

LOWER MCCOOK RIDGE LIVESTOCK EXCLOSURE - TREND STUDY NO. 10R-13-10

Vegetation Type: Desert Shrub

Range Type: Crucial Deer Winter, Crucial Elk Winter

NRCS Ecological Site Description: Upland Stony Loam (Wyoming Big Sagebrush), R034XY334UT

Land Ownership: BLM

Elevation: 6570 ft. (2003 m)

Aspect: Northwest

Slope: 4%

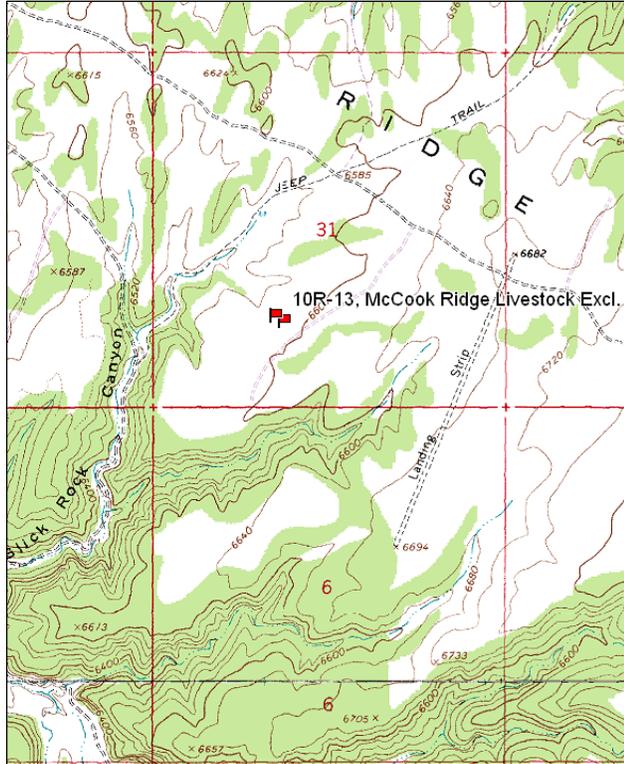
Transect bearing: 92° magnetic

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

Directions:

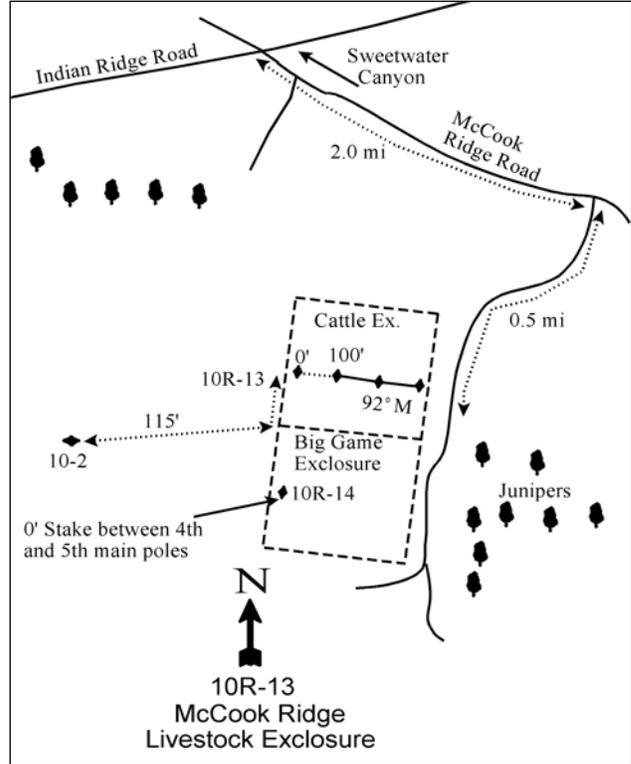
From Ouray, go 38 miles south to the McCook Ridge-Indian Ridge turnoff. Turn left (east) and travel on the Indian Ridge road towards Sweetwater Canyon and McCook Ridge 9.1 miles to the intersection of Cooper Canyon, Indian Ridge and McCook Ridge. From Indian Ridge road, turn southeast and proceed up 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. The 0-foot stake is located near the middle of the west fence.

