Trend Study 22-5-08

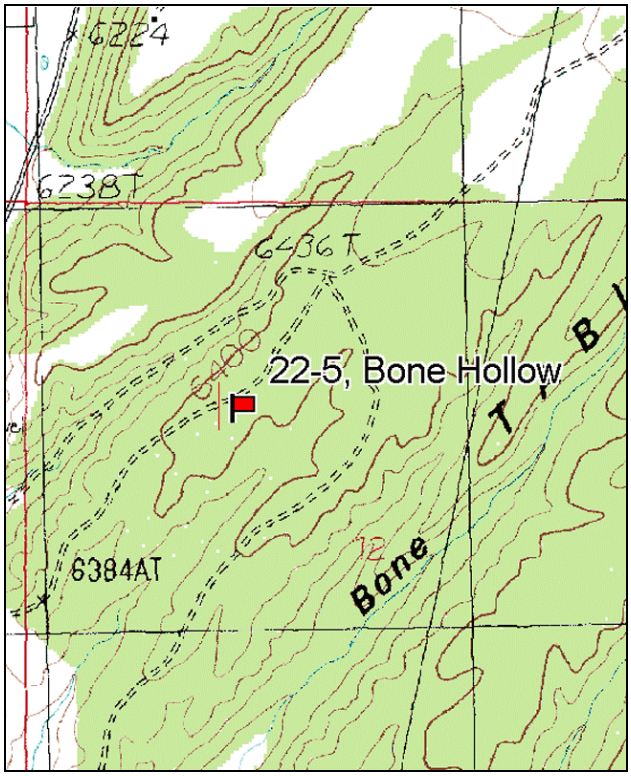
Study site name: Bone Hollow . Vegetation type: Big Sagebrush-Grass .

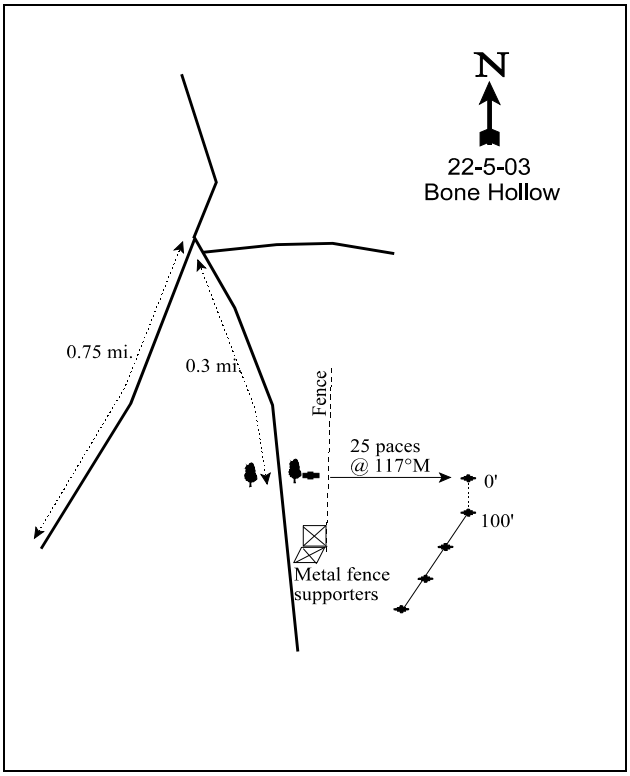
Compass bearing: frequency baseline 165 degrees magnetic. Lines 2-4 208° M.

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

LOCATION DESCRIPTION

From the intersection of North Creek Road and SR 153 on the east side of Beaver, go north 1.95 miles past an irrigation pond on the left to a gravel pit on the right. On the south side of the gravel pit a good dirt road goes northeast up the bottom of a draw (ignore the numerous other small dirt roads). Drive up this road 0.75 miles to a fork. Turn right onto another major dirt road and go south 0.3 miles. Look for a fencepost 50 feet to the left that is not part of the fence (30 feet north of metal crossposts). The fencepost marks the start of a pellet group transect. Walk 25 paces at 117 degrees magnetic from the witness post to the 0' stake marked by a 3-foot rebar tagged #7048.





Map Name: Beaver

Diagrammatic Sketch

Township 29S , Range 7W , Section 12

GPS: NAD 83, UTM 12S 360383 E, 4240690 N

DISCUSSION

Bone Hollow - Trend Study No. 22-5

Study Information

The Bone Hollow trend study samples an area of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and juniper (*Juniperus osteosperma*) on land administered by the BLM [elevation:6,400 feet (1,951m), slope: on average about 5%, aspect: south]. This site is typical of the untreated winter ranges on the benches above Beaver, which have been historically important deer winter range. Deer use is moderate to heavy and varies somewhat from year to year depending on the severity of the winter. A pellet group transect read on the site in 1998 and 2003 estimated 93 deer days use/acre (230 ddu/ha) and 132 deer days use/acre (326 ddu/ha), respectively. In 2008, deer use was 150 deer days use/acre (370 ddu/ha). Elk use was low at 3 elk days use/acre (7 edu/ha).

