Trend Study 14-13-04

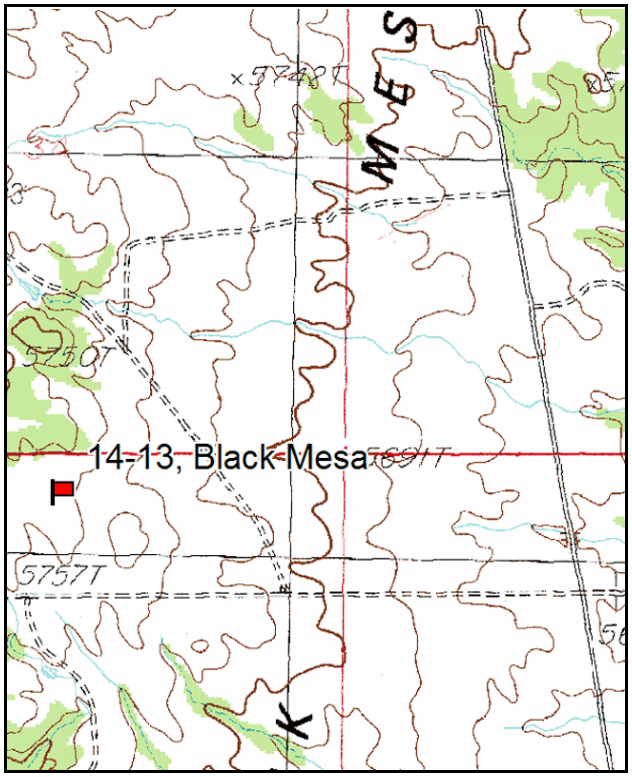
Study site name: Black Mesa . Vegetation type: Wyoming Big Sagebrush .

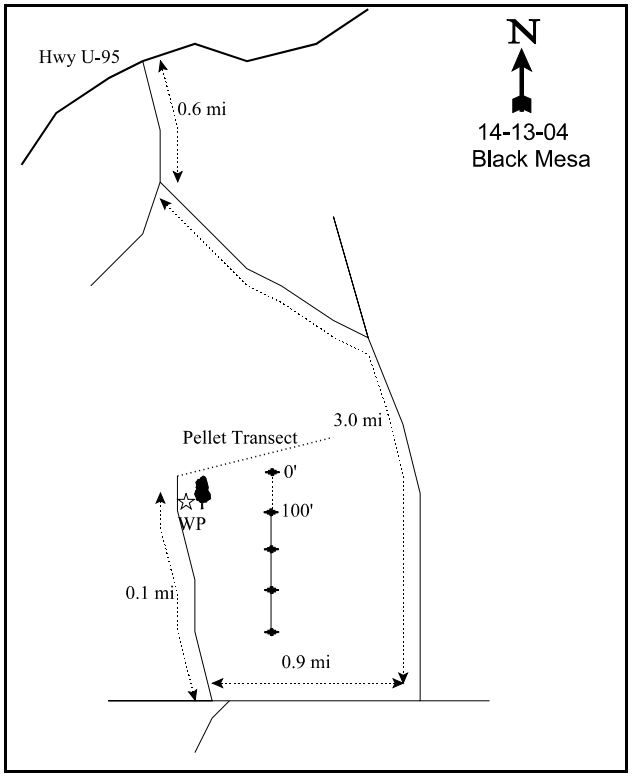
Compass bearing: frequency baseline 163 degrees magnetic.

Frequency belt placement: line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From mile marker 114 on Highway U-95 near Cottonwood Canyon east of Comb Ridge, go 0.5 miles east to County Road #233. Go south on #233 0.6 miles to a fork. Stay left and go 3.0 miles to an intersection (Road #280). Turn right and go 0.9 miles beyond a fork to the left, to a very faint road to the right. Turn right on this faint road before two gullies and go 0.1 miles to a fence post which is six feet from the right side of the road. There is a lone juniper just behind the stake. From this witness post, go about 600 feet (95 paces) at 40°M (following the deer pellet group transect) to the first baseline stake which is located 25 feet south of pellet transect stake #8718 (a 6 inch tall yellow rebar). The baseline stake is a three foot tall green fence post tagged #7822. The transect runs south from the 0-foot baseline stake, with 100 feet between all posts.