Map Name: Cooper Canyon



Township: 13S Range: 24E Section: 31

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 647981 E 4389250 N

LOWER MCCOOK RIDGE LIVESTOCK ENCLOSURE - TREND STUDY NO. 10R-13

Site Information

Site Description: The study is located within the Lower McCook Ridge enclosure complex that was constructed in 1964. The enclosure complex is within the Lower McCook allotment, which is managed by the Bureau of Land Management (BLM). This trend study is located within the livestock enclosure and was established in 1997. The livestock enclosure was rebuilt between 2005 and 2010 and the original size was decreased. The original transect did not fall within the rebuilt enclosure, so the transect was relocated in 2010 to sample inside the livestock enclosure. Pellet group transect data estimated heavy use by elk in 1997 with light use since 2000. Estimated deer use was moderate to heavy from 1997 to 2005, but was lighter in 2010 (Table - Pellet Group Data).

Browse: There are several important browse species on this site including: basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), fourwing saltbush (*Atriplex canescens*) and winterfat (*Ceratoides lanata*). Sagebrush on the site has characteristics of both basin big sagebrush and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Identification was difficult due to the high level of hybridization, as a result, all sagebrush were classified as basin big sagebrush. Sagebrush is the dominant browse species on the site providing the majority of the browse cover, though sagebrush cover has steadily decreased since 2000 (Table - Browse Trends). The big sagebrush population has been mostly mature with moderate to low amounts of decadence and poor vigor, and good recruitment of young plants. However, decadence and poor vigor were high, and recruitment of young plants low in the big sagebrush population in 2005. Utilization of big sagebrush has been moderate to heavy, with the heaviest use measured in 2005. The population of fourwing saltbush has a high amount of decadence and poor vigor with little new recruitment of young plants. Utilization of fourwing saltbush has been moderate to heavy since 1997. The winterfat population is mostly mature with low decadence and good vigor. Recruitment of young winterfat plants has been marginal over the course of the study and utilization has been mostly moderate, though there was very heavy use in 2005 (Table - Browse Characteristics).

Herbaceous Understory: Perennial grasses are neither diverse nor abundant on the site. Cheatgrass (*Bromus tectorum*) is the dominant grass species and appears in scattered dense patches throughout the area. Perennial grasses consist of a few thickspike wheatgrass (*Agropyron dasystachyum*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*) and bottlebrush squirreltail (*Sitanion hystrix*). Forbs contribute very little to the herbaceous understory. Scarlet globemallow (*Sphaeralcea coccinea*) is the most abundant perennial forb, but no perennial forb provides over 1% cover (Table - Herbaceous Trends).

Soil: The soil texture is clay loam with a neutral soil reaction (pH 6.7) (Table - Soil Analysis Data). Vegetation cover is abundant with most being provided by the browse species, and bare ground cover is relatively low (Table - Basic Cover). The soil erosion condition was classified as stable in 2005 and 2010.

Trend Assessments

Browse:

- **1997 to 2000 - slightly up (+1):** There was a 19% increase in the density of the primary browse species basin big sagebrush from 5,780 plants/acre to 6,900 plants/acre, and cover increased from 13% to 22%. However, decadence increased from 10% to 31%. Recruitment of young plants decreased, but remained good at 14% of the population.
- **2000 to 2005 - slightly down (-1):** There was little change in the density of big sagebrush, but cover decreased to 16%. Sagebrush decadence increased to 40% and poor vigor increased from 3% to 25%. Recruitment of young sagebrush plants decreased to 4%.
- **2005 to 2010 - slightly up (+1):** Due to the relocation of the transect, direct comparison is not possible between these years. There was a large decrease in the density of basin big sagebrush, but this is

likely due to the relocation of the transect. Basin big sagebrush decadence and poor vigor decreased substantially on the site. Recruitment of young sagebrush increased markedly in the population.

Grass:

- **1997 to 2000 - up (+2):** The sum of nested frequency of perennial grasses increased by 31% and cover increased from 2% to 8%. Cheatgrass decreased significantly in nested frequency, though remained similar in cover.
- **2000 to 2005 - stable (0):** There was a 10% increase in the sum of nested frequency of perennial grasses, but cover decreased to 5%. There was a substantial increase in cheatgrass cover from 5% to 10%.
- **2005 to 2010 - down (-2):** Due to the relocation of the transect, direct comparison is not possible between these years. The perennial grass sum of nested frequency and cover decreased substantially on the site. Cheatgrass increased significantly in nested frequency and cover increased to 18%.

