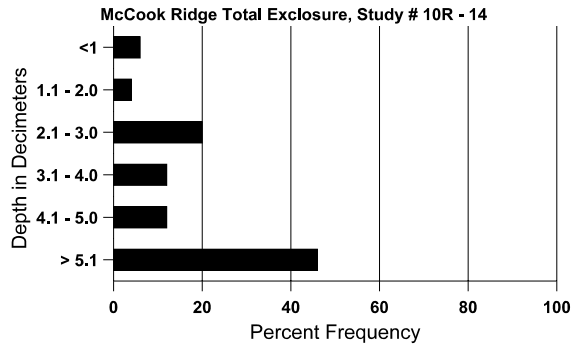
Cover Type	Average Cover %		
	'97	'00	'05
Vegetation	51.66	38.90	37.27
Rock	.13	.01	.11
Pavement	1.81	.74	1.84
Litter	61.01	76.09	45.46
Cryptogams	3.45	.23	.09
Bare Ground	7.03	10.85	27.53

SOIL ANALYSIS DATA --

Herd Unit 10R, Study no: 14, Study Name: McCook Ridge Total Exclosure

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
25.9	59.6 (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: 14

Type	Quadrat Frequency			Days use per acre (ha)	
	'97	'00	'05	'00	'05
Rabbit	2	6	82	-	-
Elk	-	-	1	-	-
Deer	-	-	16	-	-

BROWSE CHARACTERISTICS --

Management unit 10R, Study no: 14

		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	2320	-	220	2080	20	-	0	0	1	-	0	15/16
00	4620	2060	620	3700	300	20	0	0	6	-	0	6/13
05	3140	60	680	2440	20	-	26	0	1	.63	.63	4/6
<i>Artemisia tridentata tridentata</i>												
97	640	2480	520	120	-	-	0	0	0	-	0	33/37
00	1200	80	820	380	-	-	0	0	0	-	0	30/31
05	700	-	40	600	60	200	14	0	9	-	0	37/45

		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>Atriplex canescens</i>												
97	1280	-	20	740	520	100	0	0	41	14	14	34/40
00	1160	-	-	700	460	80	2	0	40	5	5	38/52
05	920	20	20	60	840	620	2	2	91	72	72	37/40
<i>Ceratoides lanata</i>												
97	8020	-	960	6420	640	80	0	0	8	2	2	23/18
00	9060	20	240	5480	3340	100	0	.22	37	2	2	17/19
05	7020	-	520	6160	340	300	21	13	5	2	3	10/11
<i>Juniperus osteosperma</i>												
97	0	-	-	-	-	-	0	0	-	-	0	-/-
00	0	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