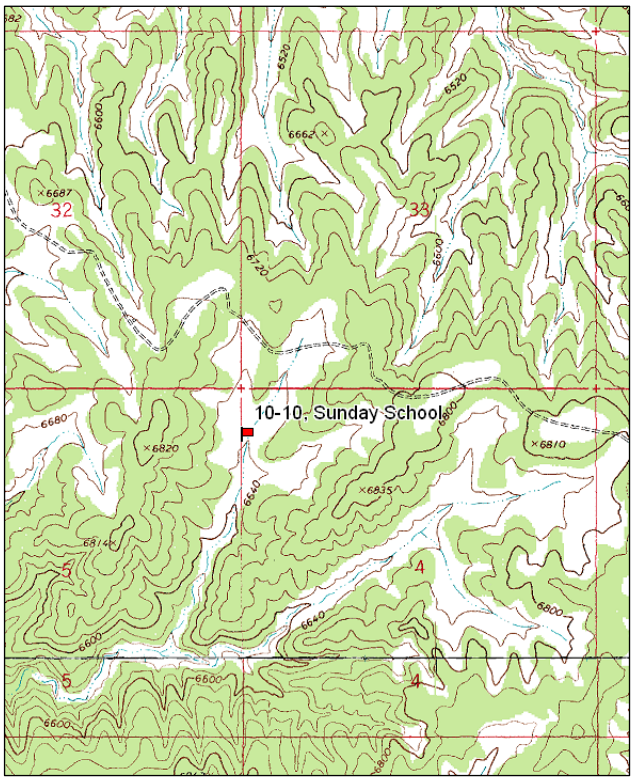
SUNDAY SCHOOL - TREND STUDY NO. 10-10-10

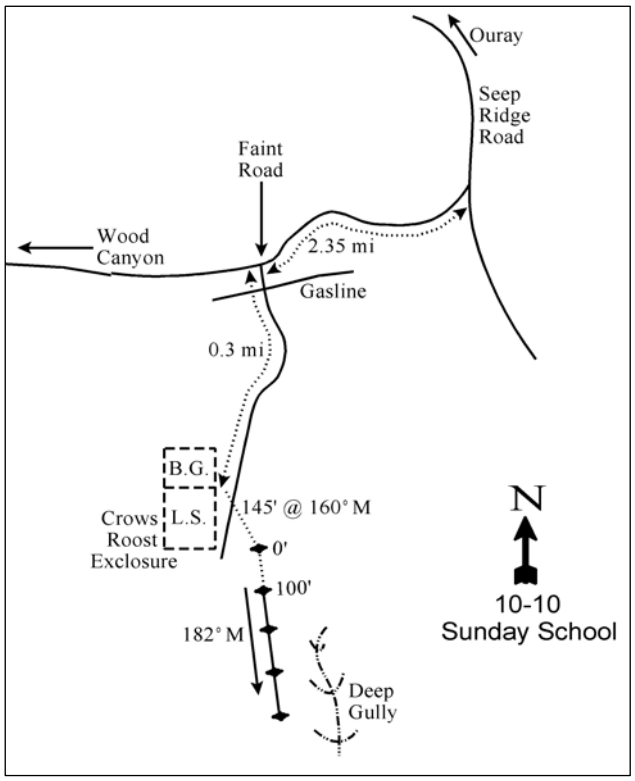
Vegetation Type: Fourwing Saltbush
Range Type: Crucial Deer Winter, Crucial Elk Winter
NRCS Ecological Site Description: Upland Silt Loam (Fourwing Saltbush-Winterfat), R034XY329UT
Land Ownership: BLM
Elevation: 6650 ft. (2027 m)
Aspect: South
Slope: 2%
Transect bearing: 182° magnetic
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

Directions:
From the Seep Ridge Road, turn onto the Wood Canyon/Willow Creek road and proceed west 2.35 miles. Turn left onto a jeep trail and go 0.3 miles to the Crows Roost Exclosure. The study site is on the east side of the exclosure. The 0-foot baseline stake is 29 paces from the Southeast corner of the big game exclosure, at a bearing of 160°M. The frequency baseline runs south from there, parallel to the livestock exclosure fence. The study is marked by 2-foot tall green metal fenceposts.