Map Name: Hotel Rock

Diagrammatic Sketch

Township 38S , Range 21E , Section 3

GPS: NAD 27, UTM 12S 4153113 N, 624402 E

DISCUSSION

Black Mesa - Trend Study No. 14-13

This transect is on top of Black Mesa which is considered an important deer wintering area southeast of Elk Ridge. This is one of the lowest elevation studies (5,700 feet) on the unit, located on a large, flat mesa dominated by open sagebrush parks and pinyon-juniper woodlands. Wyoming big sagebrush dominates the site, which is on a slight southeast facing slope. The area is managed by the BLM, which allows 200 head of cattle to graze from the first of Oct to the end of May. Sign of cattle use has been infrequent and not concentrated on the site during past readings. Pellet group data from the site estimated 44 cow use days/acre (109 cdu/ha) in 1999 and 9 cow use days/acre (21 cdu/ha)in 2004. Black Mesa has shown moderate to heavy use by deer, depending on the winter. A pellet group transect near the site estimated an average of 41 deer days use/acre (101 ddu/ha) between 1993 and 1997. This is an increase from the previous 5 years (1988-92) when 28 ddu/acre (69 ddu/ha) was estimated (Jense et al. 1992). Pellet group data taken on the site in 1999 estimated 58 deer days use/acre (143 ddu/ha) and 1 elk day use/acre (2 edu/ha). In 2004, 37 deer days use/acre (93 ddu/ha) and 1 elk day use/acre (2 edu/ha) were estimated. Human pressure in the area is generally low, however there are several mining claims staked out near the study area.

The soil is a moderately deep, but compacted below the surface. Estimated effective rooting depth is nearly 14 inches. Soil texture is a sandy clay loam with a neutral pH (7.3). There is very little rock on the surface or within the profile. Due to the sandy texture and low elevation, soil temperature is extremely high averaging 76°F in 1999 and 72°F in 2004 at an average depth of just over 12 inches. This condition gives winter annuals like cheatgrass a competitive advantage over cool season perennial grasses and forbs due to early season drying of the soil profile. Phosphorus levels are low and potassium is marginal at only 7.5 ppm and 70.4 ppm respectively. Low amounts of these elements may effect plant growth and development. Vegetation and litter cover are low, although erosion does not appear to be a problem due to the levelness of the terrain, combined with the high infiltration capacity of the soil. An erosion class index rated erosion as stable in 2004.

Wyoming big sagebrush is the key browse species on the site. It formed a moderately dense stand of 3,266 plants/acre in 1986. The old, well-established stand had a fairly good age distribution of 16% young plants, 47% mature, and 37% decadent. Utilization was moderate to heavy with 37% of the plants sampled displaying heavy use. Vigor was considered poor on 20% of the sagebrush sampled in 1986. The population appears to be in a steady state of decline since 1986 with the exception of 1994 when some improvements were seen in lighter use, reduced decadence and improved reproduction with 26% of the population being young plants. This was the highest value for young plants ever recorded. These improvements were short lived. By 1999, use returned to moderate and heavy levels, while vigor was reduced on about 20% of the population. Percent decadence increased from 37% in 1986 to 57% by 1992, to 60% in 1999, and finally to 69% in 2004. Plants showing poor vigor increased to 77% in 2004, while use was mostly moderate. In 2004, there were more dead plants counted than live plants and 51% of the living plants were considered to be dying. Density in 2004 was half of what it was in 1986. Reproduction in 1999 and 2004 were very poor as young and seedling plants were rare in both readings. Many of these problems are the result of the drought, combined with abundance of winter annuals drying the soil profile and continued heavy use.