Forb:

- **1997 to 2000 - slightly up (+1):** There was a slight increase in the sum of nested frequency of perennial forbs, but perennial forbs remained fairly rare on the site.
- **2000 to 2005 - down (-2):** The perennial forb sum of nested frequency decreased by 65% and perennial forbs became rare on the site. Annual forbs increased substantially in frequency and cover.
- **2005 to 2010 - stable (0):** Due to the relocation of the transect, direct comparison is not possible between these years. There was a slight increase in the sum of nested frequency of perennial forbs, but perennial forbs remained rare on the site. Annual forbs increased again in frequency and cover.

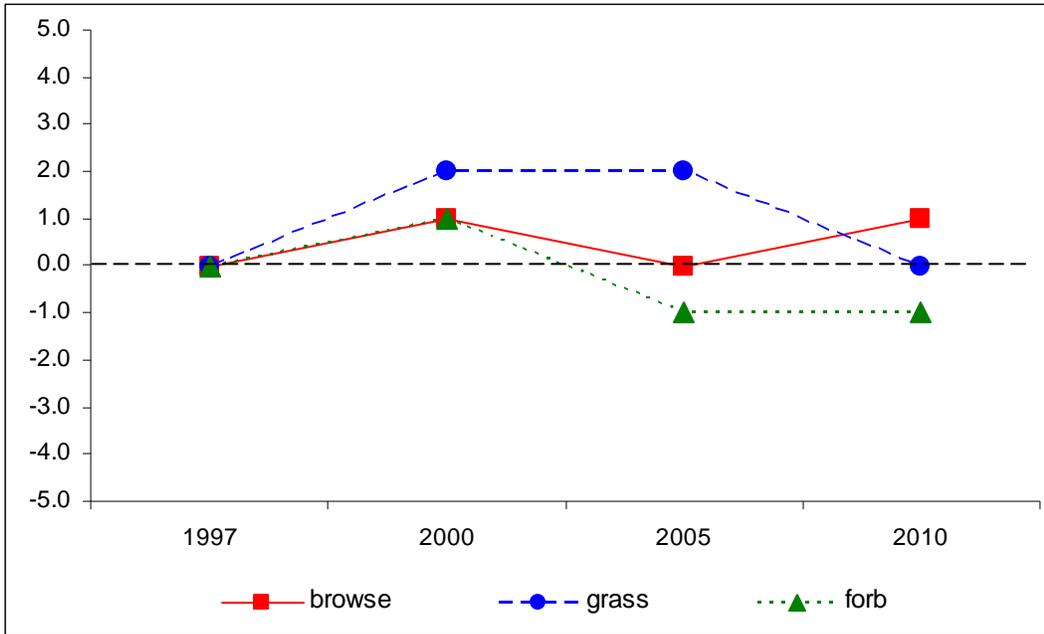
DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --

Management unit 10R, study no: 13

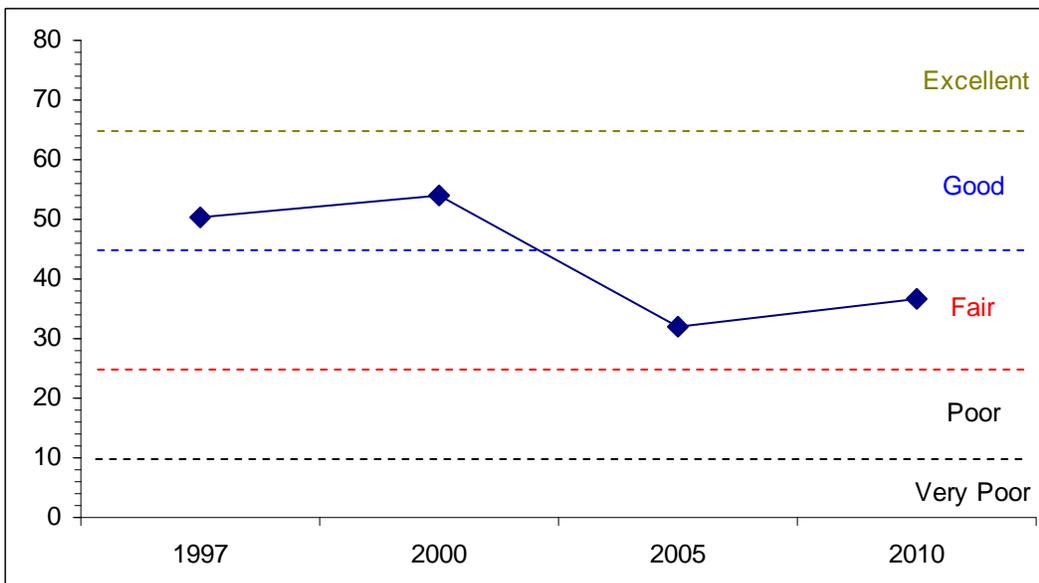
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
97	27.8	10.2	10.9	4.8	-4.4	1.3	0.0	50.5	Good
00	30.0	5.5	4.9	15.5	-3.6	1.7	0.0	54.0	Good
05	23.6	3.2	2.2	9.6	-7.6	0.9	0.0	32.0	Fair
10	19.9	12.0	13.9	2.5	-13.5	2.0	0.0	36.7	Fair