Map Name: Bates Knolls



Diagrammatic Sketch:



Township: 14S Range: 22E Section: 5

GPS: NAD 83, UTM 12S 631373 E 4388223 N

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Site Information

Site Description: The study is located in a draw adjacent to the Crows Roost Exclosure on BLM land. The wide draw drains to the south, although the bottom of the draw is relatively flat. The dominant vegetation is fourwing saltbush (*Atriplex canescens*) and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). The Sunday School Canyon allotment is used by cattle each winter with a rotational deferred system of grazing from November 1 through April 30. Few deer and elk pellet groups were encountered in 1988 and no pellet groups were sampled in 1995. Pellet group transect data has estimated light use by deer, elk and cattle since 2000. Rabbit sign was very high in 2005 with an 86% quadrat frequency, but has been low to moderate in all other sample years (Table - Pellet Group Data).

Browse: Fourwing saltbush, Wyoming big sagebrush, basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), fringed sagebrush (*A. frigida*) and winterfat (*Ceratoides lanata*) are all abundant browse species on this site. The majority of the big sagebrush on the site is Wyoming big sagebrush. Basin big sagebrush is found near the bottom of the draw where soil is deeper. Decadence of the big sagebrush species has been low except for 2005, when decadence was very high in both species. There was a large increase in the density of both big sagebrush species in 2010 due to a large surge in recruitment of young plants. Utilization of the two big sagebrush species has been mostly moderate with heavier use in 2005. Fourwing saltbush is a mostly mature population with moderately high decadence and moderate to heavy use. The density of fourwing saltbush has decreased steadily since 2000 with little knew recruitment of young plants in 2000 or 2005. However, recruitment increased in 2010. Winterfat and fringed sagebrush are very abundant on this site with mostly light to moderate use on winterfat and mostly light use on fringed sage. Utilization of both species was higher in 2005 (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory was dominated by annual species in 1995 as cheatgrass (*Bromus tectorum*) and tansy mustard (*Descurainia pinnata*) made up 88% of the herbaceous cover and 64% of the total vegetation cover. Due to the unusually wet spring of 1995, tansy mustard was 2 to 3 feet tall and cheatgrass cover was nearly 11%. Since that time, both species have decreased significantly and are not prevalent on the site. Thickspike wheatgrass (*Agropyron dasystachyum*) and blue grama (*Bouteloua gracilis*) are the most abundant perennial grasses. Scarlet globemallow (*Sphaeralcea coccinea*) is the only common perennial forb with annual forb species being more prevalent on the site (Table - Herbaceous Trends).

Soil: The soil is a well-drained clay loam with a slightly alkaline soil reaction (pH 7.7) (Table - Soil Analysis Data). Bare ground cover increased in 2000 and has remained relatively high since then due to the decrease in vegetation cover provided by annual species (Table - Basic Cover). There is an active gully in the draw that was reported to be 10 feet deep with steep banks in 2005. In 1995, it was only about 4 feet deep with vegetation growing in the bottom. In 2000 and 2005 the gully appeared to be actively head cutting the erodible soil and had steep bank 15-20 feet deep, and in 2010 it was 6-8 feet deep. The soil erosion condition was classified as critical in 2005 due to the gully, pedestaling, and soil movement, and slight in 2010 for the same reasons.

Trend Assessments

Browse:

- **1988 to 1995 - stable (0):** Differences in density may be related to the larger sample area used in 1995; therefore, trend was determined using other parameters. There was little change in most of the preferred browse. Fourwing saltbush increased substantially in decadence from 0% to 80% and poor vigor from 0% to 47%. In the nearby Crow's Roost Exclosure, decadent fourwing plants were also noted in both the total and livestock exclosure.
- **1995 to 2000 - stable (0):** Density of both big sagebrush species decreased, but increased slightly for fourwing saltbush. Cover of all three of these species increased. Decadence of fourwing saltbush

decreased to 27% and poor vigor returned to 0%. Recruitment of young plants decreased in both big sagebrush species and remained low for fourwing saltbush.