The scattered juniper in the flat are generally vigorous and could probably be slowly increasing. Point quarter data from 1999 estimated only 10 juniper trees/acre with an average diameter of 6.3 inches. The site also contains a dense population of broom snakeweed. Density has varied with annual precipitation patterns, 1986, 1992, and 1999 were very high, while 1994 and 2004 were lower. Density was 6,040 plants/acre in 2004 with about 6% cover. Young plants have made up at least 18% of the population since 1994.

Five perennial grasses and 2 annual grasses are found on this site. Cheatgrass steadily increased from 1992

(when annuals were first included in the sampling methods) to 1999 when it was most abundant. In 1999, cheatgrass was found in 96% of the quadrats and had 12% cover. This was 75% of the total grass cover in 1999. In 2004, cheatgrass abundance was significantly lower, but still quite high (found in 74% of all quadrats and 10% cover). When cheatgrass is abundant like this it can outcompete sagebrush seedlings and can create fire hazards that can eliminate sagebrush completely. Galleta nested frequency has remained stable since 1992, but was very robust in 2004 with 8% cover. This was much higher than it previously had been. Bottlebrush squirreltail and needle-and-thread were also robust in 2004, although abundance has been stable since 1999. Sum of nested frequency for perennial grasses was highest in 1994 and declined in 1999. It increased slightly in 2004. Forbs are diverse, but none are overly abundant and most are annuals.

1986 APPARENT TREND ASSESSMENT

Vegetative diversity is poor and the key species, Wyoming big sagebrush, is in poor condition on this important winter range. The form and vigor of the sagebrush, in addition to the abundance of the increaser broom snakeweed, would indicate a downward trend is occurring on this already fairly poor site. The presence of healthy young plants is one positive sign. One management option might be to release the young sagebrush plants by treatment with a smooth light-weight anchor chain. A favorable water year would do much to improve the situation. Lack of ground cover leaves the sandy soil susceptible to erosion and there is no indication that the condition is improving. Soil trend is stable to possibly down.

1992 TREND ASSESSMENT

It should be noted that during the 1992 field season, the methodology for determining cover has changed. Soil trend for this site should be considered stable to slightly improving because percent bare ground has declined and there has been a substantial increase in perennial grass and forb frequency. The browse trend would have to be judged slightly down because of a 12% loss in the Wyoming sagebrush density and an increase in percent decadency from 37% to 57%. Nested frequency for both grasses and forbs has increased substantially since 1986 which would indicate a upward trend for the herbaceous understory. The Desirable Components Index (see methods) score is 40 which is rated as fair for a Wyoming big sagebrush site.

TREND ASSESSMENT
soil - slightly up (4)
browse - slightly down (2)
herbaceous understory - up (5)
winter range condition (DC Index) - 40 (fair) Wyoming big sagebrush type

1994 TREND ASSESSMENT

Trend for soil appears stable. Ground cover characteristics are similar to 1992 estimates. Trend for browse has improved in many areas. Density has increased, utilization is light and percent decadence has declined from 57% to 39%. Recruitment is improved with seedlings and young common. However, vigor is still relatively poor on 21% of the plants sampled, and one-half of the 1,420 decadent plants sampled appeared to be dying. Taking all of these factors into consideration, trend for Wyoming big sagebrush is considered up slightly. The population should remain stable with enough young plants to replace decadent and dying plants. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency for perennial grasses. Frequency of perennial forbs declined slightly, but total cover contributed by the forbs is not more than three-tenths of one-percent. The DCI score improved to good (53) as sagebrush cover increased, decadence decreased, and the proportion of young plants improved.