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 10R, Study no: 13



DEER DESIRABLE COMPONENTS INDEX TREND, LOW POTENTIAL SCALE--
Management unit 10R, Study no: 13



HERBACEOUS TRENDS--

Management unit 10R, Study no: 13

T y p e	Species	Nested Frequency				Average Cover %			
		'97	'00	'05	'10	'97	'00	'05	'10
G	Agropyron dasystachyum	_{ab} 18	_b 28	_b 24	_a 3	.49	2.15	.16	.00
G	Bromus tectorum (a)	_b 339	_a 241	_a 221	_b 347	5.82	4.84	10.17	18.03
G	Oryzopsis hymenoides	1	1	-	3	.15	.18	.00	.03
G	Poa secunda	_b 131	_{ab} 116	_b 162	_a 69	1.31	2.68	3.20	1.14
G	Sitanion hystrix	_b 43	_c 107	_c 91	_a 10	.44	2.74	1.45	.05
Total for Annual Grasses		339	241	221	347	5.82	4.84	10.17	18.03
Total for Perennial Grasses		193	252	277	85	2.40	7.75	4.81	1.23
Total for Grasses		532	493	498	432	8.22	12.59	14.99	19.26
F	Arabis sp.	2	-	-	-	.00	-	-	-
F	Castilleja sp.	-	6	-	-	.03	.01	-	-
F	Descurainia pinnata (a)	_b 23	_a 3	_c 46	_a 5	.07	.00	1.14	.01
F	Draba sp. (a)	_a -	_a -	_b 13	_a -	-	-	.05	-
F	Erigeron pumilus	_b 25	_b 42	_a -	_a 7	.15	.22	-	.03
F	Lappula occidentalis (a)	_a 8	_a 6	_b 72	_c 213	.02	.03	.52	2.13
F	Phlox longifolia	-	1	-	-	-	.00	-	-
F	Schoenrambe linifolia	_b 19	_a -	_a -	_a 5	.04	-	-	.06
F	Sphaeralcea coccinea	57	63	45	42	.41	.53	.45	.92
F	Tragopogon dubius	_a -	_b 17	_a -	_a -	-	.08	-	-
Total for Annual Forbs		31	9	131	218	0.09	0.03	1.73	2.15
Total for Perennial Forbs		103	129	45	54	0.63	0.85	0.45	1.01
Total for Forbs		134	138	176	272	0.73	0.89	2.18	3.16

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

BROWSE TRENDS--

Management unit 10R, Study no: 13

T y p e	Species	Strip Frequency				Average Cover %			
		'97	'00	'05	'10	'97	'00	'05	'10
B	Artemisia frigida	66	69	28	75	2.56	3.62	.21	4.03
B	Artemisia tridentata tridentata	75	78	79	42	13.35	21.68	15.86	8.65
B	Atriplex canescens	35	36	29	29	3.79	5.64	1.32	2.87
B	Ceratoides lanata	61	66	58	71	3.03	2.51	1.57	1.14
B	Chrysothamnus nauseosus	0	0	0	1	-	-	-	-
B	Gutierrezia sarothrae	7	19	9	14	.15	.19	.03	.21
B	Juniperus osteosperma	0	0	1	0	-	-	-	-
B	Opuntia sp.	5	5	1	0	.15	.38	.03	-
B	Sclerocactus sp.	0	1	0	0	-	-	-	-
Total for Browse		249	274	205	232	23.06	34.05	19.03	16.92