- **2000 to 2005 - slightly down (-1):** Decadence of the big sagebrush species and fourwing saltbush increased markedly and recruitment of young plants has remained low.
- **2005 to 2010 - slightly up (+1):** The density of the two big sagebrush species increased substantially, primarily due to a large increase in the recruitment of young plants with only a slight increase in total big sagebrush cover. Decadence and poor vigor of big sagebrush also decreased substantially. The density of fourwing saltbush decreased by 28% and decadence remained moderately high.

Grass:

- **1988 to 1995 - down (-2):** The sum of nested frequency of perennial grasses decreased by 59% with a significant decrease in thickspike wheatgrass and blue grama. Annual species were not included in the sample in 1988, but cheatgrass was prevalent in 1995 providing nearly 11% cover.
- **1995 to 2000 - up (+2):** Perennial grass sum of nested frequency increased over two-fold and cover increased from 2% to 13%. There was a significant increase in the nested frequency of thickspike wheatgrass and blue grama. Cheatgrass decreased significantly in nested frequency and cover decreased to less than 1%.
- **2000 to 2005 - stable (0):** There was little change in the sum of nested frequency of perennial grasses, though cover decreased slightly to 10%. Cheatgrass had a significant decrease in nested frequency.
- **2005 to 2010 - stable (0):** The perennial grass sum of nested frequency remained similar and cover increased to 13%. Cheatgrass nested frequency increased significantly though cover remained less than 1%

Forb:

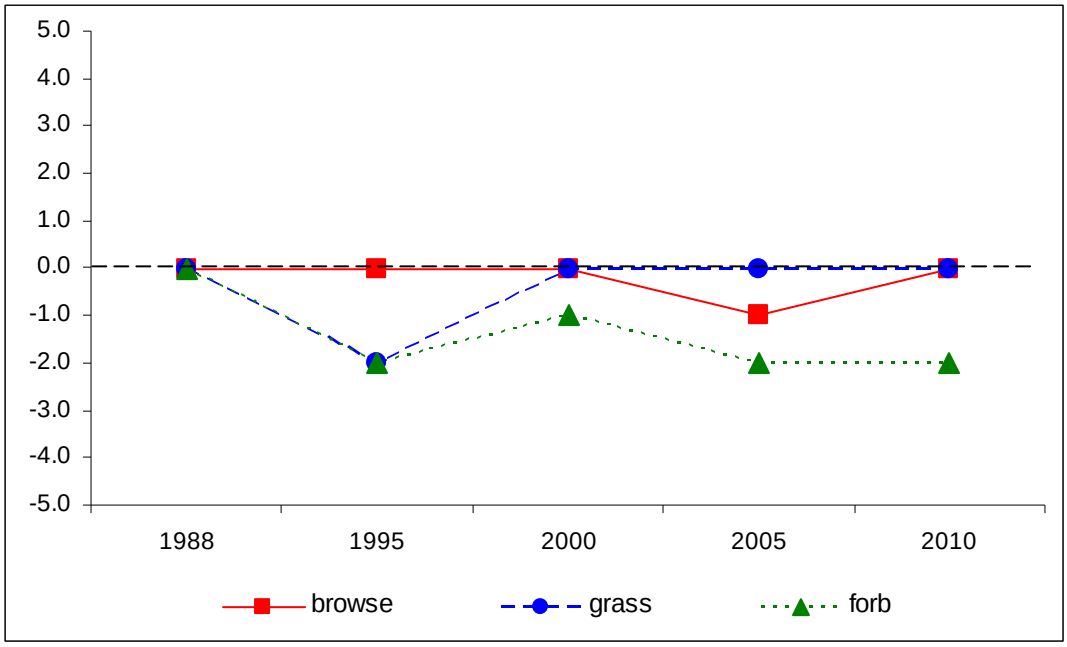
- **1988 to 1995 - down (-2):** The sum of nested frequency of perennial forbs decreased by 42%. Annual species were not included in the sample in 1988, but tansy mustard was prevalent at 19%.
- **1995 to 2000 - slightly up (+1):** There was an 18% increase in the sum of nested frequency of perennial forbs and cover increased from 1% to 3%. Tansy mustard was not sampled.
- **2000 to 2005 - slightly down (-1):** The sum of nested frequency of perennial forbs decreased to 1995 levels and cover decreased to 2%.
- **2005 to 2010 - stable (0):** There was no change in the sum of nested frequency of perennial forbs and cover decreased to 1%.

