

Trend Study 30-54-08

Study site name: Bullion Canyon.

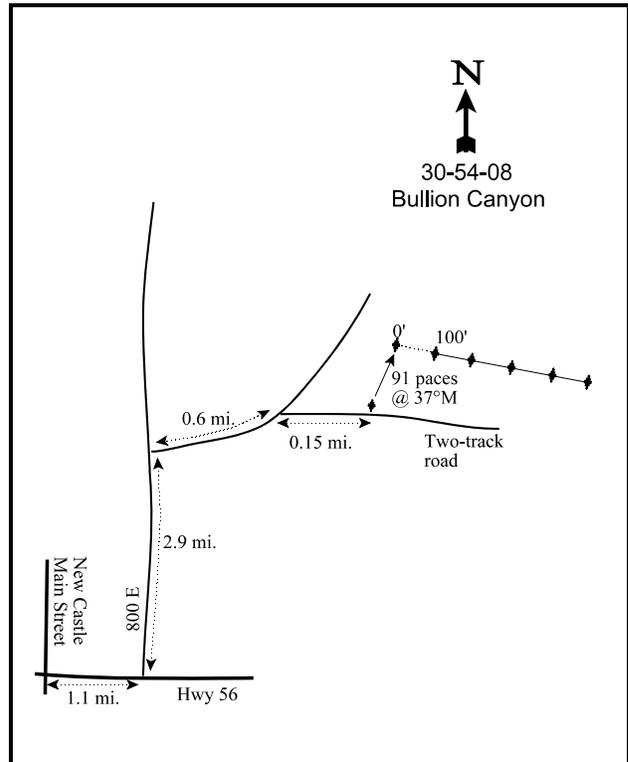
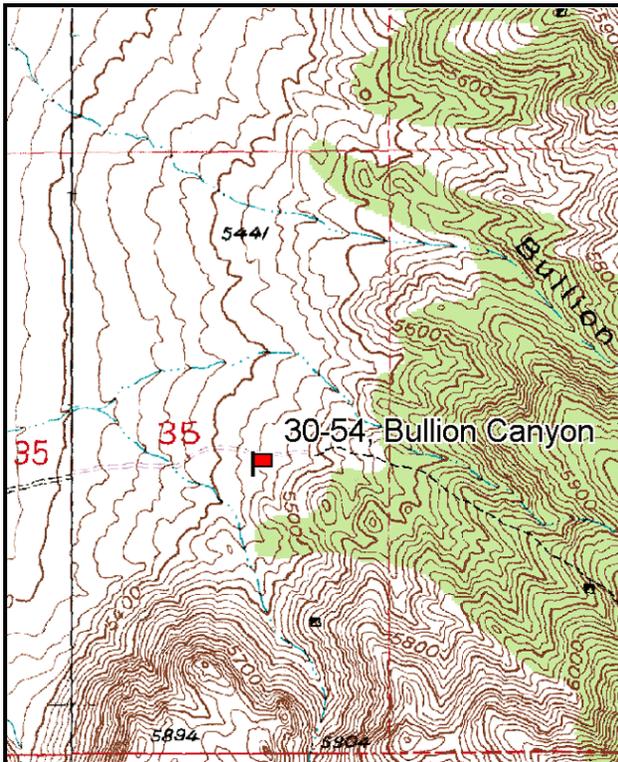
Vegetation type: Wyoming Big Sagebrush.

Compass bearing : frequency baseline 97 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

Starting at the intersection of Hwy 56 and Main street in New Castle, head east on Hwy 56 1.1 miles to 800 E. Turn left (north) onto 800 E. and drive 2.9 miles to a right turn (0.3 miles past a gate). Go 0.6 miles to a fork. Take the faint two-track road to the right and go 0.15 miles to a witness post on the left side of the road. The 0-foot stake is 91 paces at 37 degrees magnetic from the witness post. The 0-foot stake is marked by browse tag #493. The study is marked by green steel "T" fence posts approximately 12 to 18 inches in height.