Soil

Soils are moderately deep, fairly compacted, and very stony throughout. Soil textural analysis indicates a sandy clay loam with a neutral pH (6.7). Plant development may be limited due to marginal amounts of phosphorous (8.5 ppm) (Tiedemann and Lopez 2004). Past erosion is apparent with a high percentage of pavement and rock cover on the soil surface. Litter and herbaceous vegetation are found mostly under sagebrush plants. Erosion was rated as minimal and stable in 2003 and 2008 by an erosion condition class assessment.

Browse

This site is characterized by a fairly dense and uniform stand of Wyoming big sagebrush, along with an open woodland of juniper and pinyon (*Pinus edulis*). Sagebrush density was estimated at 4,680 plants/acre in 1998, declining to 3,920 plants/acre in 2003, and down to 3,140 plants/acre in 2008. Overall, sagebrush density since 1998 has decreased by 33%. Browsing pressure has been light to moderate in all readings, with vigor being generally good. Recruitment has been very low since 1998, with young plants on average making up only 2% of the population. Decadence was moderate, but fairly stable from 1985 to 1998 (30-35%). Since then decadence has increased to 46% in 2003 and 59% in 2008. Drought and the abundance of pinyon andjuniper on the site are playing a significant role in declining sagebrush health.

Point-center quarter data collected in 2003 estimated 63 pinyon trees/acre and 196 Utah juniper trees/acre. Data from 2008 showed an increase in juniper trees (61 pinyon trees/acre and 222 juniper trees/acre). Total line intercept canopy cover of pinyon and juniper was estimated at about 18% in 2003 and 2008. When woodland canopy cover begins approaching and exceeds 15%, it begins to have negative affects on the understory species (Tausch and West 1994). Pinyon and juniper trees have some value as thermal cover, with many of them showing the affects of highlining. This site would be a good candidate for mechanical treatment to reduce tree density, but should be cautious as cheatgrass (*Bromus tectorum*) has been very abundant in the past. Other browse species scattered throughout the site are in low abundance and are increasers.

Herbaceous Understory

A variety of grass species are found on the site, although most occur in low abundance. Cheatgrass was the dominant grass in 1998 as it provided 79% of the herbaceous understory. Cheatgrass was encountered in every quadrat in 1998. In 2003, with much drier conditions, cheatgrass significantly declined in nested frequency and was sampled in only 69% of the quadrats. Cheatgrass cover dropped by 86% in 2003 as well. This trend continued in 2008 as cheatgrass declined to only 4% quadrat frequency. Several valuable perennial grasses have been sampled on the site but all occur in low densities including bottlebrush squirreltail (*Sitanion hystrix*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), and bluebunch wheatgrass (*Agropyron spicatum*). Perennial forbs occur sporadically throughout the community and in any year has never contributed to more than 1% cover. Composition is composed of annuals and/or small statured

species that contribute little forage in the spring. Sum of nested frequency for perennial forbs was fairly stable from 1985-1998, but declined in 2003 and again in 2008.

1991 TREND ASSESSMENT

Wyoming big sagebrush density increased by 4%. Decadence remains high but fairly stable at 33%. The browse trend is stable. The perennial grass trend is slightly down with the decrease in sum of nested frequency value. Perennial grasses continue to be a minor component of the understory. The perennial forb trend is stable with forbs contributing less than 1% cover.

browse – stable (0) grass - slightly down (-1) forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. Differences in density may be due to the increased sample size used in 1998. The grass trend is slightly down with little change in the nested frequency of perennial grasses. However, cheatgrass is currently dominant and could carry a catastrophic fire where all browse would be lost. It currently has a quadrat frequency of 100% and total cover of 20%. Compare this to the total perennial grass cover of only 5%. The perennial forb trend is stable with little change in sum of nested frequency. It should be noted that it continues to be an insignificant component of the understory as it contributes to only eight-tenths of 1% total cover.

Winter Range Condition (DCI) - poor-fair (24) low potential scale
browse - stable (0) grass – slightly down (-1) forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is slightly down. Several key parameters in the Wyoming big sagebrush population showed negative changes in 2003 including a decline in density (-16%), no recruitment (0% young), and increase in decadence. Trend for perennial grasses is slightly up. Perennial grasses have a fairly stable sum of nested frequency value with a slight increase in total cover since the last reading. Cheatgrass nested frequency decreased by 50% and its cover decreased by 86%. Perennial forbs declined in sum of nested frequency in 2003, but are less significant than grasses on this site as they currently contribute to only three-tenths of 1% total cover.