DEER DESIRABLE COMPONENTS INDEX - LOW POTENTIAL SCALE --
Management unit 10, study no: 10

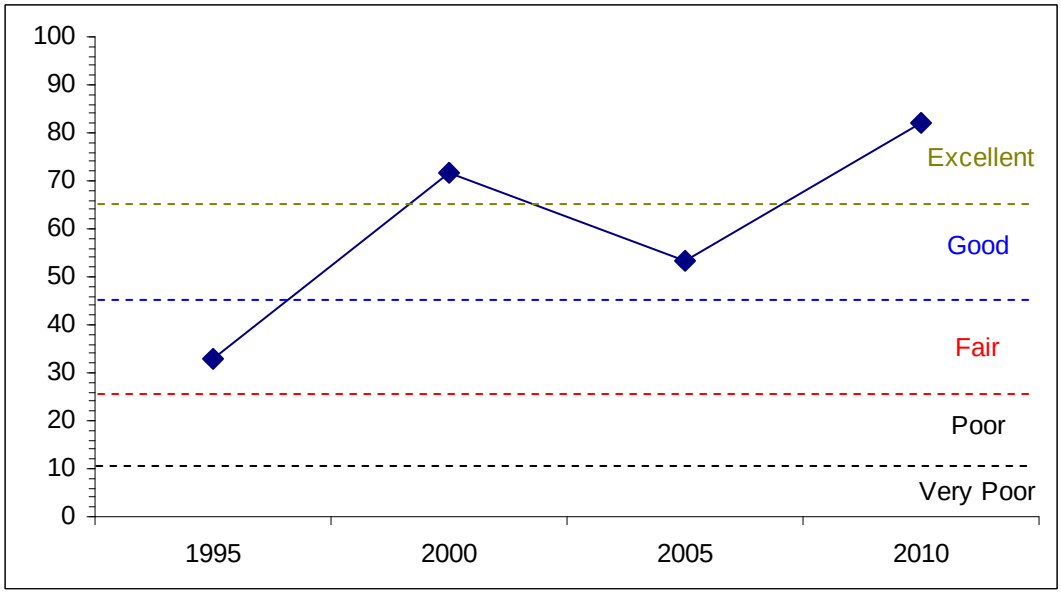
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
95	15.0	8.6	11.2	3.6	-8.1	2.6	0.0	**33.0**	Fair
00	23.7	12.4	4.3	25.1	-0.4	6.4	0.0	**71.5**	Excellent
05	19.3	7.6	4.0	19.1	-0.1	3.6	0.0	**53.4**	Good
10	24.8	14.1	15.0	26.6	-0.5	2.0	0.0	**82.0**	Excellent