TREND ASSESSMENT
soil - stable (3)
browse - slightly up (4)
herbaceous understory - slightly up (4)
winter range condition (DC Index) - 53 (good) Wyoming big sagebrush type

1999 TREND ASSESSMENT

Tend for soil is slightly up due to a decline in percent bare ground from 46% in 1994 to 38% in 1999. Litter cover also increased slightly. Unfortunately, much of the improvements are due to the dramatic increase in cheatgrass. Trend for browse is down once again after a slightly improving trend in 1994. Use is heavy, vigor poor on 22% of the plants sampled, percent decadence high at 60%, and recruitment poor with low numbers of seedlings and young. To make matters worse, now cheatgrass is abundant in the understory which will further decrease seedling sagebrush establishment. The improvements in sagebrush seen in 1994, must have been due to favorable climatic conditions after the 1992 reading, which enhanced the establishment of seedling sagebrush. Trend for the herbaceous understory is down. Sum of nested frequency of perennial grasses and forbs has declined while the frequency of cheatgrass has increased significantly. Cheatgrass was present on the site in small numbers in 1992, however it was never abundant. Sum of nested frequency did increase significantly with every reading, yet cover was very low. By 1999, sum of nested frequency of cheatgrass increased nearly four-fold and cover rose from 0.5% in 1994 to 12% in 1999. It now accounts for 75% of the grass cover and 74% of the herbaceous cover. Perennial grasses, bottlebrush squirreltail, and sand dropseed declined significantly in frequency. The only common perennial grass left on the site is Galleta, a warm season species. In 1992 it provided 44% of the grass cover, although by 1999, it contributed to only 20%. Forbs continue to be very scarce. The DCI dropped to 7 which is classified as very poor. This drop is due to declines in every category and the high amount of cheatgrass.

TREND ASSESSMENT
soil - slightly up (4)
browse - down (1)
herbaceous understory - down (1)
winter range condition (DC Index) - 7 (very poor) Wyoming big sagebrush type

2004 TREND ASSESSMENT

The trend for soil is slightly down. On a relative scale the amount of bare ground cover increased from 37% in 1999 to 42% in 2004. The ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground declined from 1:2.5 to 1:2.1. Erosion is not currently a problem. The browse trend is continuing downward. Wyoming big sagebrush density is 21% lower than it was in 1999. Percent decadency has continued to rise since 1994 and vigor is much worse than it was in 1999. There are very few young and seedling plants to replace the dying plants. Drought, heavy use, and winter annuals have been detrimental to this population. The trend for the herbaceous understory is stable. Cheatgrass abundance declined significantly, but is still very high and cover remains very high. Perennial grasses were much more robust in 2004 as cover increased from 4 to 12%, but nested frequency was only slightly up. There is no significant forb component on this site. The DCI score improved to 23 which is poor to fair. This increase was the result of increased perennial grass cover and a slight decrease in cheatgrass cover.

TREND ASSESSMENT
soil - slightly down (2)
browse - down (1)
herbaceous understory - stable (3)
winter range condition (DC Index) - 23 (poor to fair) Wyoming big sagebrush type