Map name: Silver Peak

Diagrammatic Sketch

Township 35S, Range 15W, Section 35

GPS: NAD 83, UTM 12S 280060 E, 4176993 N

## DISCUSSION

### Bullion Canyon - Trend Study No. 30-54

#### Study Information

This trend study is located near the mouth of Bullion Canyon [elevation 5,400 feet (1,646 m), slope: 5%-10%, aspect: west]. It was established in 1998 and samples a sagebrush-grass vegetation type within a scattered population of juniper trees. Agricultural fields are located in the valley bottom about one and a half miles to the west. Pellet group data from 1998 estimated light deer use at 23 deer days use/acre (57 ddu/ha). Some of the deer pellet groups were recent and bedding sites were present under several highlined juniper trees. A few old cattle pats were also encountered along with some horse sign. Pellet group data from 2003 estimated a higher level of use at 50 deer days use/acre (124 ddu/ha). Pellet group data from 2008 estimated 62 deer days use/acre (154 ddu/ha) and 4 cow days use /acre (9 cdu/ha).

#### Soil

Soil on the site is deep with an effective rooting depth estimated at 19 inches. Rock and gravel are abundant on the surface and within the profile. Soil texture is a loam which is neutral in reaction (pH 7.0). Phosphorus has a low availability for plant growth and development at only 6.4 ppm (Tiedemann and Lopez 2004). Protective ground cover consists mostly of rock and pavement cover and sagebrush crowns. The relative combined vegetation and litter cover has been moderate at 38% - 40% since 1998. Relative bare ground cover has been low at 14% - 18% since 1998. There are some active gullies in the area. The upper hillside is terraced with some localized erosion occurring, but it does not appear to be excessive. The soil erosion condition class was determined to be slight in 2003 and 2008 due to pedestaling of plants, flow patterns, and soil movement.

#### Browse

The key browse species consist of a combination of black sagebrush (*Artemisia nova*) and Wyoming big sagebrush (*Artemisia tridentata wyomingensis*). These species appear to be hybridizing with many shrubs displaying phenotypes of both black and Wyoming big sagebrush. All sagebrush has been classified as Wyoming big sagebrush. The population density of sagebrush was estimated at 6,420 plants/acre in 1998. Use was moderate, vigor was normal on most plants, and decadence was low at 17%. Young recruitment was good with 13% of the population consisting of young plants. Data from 2003 show a 18% decline in sagebrush density. Use was classified as moderate to heavy. Due to drought, average vigor has declined and the number of decadent plants increased from 17% in 1998 to 54% in 2003. Young recruitment is fair but not nearly enough to replace decadent/dying plants. In 2008, sagebrush density was estimated at 4,880 plants/acre, a 7% decrease, while decadent plants decreased from 54% to 42% since 2003. Recruitment also decreased from 320 young/acre to 40 young/acre.

Other preferred species found on the site in small numbers include fourwing saltbush (*Atriplex canescens*), green ephedra (*Ephedra viridis*), and rubber rabbitbrush (*Chrysothamnus nauseosus*). Fourwing is scattered over the site, although it occurs in a dense patch near the baseline. Use was moderate and vigor was poor on one-third of the plants sampled in 1998. Fourwing decadence was also high at 43%. All plants sampled in 2003 were classified as decadent. By 2008, although density had decreased 25% to 60 plants/acre no plants were classified as decadent and seedlings were sampled for the first time. The green ephedra appeared to be fair better in 2003. They showed heavy use in 1998 and moderate to heavy use in 2003. Density increased

31% in 2003 to 840 plants/acre. Average vigor is still poor on nearly one-third of the population although the number of decadent plants declined to only 19%. The density of ephedra remained similar in 2008, but decadence and plants displaying poor vigor increased.

Increaser shrubs include narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus stenophyllus*) and broom snakeweed (*Gutierrezia sarothrae*). Snakeweed was the most abundant increaser in 1998 with an estimated density of 1,360 plants/acre. By 2008, snakeweed density had increased to 5,320 plants/acre after decreasing to 560 plants/acre in 2003. Singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) trees are scattered over the site. Point-quarter data from 1998 estimated 21 pinyon and 96 juniper trees/acre. Average basal diameter was 1.6 inches for pinyon and 1.9 inches for juniper. Many of the larger, older trees appeared to be highlined. Tree density has slowly increased. Point- quarter data from 2003 estimated 29 pinyon and 157 juniper trees/acre. Average diameter has remained similar (1.7 inches for pinyon and 1.7 inches for juniper). Point-quarter data for 2008 estimated 25 pinyon and 164 juniper trees/acre with average diameters of 2.0 and 3.1 inches, respectively.