Trend Summary

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



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



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

Type	Species	Nested Frequency					Average Cover %			
		'88	'95	'00	'05	'10	'95	'00	'05	'10
G	Agropyron dasystachyum	$_{b}$208	$_{a}$119	$_{b}$247	$_{b}$245	$_{b}$229	1.43	10.67	5.08	7.58
G	Agropyron spicatum	-	9	-	2	6	.09	-	.00	.18
G	Bouteloua gracilis	$_{d}$177	$_{a}$22	$_{b}$97	$_{bc}$129	$_{c}$130	.18	1.68	3.79	5.11
G	Bromus tectorum (a)	-	$_{c}$252	$_{b}$82	$_{a}$43	$_{b}$84	10.79	.53	.19	.73
G	Oryzopsis hymenoides	-	-	-	1	-	-	-	.00	-
G	Poa secunda	20	16	26	24	22	.10	.21	.64	.42
G	Sitanion hystrix	-	-	-	3	-	-	-	.00	-
Total for Annual Grasses		0	252	82	43	84	10.79	0.53	0.19	0.73
Total for Perennial Grasses		405	166	370	404	387	1.81	12.57	9.53	13.30
Total for Grasses		405	418	452	447	471	12.61	13.10	9.73	14.04
F	Chenopodium fremontii (a)	-	-	-	5	10	-	-	.01	.02
F	Delphinium sp.	-	1	-	-	-	.00	-	-	-
F	Descurainia pinnata (a)	-	$_{c}$302	$_{a}$-	$_{ab}$6	$_{b}$15	19.10	-	.04	.05
F	Erigeron eatonii	$_{a}$1	$_{b}$18	$_{a}$-	$_{a}$-	$_{a}$4	.54	-	-	.00
F	Lappula occidentalis (a)	-	$_{b}$88	$_{a}$44	$_{c}$245	$_{c}$221	.39	.16	7.76	1.58
F	Machaeranthera canescens	$_{b}$9	$_{a}$-	$_{a}$-	$_{a}$-	$_{a}$-	-	-	-	.03
F	Phlox longifolia	$_{a}$15	$_{ab}$28	$_{a}$13	$_{a}$16	$_{b}$48	.11	.10	.04	.40
F	Ranunculus testiculatus (a)	-	$_{b}$84	$_{a}$21	$_{a}$23	$_{c}$181	.70	.10	.08	2.50
F	Schoencrambe linifolia	-	-	-	-	2	-	-	.00	.00
F	Sphaeralcea coccinea	$_{d}$202	$_{ab}$84	$_{c}$142	$_{bc}$107	$_{a}$69	.63	3.08	1.75	.56
Total for Annual Forbs		0	474	65	279	427	20.20	0.27	7.90	4.17
Total for Perennial Forbs		227	131	155	123	123	1.28	3.18	1.80	1.00
Total for Forbs		227	605	220	402	550	21.48	3.45	9.71	5.17

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

BROWSE TRENDS--
Management unit 10, Study no: 10

Type	Species	Strip Frequency				Average Cover %			
		'95	'00	'05	'10	'95	'00	'05	'10
B	Artemisia frigida	44	79	79	91	1.78	3.60	3.02	8.17
B	Artemisia tridentata tridentata	11	15	11	20	.71	2.84	3.12	2.28
B	Artemisia tridentata wyomingensis	36	27	27	27	3.84	5.17	4.18	6.39
B	Atriplex canescens	55	53	49	42	2.83	5.23	2.46	1.13
B	Ceratoides lanata	55	61	68	72	3.23	2.85	3.28	3.53
B	Gutierrezia sarothrae	0	0	0	1	-	-	-	-
Total for Browse		201	235	234	253	12.39	19.71	16.09	21.53

CANOPY COVER, LINE INTERCEPT--
Management unit 10, Study no: 10

Species	Percent Cover	
	'05	'10
Artemisia frigida	1.38	8.31
Artemisia tridentata tridentata	2.73	4.11
Artemisia tridentata wyomingensis	3.36	4.50
Atriplex canescens	1.86	2.16
Ceratoides lanata	3.16	3.08

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 10, Study no: 10

Species	Average leader growth (in)	
	'05	'10
Artemisia tridentata wyomingensis	1.9	2.2
Ceratoides lanata	4.2	2.8