HERBACEOUS TRENDS --
Management unit 14 , Study no: 13

Type	Species	Nested Frequency					Average Cover %			
		'86	'92	'94	'99	'04	'92	'94	'99	'04
G	Bromus tectorum (a)	-	a26	b95	d358	c242	.14	.49	12.17	10.00
G	Hilaria jamesii	a40	b66	b75	b72	b82	4.26	4.42	3.22	8.26
G	Oryzopsis hymenoides	a-	b13	b12	ab2	ab4	.05	.08	.03	.21
G	Sitanion hystrix	c142	b55	c131	a15	ab21	1.33	2.24	.21	1.35
G	Sporobolus cryptandrus	a-	b27	ab11	a5	ab10	1.74	.39	.01	.36
G	Stipa comata	a2	b53	c93	b43	b36	2.02	1.75	.33	1.91
G	Vulpia octoflora (a)	-	a17	b50	b59	a23	.04	.12	.19	.05
Total for Annual Grasses		0	43	145	417	265	0.18	0.61	12.36	10.05
Total for Perennial Grasses		184	214	322	137	153	9.42	8.89	3.81	12.11
Total for Grasses		184	257	467	554	418	9.60	9.51	16.18	22.17
F	Astragalus convallarius	-	7	5	3	-	.09	.04	.03	.00
F	Chenopodium album (a)	-	b26	a-	a-	a-	.39	-	-	-
F	Chaenactis stevioides	-	5	-	-	-	.01	-	-	-
F	Comandra pallida	a-	b13	ab9	ab11	ab6	.25	.04	.09	.19
F	Cordylanthus wrightii (a)	-	b58	a-	a-	a3	2.34	-	-	.00
F	Cryptantha spp.	-	-	8	-	-	-	.07	-	-
F	Descurainia pinnata (a)	-	18	13	3	15	.06	.05	.00	.23
F	Draba rectifructa (a)	-	a-	b9	a-	a-	-	.05	-	-
F	Eriogonum cernuum (a)	-	b22	a2	a-	a-	.13	.01	-	-
F	Erodium cicutarium (a)	-	-	-	2	4	-	-	.00	.15
F	Erigeron spp.	2	-	-	-	-	-	-	-	-
F	Euphorbia fendleri	3	-	1	-	1	-	.00	-	.00
F	Gilia hutchinifolia (a)	-	b109	a5	a14	a12	.38	.02	.22	.08
F	Lappula occidentalis (a)	-	b28	b11	a-	b16	.30	.02	-	.18
F	Lactuca serriola	-	-	6	-	-	-	.03	-	-
F	Leucelene ericoides	-	-	-	-	-	-	-	-	.00
F	Lupinus spp.	a-	c92	a-	a-	b29	.68	-	-	.07
F	Lygodesmia spp.	-	-	1	-	-	-	.00	-	-
F	Mentzelia albicaulis (a)	-	b39	a-	a-	a1	.47	-	-	.00
F	Medicago sativa	2	-	-	-	-	-	-	-	-
F	Navarretia intertexta (a)	-	-	3	1	1	-	.00	.00	.00
F	Phlox longifolia	ab26	b41	b52	a7	b42	.11	.10	.02	.17
F	Sphaeralcea coccinea	a1	a-	a1	a3	b15	.00	.00	.00	.31
F	Tragopogon dubius	-	-	-	-	3	-	-	-	.00
F	Unknown forb-annual (a)	-	b34	a-	a-	a-	.33	-	-	-

Type	Species	Nested Frequency					Average Cover %			
		'86	'92	'94	'99	'04	'92	'94	'99	'04
F	Unknown forb-perennial	-	-	2	-	-	-	.00	-	-
Total for Annual Forbs		0	334	43	20	52	4.42	0.16	0.23	0.67
Total for Perennial Forbs		34	158	85	24	96	1.16	0.31	0.14	0.77
Total for Forbs		34	492	128	44	148	5.59	0.48	0.38	1.44

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

BROWSE TRENDS --
Management unit 14 , Study no: 13

Type	Species	Strip Frequency				Average Cover %			
		'92	'94	'99	'04	'92	'94	'99	'04
B	Artemisia tridentata wyomingensis	57	67	63	47	7.89	12.23	4.72	6.65
B	Ephedra viridis	1	1	1	1	-	-	-	-
B	Gutierrezia sarothrae	51	42	70	72	6.96	.57	2.88	6.17
B	Juniperus osteosperma	-	-	-	-	-	.85	-	-
B	Opuntia spp.	0	1	0	1	-	-	-	-
B	Yucca spp.	1	0	2	1	.63	-	-	.00
Total for Browse		110	111	136	122	15.48	13.66	7.60	12.84

CANOPY COVER, LINE INTERCEPT --
Management unit 14 , Study no: 13

Species	Percent Cover '04
Artemisia tridentata wyomingensis	5.03
Gutierrezia sarothrae	7.31