#### Herbaceous Understory

The herbaceous understory is poor. Grasses were dominated by the annual cheatgrass (*Bromus tectorum*) which provided 76% of the herbaceous cover in 1998. With drought, cover of cheatgrass declined and provided only 1% of the total grass cover in 2003. Perennial species are not abundant with only the warm season grass, galleta (*Hilaria jamesii*), occurring more than occasionally. Perennial grasses have maintained cover and had a 21% increase in nested frequency in 2008. Cheatgrass increased significantly in nested frequency from 2003 to 2008, but provides only 0.5% cover. Forbs are diverse, but produced 1% or less cover in all sample years. The most common forb species are thistle (*Cirsium sp.*) and Desert Indian paintbrush (*Castilleja chromsa*).

#### 1998 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - fair (42) low potential scale

#### 2003 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush, is down likely due to drought. Density has declined by 18% since 1998, poor vigor has increased, and the number of decadent plants has increased from 17% to 54% of the population. In addition, 53% of the decadent plants sampled were classified as dying (>50% crown death), which amounts to 1,500 plants/acre. No seedlings were sampled in 2003 and young plants accounted for only 6% of the population. The less abundant fourwing saltbush also displayed downward trends. Trend for the grasses is down slightly. Sum of nested frequency for perennial grasses declined slightly, although average cover of perennials has remained similar to 2003 levels. Drought conditions likely contributed to a significant decline in nested frequency of the annual, cheatgrass. Cover of cheatgrass also declined from 13% in 1998 to less than one tenth of one percent in 2003. All perennial grasses declined in nested frequency but only Sandberg bluegrass (*Poa secunda*) and bottlebrush squirreltail (*Sitanion hystrix*) declined significantly. Trend for forbs is stable. Perennial forbs remain rare yet sum of nested frequency has remained similar to 1998.

winter range condition (DCI) - poor-fair (26) low potential scale

browse - down (-2)

grass - slightly down (-1)

forb - stable (0)

2008 TREND ASSESSMENT

Trend for browse is stable. Wyoming big sage brush density is 4,880 plants/acre (down 7%) while decadence has decreased from 54% in 2003 to 42%. Recruitment of young sagebrush plants was low at 1% of the population.. Fourwing saltbush density has decreased 25% to 60 plants/acre but none were classified as decadent (down from 100% in 2003). Trend for the grasses is slightly up. The herbaceous understory has seen a small return of cheatgrass with a significant increase in nested frequency, but at 0.5% cover is nowhere near 1998 levels. Perennial grass species sum of nested frequency has increased 20%. The sum of nested frequency of perennial forbs has remained similar to 2003, but cover of perennial forbs has nearly doubled.

winter range condition (DCI) - poor-fair (26) low potential scale

browse - stable (0)

grass - slightly up (+1)