CANOPY COVER, LINE INTERCEPT--

Management unit 10R, Study no: 13

Species	Percent Cover	
	'05	'10
Artemisia frigida	.23	3.03
Artemisia tridentata tridentata	14.00	7.69
Atriplex canescens	.85	3.79
Ceratoides lanata	.86	.85
Gutierrezia sarothrae	.03	.15

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 10R, Study no: 13

Species	Average leader growth (in)	
	'05	'10
Artemisia tridentata tridentata	2.1	1.5
Atriplex canescens	4.4	1.8
Ceratoides lanata	3.2	1.9

BASIC COVER--

Management unit 10R, Study no: 13

Cover Type	Average Cover %			
	'97	'00	'05	'10
Vegetation	32.47	45.88	33.21	40.25
Rock	.75	.20	.25	.06
Pavement	8.74	3.42	3.87	2.73
Litter	35.06	51.30	35.02	51.26
Cryptogams	3.60	1.75	2.04	.38
Bare Ground	21.07	27.85	39.18	24.78

SOIL ANALYSIS DATA --

Management unit 10R, Study no: 13, Study Name: McCook Ridge Livestock Enclosure

Effective rooting depth (in)	pH	clay loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
14.6	6.7	31.0	37.8	31.2	5.0	7.2	153.6	0.7

PELLET GROUP DATA--

Management unit 10R, Study no: 13

Type	Quadrat Frequency				Days use per acre (ha)			
	'97	'00	'05	'10	'97	'00	'05	'10
Rabbit	10	12	73	15	-	-	-	-
Elk	18	16	13	3	96 (237)	12 (30)	26 (65)	15 (36)
Deer	36	41	85	38	59 (146)	64 (158)	166 (410)	23 (58)

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

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
<i>Artemisia frigida</i>									
97	6260	12	87	1	100	.31	0	.31	13/10
00	6500	6	91	3	10620	17	.61	0	5/8
05	1120	25	75	0	140	11	5	0	5/5
10	6180	11	89	0	700	0	0	0	7/9
<i>Artemisia tridentata tridentata</i>									
97	5780	31	58	10	400	36	25	3	24/29
00	6900	14	54	31	-	44	30	3	20/26
05	6600	4	56	40	-	28	66	25	21/27
10	4860	43	50	7	400	27	23	6	23/30
<i>Atriplex canescens</i>									
97	880	7	32	61	-	34	9	16	30/35
00	1100	0	33	67	-	25	13	13	31/38
05	900	4	13	82	-	33	38	47	22/20
10	680	12	50	38	-	18	35	38	31/36
<i>Ceratoides lanata</i>									
97	4960	8	88	3	20	34	17	.40	10/11
00	5920	2	84	14	20	33	3	3	8/8
05	6200	7	84	9	-	4	93	6	5/6
10	3460	13	86	1	20	17	0	3	9/9
<i>Chrysothamnus nauseosus</i>									
97	0	0	0	-	-	0	0	0	-/-
00	0	0	0	-	-	0	0	0	-/-
05	0	0	0	-	-	0	0	0	-/-
10	60	100	0	-	-	0	0	0	-/-
<i>Gutierrezia sarothrae</i>									
97	300	0	100	-	-	0	0	0	8/8
00	840	7	93	-	80	0	0	0	5/7
05	180	0	100	-	20	0	0	0	6/6
10	720	17	83	-	-	0	0	0	7/7
<i>Juniperus osteosperma</i>									
97	0	0	0	-	-	0	0	0	-/-
00	0	0	0	-	20	0	0	0	-/-
05	20	100	0	-	-	0	0	0	-/-
10	0	0	0	-	-	0	0	0	-/-
<i>Opuntia sp.</i>									
97	180	0	100	-	-	0	0	0	5/9
00	180	11	89	-	20	0	0	0	3/9
05	20	0	100	-	-	0	0	0	4/8
10	0	0	0	-	-	0	0	0	-/-

		Age class distribution					Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)	
Sclerocactus sp.										
97	0	0	0	-	-	0	0	0	-/-	
00	20	0	100	-	-	0	0	0	-/-	
05	0	0	0	-	-	0	0	0	-/-	
10	0	0	0	-	-	0	0	0	-/-	