Winter Range Condition (DCI) - fair (29) low potential scale
browse – slightly down (-1) grass – slightly up (+1) forb - slightly down (-1)

2008 TREND ASSESSMENT

Trend for browse is down. Some key downward parameters for sagebrush are: density decreased by 20%, recruitment continues to be low at only 3%, and decadence has gone up to 59%. This downward trend should continue if current climatological conditions persist. Trend for perennial grasses is stable. Perennial grasses have a decreased sum of nested frequency value, while they have shown a slight increase in total cover. Cheatgrass nested frequency significantly decreased again. Perennial forbs declined slightly in sum of nested frequency in 2008, but contribute to less than four-tenths of 1% total cover and are still an insignificant herbaceous resource.

Winter Range Condition (DCI) - fair (27) low potential scale
browse - down (-2) grass - stable (0) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 5

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron intermedium	-	-	-	1	-	-	.00	-
G	Agropyron spicatum	1	3	1	-	2	.03	.00	.38
G	Bouteloua gracilis	a1	a-	ab12	b12	b11	.12	.39	.39
G	Bromus tectorum (a)	-	-	c379	b186	a10	20.28	2.75	.04
G	Oryzopsis hymenoides	50	35	34	33	43	1.51	1.95	2.87
G	Poa secunda	a-	b11	a2	b10	a1	.00	.05	.03
G	Sitanion hystrix	b122	ab99	ab103	ab91	a70	2.21	2.35	1.72
G	Stipa columbiana	-	-	-	-	3	-	-	.15
G	Stipa comata	9	12	11	13	11	.64	.26	.65
G	Vulpia octoflora (a)	-	-	-	1	-	-	.00	-
Total for Annual Grasses		0	0	379	187	10	20.28	2.76	0.04
Total for Perennial Grasses		183	160	163	160	141	4.52	5.01	6.20
Total for Grasses		183	160	542	347	151	24.80	7.77	6.25
F	Agoseris glauca	a5	ab5	b17	a-	a1	.11	-	.00
F	Alyssum alyssoides (a)	-	-	9	-	-	.01	-	-
F	Antennaria rosea	-	3	4	-	3	.01	-	.03
F	Arabis demissa	1	1	5	5	-	.04	.01	-
F	Astragalus sp.	a-	a4	b17	a-	a8	.10	-	.01
F	Camelina microcarpa (a)	-	-	-	3	-	-	.03	-
F	Chaenactis douglasii	a7	b20	a5	a-	a-	.01	-	-
F	Collinsia parviflora (a)	-	-	-	7	6	-	.01	.04
F	Cryptantha sp.	b10	b20	a-	b9	a-	-	.11	-
F	Descurainia pinnata (a)	-	-	3	8	-	.00	.02	-
F	Draba sp. (a)	-	-	-	9	-	-	.01	-
F	Erigeron pumilus	b10	a-	a3	a-	a-	.00	-	-
F	Gayophytum ramosissimum(a)	-	-	-	7	2	-	.01	.00
F	Gilia sp. (a)	-	-	a-	b136	a-	-	1.27	-
F	Holosteum umbellatum (a)	-	-	-	1	-	-	.00	-
F	Lappula occidentalis (a)	-	-	-	6	3	-	.03	.01
F	Leucelene ericoides	-	7	5	11	3	.03	.02	.00
F	Machaeranthera canescens	b11	a2	a-	a-	a-	-	-	-
F	Microsteris gracilis (a)	-	-	1	5	-	.00	.01	-
F	Phlox austromontana	ab17	a9	b27	a5	a7	.23	.04	.01
F	Ranunculus testiculatus (a)	-	-	a33	b77	c190	.16	.84	.39

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	Schoencrambe linifolia	-	-	-	3	-	-	.00	-
F	Senecio multilobatus	-	-	-	-	1	-	-	.15
F	Sphaeralcea coccinea	5	14	16	18	15	.22	.13	.17
Total for Annual Forbs		0	0	46	259	201	0.18	2.26	0.44
Total for Perennial Forbs		66	85	99	51	38	0.79	0.31	0.39
Total for Forbs		66	85	145	310	239	0.97	2.58	0.84