forb - slightly up (+1)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 54

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
G	Aristida purpurea	1	5	4	.03	.01	.07
G	Bouteloua gracilis	a-	a-	b <sup>19</sup>	-	-	.30
G	Bromus tectorum (a)	c <sup>404</sup>	a <sup>12</sup>	b <sup>144</sup>	12.57	.02	.52
G	Carex sp.	1	-	-	.00	-	-
G	Hilaria jamesii	112	96	98	2.07	2.59	2.49
G	Oryzopsis hymenoides	46	29	25	.95	.52	.41
G	Poa secunda	22	7	12	.46	.05	.06
G	Sitanion hystrix	b <sup>40</sup>	a <sup>2</sup>	a <sup>6</sup>	.38	.01	.01
G	Stipa comata	a-	a-	b <sup>4</sup>	-	.00	.07
G	Vulpia octoflora (a)	2	-	6	.00	-	.02
Total for Annual Grasses		406	12	150	12.57	0.02	0.54
Total for Perennial Grasses		222	139	168	3.91	3.19	3.43
Total for Grasses		628	151	318	16.48	3.22	3.98
F	Allium sp.	2	-	1	.00	-	.00
F	Arabis sp.	4	2	-	.00	.01	-
F	Astragalus sp.	5	-	4	.01	-	.01
F	Brickellia oblongifolia linifolia	-	-	5	-	-	.06
F	Castilleja chromosa	ab <sup>8</sup>	a-	b <sup>12</sup>	.09	-	.30
F	Calochortus flexuosus	a <sup>5</sup>	b <sup>29</sup>	b <sup>22</sup>	.01	.09	.08
F	Cirsium sp.	8	-	2	.04	-	.15
F	Cryptantha sp.	b <sup>15</sup>	a-	b <sup>11</sup>	.03	-	.05
F	Cymopterus sp.	b <sup>17</sup>	c <sup>28</sup>	a-	.07	.07	-
F	Delphinium nuttallianum	-	6	1	-	.04	.00

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		F	Descurainia pinnata (a)	<sub>b</sub> 13	<sub>a</sub> -	<sub>a</sub> 2	.06
F	Draba sp. (a)	<sub>b</sub> 24	<sub>a</sub> -	<sub>a</sub> 2	.11	-	.01
F	Eriogonum sp.	8	11	-	.06	.02	-
F	Eriogonum ovalifolium	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 15	-	-	.05
F	Gilia sp. (a)	<sub>a</sub> 10	<sub>a</sub> 4	<sub>b</sub> 39	.06	.00	.12
F	Lappula occidentalis (a)	-	-	7	-	-	.02
F	Lithospermum sp.	-	5	-	-	.18	-
F	Lomatium sp.	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 25	-	-	.09
F	Penstemon sp.	2	-	3	.01	-	.03
F	Phlox longifolia	48	45	38	.23	.10	.11
F	Senecio multilobatus	1	-	-	.03	-	.03
F	Sphaeralcea grossulariifolia	-	-	1	-	-	.03
F	Streptanthus cordatus	11	8	3	.08	.02	.03
Total for Annual Forbs		47	4	50	0.23	0.00	0.15
Total for Perennial Forbs		134	134	143	0.68	0.54	1.03
Total for Forbs		181	138	193	0.91	0.55	1.19

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

#### BROWSE TRENDS --

Management unit 30 , Study no: 54

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
		B	Artemisia tridentata wyomingensis	92	92	87	19.54
B	Atriplex canescens	6	4	2	.97	.21	.63
B	Chrysothamnus viscidiflorus stenophyllus	32	19	26	.98	.07	.23
B	Ephedra viridis	7	11	11	.45	.17	.10
B	Gutierrezia sarothrae	18	14	48	.49	.13	1.25
B	Juniperus osteosperma	7	6	6	1.44	3.44	4.34
B	Opuntia sp.	4	9	7	.00	.03	.15
B	Pediocactus simpsonii	3	4	1	.00	.00	.00
B	Pinus monophylla	0	0	1	-	.03	.03
B	Sclerocactus sp.	1	4	5	.00	.00	.00
Total for Browse		170	163	194	23.89	16.66	16.87

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 54

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata wyomingensis	-	7.80	9.86
Atriplex canescens	-	.20	.85
Chrysothamnus viscidiflorus stenophyllus	-	.15	.18
Ephedra viridis	-	.05	.15
Gutierrezia sarothrae	-	-	.81
Juniperus osteosperma	3.40	2.90	4.69
Opuntia sp.	-	.16	.03
Sclerocactus sp.	-	.03	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 54

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.0	0.8

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 54

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	96	157	164
Pinus monophylla	-	29	25