LOWER MCCOOK RIDGE EXCLOSURE COMPARISON
TREND STUDY NO. 10-2, 10R-13 & 10R-14

Site Information

Site Description: The Lower McCook Ridge area is important big game winter range. Several important key browse species are present in the area including big sagebrush (*Artemisia spp.*), winterfat (*Ceratoides lanata*) and fourwing saltbush (*Atriplex canescens*). The site is located on a broad swale that slopes gently to the northwest. Grazing in the area is managed by the Bureau of Land Management (BLM) as part of the Lower McCook allotment. Wildlife use has fluctuated markedly throughout the sample years. Pellet group data indicates that deer use is typically higher within the livestock enclosure (10R-13) than outside the enclosure (10-2). Deer use was extremely heavy both outside the enclosure and in the livestock enclosure in 2005, but decreased to light levels on both studies in 2010. Estimated elk use was heavy at the outset of the study in 1997, but has been light to moderate both outside the enclosure and within the livestock enclosure since 2000. Cattle use appears to be light in the area (Table 1).

Browse: Big sagebrush was classified as basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), but is most likely a hybrid between basin big sagebrush and Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*). Sagebrush outside the enclosure and within the livestock enclosure typically display moderate to heavy use. Density and cover of sagebrush varies between the enclosures with the total enclosure (10R-14) having the lowest density of sagebrush plants, the livestock enclosure having the highest and outside the enclosure being intermediate. Recruitment of young sagebrush plants has generally been very good across all three studies, but was poor in 2005. Decadence is higher outside the enclosure and within the livestock enclosure than it is within the total enclosure (Table 2).

At the outset of the studies in 1997, winterfat had the highest density and cover inside the total enclosure with lower rates outside the enclosure and inside the livestock enclosure. There was a general decline in winterfat on all three studies in 2010, but particularly so within the total enclosure. Cover and density of winterfat were similar on all three studies in 2010. Winterfat cover was about six times greater in the total enclosure than in both the livestock enclosure and outside the enclosure in 2000, but cover within the total enclosure decreased substantially in 2005. Recruitment of young winterfat plants was somewhat low on all three studies from 1997 to 2005, but there was a large increase in recruitment outside the enclosure in 2010 with slight increases in recruitment within both the livestock enclosure and total enclosure. Average height and crown measurements also show winterfat inside the total enclosure to be larger than the winterfat in either of the other two studies. With the highest density, highest cover, and largest individuals occurring inside the total enclosure, it is likely that competition is greater here and may be responsible for the highest rate of decadence inside the total enclosure (Table 4).

Fourwing saltbush has similar densities in the total and livestock enclosures, with a lower density outside the enclosure. There was a large increase in cover on all three studies in 2000, but density of fourwing saltbush has declined on the studies throughout the study years. Percent decadence has been high for each transect in each reading. As with winterfat, the high decadence of fourwing saltbush is likely due more to drought and/or competition rather than utilization (Table 3).

Herbaceous Understory: Perennial grasses and forbs are neither abundant nor diverse on the studies (Table 5). Cheatgrass (*Bromus tectorum*) is the dominant herbaceous species on all three of the transects with the highest levels within the total enclosure and the lowest outside of the enclosure. The herbaceous understories have been similar for each transect.

Soil: Soils within the livestock enclosure and total enclosure have a clay loam texture and neutral pH. Soils on the transect outside the enclosure have a loam texture and a slightly alkaline pH. Basic ground cover is similar between the studies with high amounts of vegetation and litter cover, though bare ground cover is lower within the total enclosure than on the other two transects.

Exclosure Complex Summary

Study Name	Year	Deer	Elk	Cattle
		<i>days use/acre (ha)</i>	<i>days use/acre (ha)</i>	<i>days use/acre (ha)</i>
Outside Exclosure (10-2)	1997	38 (94)	51 (126)	12 (29)
	2000	27 (67)	28 (68)	--
	2005	86 (212)	8 (20)	7 (18)
	2010	19 (48)	19 (46)	--
Livestock Exclosure (10R-13)	1997	59 (146)	96 (237)	--
	2000	64 (158)	12 (30)	--
	2005	166 (410)	26 (65)	--
	2010	23 (58)	15 (36)	--

Table 1. Pellet group transect data estimated use for the Lower McCook Ridge exclosure complex.