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 14 , Study no: 13

Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	1.4

POINT-QUARTER TREE DATA --
Management unit 14 , Study no: 13

Species	Trees per Acre	
	'99	'04
Juniperus osteosperma	10	-

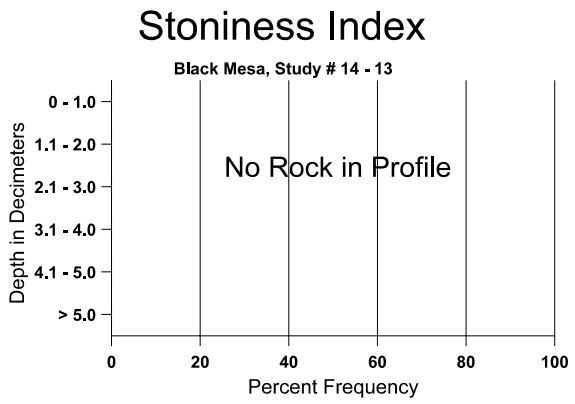
Average diameter (in)	
'99	'04
6.3	-

BASIC COVER --
Management unit 14 , Study no: 13

Cover Type	Average Cover %				
	'86	'92	'94	'99	'04
Vegetation	3.25	23.40	23.32	25.59	37.04
Rock	0	.45	.10	.06	.02
Pavement	.50	0	.09	.06	.26
Litter	38.50	27.37	29.72	38.25	25.48
Cryptogams	5.75	.91	.31	.08	.22
Bare Ground	52.00	39.81	46.33	38.41	45.67

SOIL ANALYSIS DATA --
Management unit 14, Study no: 13, Study Name: Black Mesa

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
13.7	72.0 (11.9)	7.3	60.9	16.6	22.6	1.3	7.5	70.4	0.5



PELLET GROUP DATA --
Management unit 14 , Study no: 13

Type	Quadrat Frequency			
	'92	'94	'99	'04
Rabbit	52	39	75	39
Elk	-	1	1	-
Deer	22	17	34	33
Cattle	-	4	10	3

Days use per acre (ha)	
'99	'04
-	-
1 (2)	1 (2)
58 (143)	38 (93)
44 (109)	9 (22)

BROWSE CHARACTERISTICS --
Management unit 14 , 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)
Artemisia tridentata wyomingensis												
86	**3266**	466	533	1533	1200	-	29	37	37	3	20	19/15
92	**2880**	-	560	680	1640	-	50	26	57	7	7	-/-
94	**3660**	5660	960	1280	1420	1200	0	0	39	20	22	25/36
99	**2140**	120	200	660	1280	1460	36	53	60	21	22	23/33
04	**1680**	80	20	500	1160	1900	61	14	69	51	77	18/25
Ephedra viridis												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**20**	-	-	20	-	-	0	0	-	-	0	-/-
94	**20**	-	-	20	-	-	0	0	-	-	0	17/19
99	**20**	-	-	20	-	-	0	0	-	-	0	19/15
04	**20**	-	-	20	-	-	0	0	-	-	0	17/17
Gutierrezia sarothrae												
86	**10132**	66	1266	7400	1466	-	0	0	14	-	0	9/9
92	**8320**	80	140	7340	840	-	0	0	10	-	0	-/-
94	**2940**	3920	800	1720	420	420	0	0	14	10	24	13/13
99	**8900**	40	1580	7120	200	200	0	0	2	.89	1	9/9
04	**6040**	-	1280	4640	120	940	0	0	2	-	8	7/9
Opuntia spp.												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	-	0	-/-
94	**20**	-	20	-	-	-	0	0	-	-	0	4/3
99	**0**	-	-	-	-	-	0	0	-	-	0	-/-
04	**20**	-	-	20	-	-	0	0	-	-	0	8/24
Yucca spp.												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**20**	-	-	20	-	-	100	0	-	-	0	-/-
94	**0**	-	-	-	-	-	0	0	-	-	0	-/-
99	**40**	-	-	40	-	-	0	0	-	-	0	14/19
04	**40**	-	-	40	-	-	0	0	-	-	0	20/26