Average diameter (in)		
'98	'03	'08
1.9	1.7	3.1
-	1.7	2.0

BASIC COVER --

Management unit 30 , Study no: 54

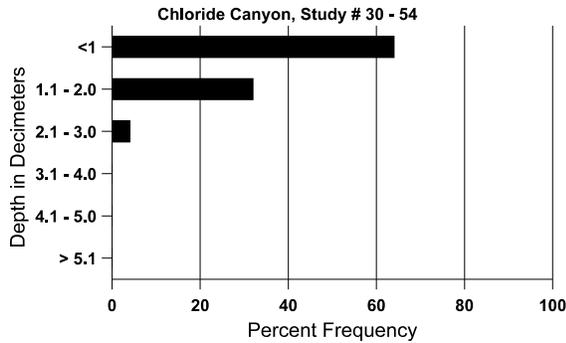
Cover Type	Average Cover %		
	'98	'03	'08
Vegetation	33.48	21.92	21.14
Rock	14.30	16.04	14.76
Pavement	33.29	35.88	36.98
Litter	12.42	20.07	24.34
Cryptogams	.63	.31	.50
Bare Ground	20.05	15.18	16.81

SOIL ANALYSIS DATA --

Management unit 30, Study no: 54, Study Name: Chloride Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	loam			%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
19.0	45.6 (18.3)	7.0	46.0	29.4	24.6	1.7	6.4	160.0	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 54

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	9	5	62
Deer	24	18	32
Cattle	-	1	2

Days use per acre (ha)		
'98	'03	'08
-	-	-
23 (57)	50 (124)	62 (154)
2 (5)	-	4 (9)

BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 54

		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)
<b>Artemisia tridentata wyomingensis</b>												
98	<b>6420</b>	120	860	4460	1100	560	60	9	17	10	10	12/22
03	<b>5260</b>	-	320	2120	2820	1480	31	16	54	29	32	9/19
08	<b>4880</b>	120	40	2780	2060	1000	30	11	42	31	31	11/21
<b>Atriplex canescens</b>												
98	<b>140</b>	-	-	80	60	-	86	0	43	29	29	21/27
03	<b>80</b>	-	-	-	80	-	0	75	100	75	75	19/37
08	<b>60</b>	20	-	60	-	-	33	0	0	-	0	22/38

		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)
<b>Chrysothamnus nauseosus</b>												
98	0	-	-	-	-	-	0	0	-	-	0	8/18
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<b>Chrysothamnus viscidiflorus stenophyllus</b>												
98	960	60	60	820	80	-	2	0	8	4	6	10/13
03	480	-	60	120	300	20	8	0	63	38	38	6/9
08	660	60	60	340	260	20	12	12	39	24	24	7/10
<b>Ephedra viridis</b>												
98	580	-	20	360	200	20	14	83	34	31	31	16/16
03	840	-	480	200	160	40	12	24	19	12	26	10/14
08	760	120	120	300	340	80	0	89	45	37	37	15/19
<b>Grayia spinosa</b>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	31/41
<b>Gutierrezia sarothrae</b>												
98	1360	20	420	920	20	20	0	0	1	1	1	6/6
03	560	-	-	520	40	260	0	0	7	4	7	5/7
08	5320	100	680	4400	240	60	.37	0	5	1	2	5/6
<b>Juniperus osteosperma</b>												
98	140	20	120	20	-	40	0	0	-	-	0	-/-
03	120	-	40	80	-	-	0	0	-	-	0	-/-
08	120	-	40	80	-	20	0	0	-	-	0	-/-
<b>Opuntia sp.</b>												
98	80	-	-	40	40	20	0	0	50	-	0	4/7
03	180	-	-	120	60	-	0	0	33	22	33	5/16
08	160	-	40	60	60	20	0	0	38	25	38	5/16
<b>Pediocactus simpsonii</b>												
98	60	-	-	60	-	20	0	0	0	-	0	3/3
03	80	-	-	60	20	-	0	0	25	25	25	2/2
08	20	-	-	20	-	-	0	0	0	-	0	1/2
<b>Pinus monophylla</b>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	20	20	-	-	-	0	0	-	-	0	-/-

		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)
Polygala subspinosa												
98	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
03	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
08	<b>0</b>	-	-	-	-	-	0	0	-	-	0	5/9
Sclerocactus sp.												
98	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-
03	<b>80</b>	-	-	80	-	-	0	0	-	-	0	3/2
08	<b>100</b>	-	-	100	-	-	0	0	-	-	0	4/3