BASIC COVER--
Management unit 10, Study no: 10

Cover Type	Average Cover %				
	'88	'95	'00	'05	'10
Vegetation	7.00	49.70	36.77	29.32	38.70
Rock	.25	.27	.06	.62	.05
Pavement	9.50	2.63	3.00	7.91	5.70
Litter	55.00	40.40	42.09	22.85	40.18
Cryptogams	.50	.03	.36	.06	.03
Bare Ground	27.75	21.33	35.75	49.85	36.77

SOIL ANALYSIS DATA --
Management unit 10, Study no: 10, Study Name: Sunday School #1

Effective rooting depth (in)	pH	caly loam			%OM	PPM P	PPM K	ds/m
		%sand	%silt	%clay				
17.8	7.7	28.0	39.4	32.6	2.4	10.1	409.6	0.6

PELLET GROUP DATA--
Management unit 10, Study no: 10

Type	Quadrat Frequency			
	'95	'00	'05	'10
Rabbit	3	38	86	16
Horse	-	-	-	6
Elk	-	11	22	3
Deer	-	6	10	8
Cattle	3	6	10	-

Days use per acre (ha)		
'00	'05	'10
-	-	-
-	-	6 (16)
20 (50)	15 (38)	7 (17)
3 (9)	10 (25)	9 (23)
19 (47)	14 (34)	-

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

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Artemisia frigida									
88	**94599**	66	34	0	132333	0	0	0	7/5
95	**2040**	33	66	1	8880	0	0	.98	7/5
00	**9660**	14	86	0	340	0	0	.20	5/8
05	**7860**	13	87	0	160	32	7	0	5/7
10	**18960**	37	63	0	2480	7	1	.42	6/9
Artemisia tridentata tridentata									
88	**0**	0	0	0	-	0	0	0	-/-
95	**760**	53	47	0	160	11	0	0	24/33
00	**660**	18	79	3	-	3	0	27	72/65
05	**740**	0	59	41	-	32	24	22	34/41
10	**3260**	75	23	2	160	1	6	0	38/50
Artemisia tridentata wyomingensis									
88	**199**	100	0	0	1733	0	0	0	-/-
95	**1940**	39	58	3	260	11	5	1	19/24
00	**1120**	4	93	4	60	7	0	9	24/30
05	**980**	10	45	45	-	39	31	31	21/29
10	**3720**	74	23	3	700	24	0	11	22/27
Atriplex canescens									
88	**1332**	10	90	0	-	0	0	0	31/28
95	**1860**	3	17	80	-	5	8	47	18/26
00	**2200**	6	66	27	-	43	5	0	18/24
05	**1740**	7	61	32	-	20	60	18	11/16
10	**1260**	22	43	35	20	37	21	16	13/20
Ceratoides lanata									
88	**9399**	30	70	0	66	0	0	0	9/3
95	**8320**	7	86	7	40	3	4	0	10/10
00	**7380**	6	94	1	120	18	1	0	7/8
05	**10280**	9	90	1	20	13	79	.58	7/7
10	**9440**	9	91	0	140	20	17	0	7/9
Gutierrezia sarothrae									
88	**0**	0	0	-	-	0	0	0	-/-
95	**0**	0	0	-	-	0	0	0	-/-
00	**0**	0	0	-	-	0	0	0	-/-
05	**0**	0	0	-	-	0	0	0	6/8
10	**20**	0	100	-	-	0	0	0	5/6

		Age class distribution				Utilization			
Year	Plants per Acre (excluding seedlings)	% Young	% Mature	% Decadent	Seedling (plants/acre)	% moderate	% heavy	% poor vigor	Average Height Crown (in)
Opuntia sp.									
88	**0**	0	0	-	-	0	0	0	-/-
95	**0**	0	0	-	-	0	0	0	1/3
00	**0**	0	0	-	-	0	0	0	-/-
05	**0**	0	0	-	-	0	0	0	-/-
10	**0**	0	0	-	-	0	0	0	-/-