Study Name	Year	Percent Cover	Density <i>Plants/acre</i>	Percent Young	Percent Mature	Percent Decadent	Ave. height/crown
				<i>(Plants/acre)</i>	<i>(Plants/acre)</i>	<i>(Plants/acre)</i>	<i>(in)</i>
Outside Exclosure (10-2)	1997	9.15	3040	14	66	20	21/28
	2000	12.00	3980	32	43	26	19/29
	2005	10.66	3500	5	59	35	24/31
	2010	9.66	3940	32	46	22	23/32
Livestock Exclosure (10R-13)	1997	13.35	5780	31	58	10	24/29
	2000	21.68	6900	14	54	31	20/26
	2005	15.86	6600	4	56	40	21/27
	2010	8.65	4860	43	50	7	23/30
Total Exclosure (10R-14)	1997	1.33	640	81	19	0	33/37
	2000	2.62	1200	68	32	0	30/31
	2005	2.53	700	6	86	9	37/45
	2010	3.12	1260	63	29	8	40/52

Table 2. Browse characteristics of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) for the Lower McCook Ridge exclosure study sites.

Study Name	Year	Percent Cover	Density <i>Plants/acre</i>	Percent Young	Percent Mature	Percent Decadent	Ave. height/crown
				<i>(Plants/acre)</i>	<i>(Plants/acre)</i>	<i>(Plants/acre)</i>	<i>(in)</i>
Outside Exclosure (10-2)	1997	0.73	240	8	50	42	29/28
	2000	2.55	700	0	60	40	31/35
	2005	1.04	640	6	28	66	23/36
	2010	0.26	480	33	21	46	17/20
Livestock Exclosure (10R-13)	1997	3.79	880	7	32	61	30/35
	2000	5.64	1100	0	33	67	31/38
	2005	1.32	900	4	13	82	22/20
	2010	2.87	680	12	50	38	31/36
Total Exclosure (10R-14)	1997	7.39	1280	2	58	41	34/40
	2000	12.48	1160	0	60	40	38/52
	2005	2.00	920	2	7	91	37/40
	2010	7.08	680	6	76	18	35/52

Table 3. Browse characteristics of fourwing saltbush (*Atriplex canescens*) for the Lower McCook Ridge exclosure study sites.

Study Name	Year	Percent Cover	Density Plants/acre	Percent Young (Plants/acre)	Percent Mature (Plants/acre)	Percent Decadent (Plants/acre)	Ave. height/crown (in)
Outside Exclosure (10-2)	1997	2.08	7620	10	90	0	8/9
	2000	2.20	7020	3	87	10	8/9
	2005	2.25	8020	3	95	1	6/7
	2010	2.05	4400	35	65	1	8/9
Livestock Exclosure (10R-13)	1997	3.03	4960	8	88	3	10/11
	2000	2.51	5920	2	84	14	8/8
	2005	1.57	6200	7	84	9	5/6
	2010	1.14	3460	13	86	1	9/9
Total Exclosure (10R-14)	1997	13.34	8020	12	80	8	23/18
	2000	13.75	9060	3	60	37	17/19
	2005	3.83	8860	6	90	4	10/11
	2010	2.94	4560	12	86	1	11/12

Table 4. Browse characteristics of winterfat (*Ceratoides lanata*) for the Lower McCook Ridge exclosure study sites.

Study Name	Year	Perennial Grass Species			Perennial Forb Species		
		<i>n</i>	<i>Sum of Nested Frequency</i>	<i>Percent Cover</i>	<i>n</i>	<i>Sum of Nested Frequency</i>	<i>Percent Cover</i>
Outside Exclosure (10-2)	1997	3	177	2.29	5	153	1.39
	2000	5	247	7.93	4	175	2.71
	2005	4	225	3.47	3	99	1.04
	2010	4	173	4.00	4	122	2.09
Livestock Exclosure (10R-13)	1997	4	193	2.40	4	103	0.63
	2000	4	252	7.75	5	129	0.85
	2005	4	277	4.81	1	45	0.45
	2010	4	85	1.23	3	54	1.01
Total Exclosure (10R-14)	1997	3	15	0.54	2	34	0.38
	2000	3	40	1.14	3	137	1.85
	2005	3	45	0.49	2	20	0.07
	2010	4	84	4.73	4	49	1.00

Table 5. Number of species sampled (*n*), sum of nested frequency and cover of perennial grasses and perennial forbs in the three studies at the Lower McCook Ridge exclosure complex.