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

BROWSE TRENDS --
Management unit 22 , Study no: 5

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata wyomingensis	87	88	77	17.43	15.22	12.32
B	Atriplex canescens	0	0	0	-	.15	-
B	Chrysothamnus nauseosus	1	0	0	.03	-	-
B	Chrysothamnus parryi	0	1	0	-	.00	-
B	Gutierrezia sarothrae	4	1	2	.06	.00	.00
B	Juniperus osteosperma	11	14	14	4.32	7.50	5.61
B	Mahonia repens	0	1	0	-	.00	-
B	Opuntia sp.	4	3	0	.03	.15	-
B	Pinus edulis	2	7	6	2.65	4.05	3.79
B	Sclerocactus sp.	1	0	0	.00	-	-
Total for Browse		110	115	99	24.54	27.07	21.73

CANOPY COVER, LINE INTERCEPT --
Management unit 22 , Study no: 5

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata wyomingensis	-	11.89	9.93
Juniperus osteosperma	9.39	12.43	15.31
Opuntia sp.	-	.16	-
Pinus edulis	2.00	5.19	2.66

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 22 , Study no: 5

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata wyomingensis	1.6	2.5

POINT-QUARTER TREE DATA --
Management unit 22 , Study no: 5

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	149	196	222
Pinus edulis	39	63	61

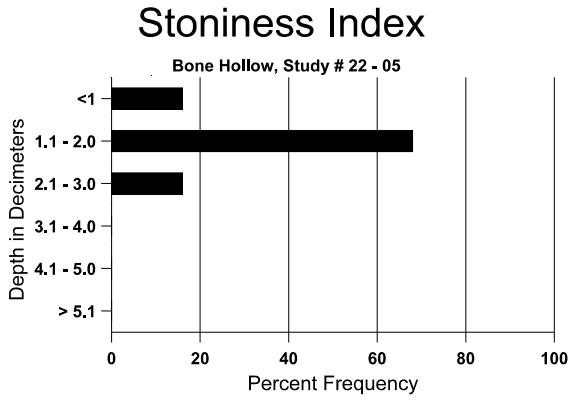
Average diameter (in)		
'98	'03	'08
4.5	3.4	5.4
3.3	2.8	3.9

BASIC COVER --
Management unit 22 , Study no: 5

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	3.75	3.75	41.04	35.17	28.94
Rock	1.75	2.25	6.06	3.44	2.30
Pavement	42.75	35.25	27.36	31.30	33.33
Litter	43.00	39.75	48.47	34.86	45.30
Cryptogams	0	.50	.26	.07	.00
Bare Ground	8.75	18.50	14.31	12.32	9.21

SOIL ANALYSIS DATA --
Management unit 22, Study no: 5, Study Name: Bone Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
12.4	49.0 (14.9)	6.7	52.4	23.1	24.6	2.6	8.5	96.0	0.7



PELLET GROUP DATA --
Management unit 22 , Study no: 5

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	34	4	81
Elk	-	-	5
Deer	66	27	34
Cattle	1	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	3 (7)
93 (230)	132 (326)	150 (370)
-	-	-

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 5

		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												
85	**5865**	1133	1266	2866	1733	-	44	16	30	-	8	15/15
91	**6131**	-	333	3799	1999	-	45	14	33	6	18	13/24
98	**4680**	80	200	2860	1620	680	59	18	35	6	8	17/27
03	**3920**	-	-	2100	1820	580	32	37	46	12	12	19/27
08	**3140**	320	100	1200	1840	980	32	18	59	18	18	23/30
Chrysothamnus depressus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	20	0	0	-	-	0	-/-
Chrysothamnus nauseosus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**20**	-	-	20	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus parryi												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**20**	-	-	20	-	-	0	0	-	-	0	6/6
08	**0**	-	-	-	-	-	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)
Chrysothamnus viscidiflorus stenophyllus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**66**	-	66	-	-	-	100	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**133**	-	133	-	-	-	0	0	-	-	0	-/-
98	**100**	80	-	100	-	-	0	0	-	-	0	7/9
03	**20**	-	20	-	-	-	0	0	-	-	0	8/8
08	**60**	-	-	60	-	-	0	0	-	-	0	5/5
Juniperus osteosperma												
85	**66**	-	66	-	-	-	0	0	-	-	0	-/-
91	**66**	133	66	-	-	-	0	0	-	-	0	-/-
98	**240**	180	160	80	-	-	0	0	-	-	0	-/-
03	**280**	20	160	120	-	-	0	0	-	-	0	-/-
08	**280**	20	200	80	-	-	0	0	-	-	0	-/-
Mahonia repens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**20**	-	-	20	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
85	**66**	66	66	-	-	-	0	0	-	-	0	-/-
91	**465**	-	199	266	-	-	0	0	-	-	0	5/6
98	**80**	-	-	80	-	-	0	0	-	-	0	5/10
03	**60**	-	-	60	-	-	0	0	-	-	0	4/9
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Pediocactus simpsonii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	20	-	-	-	-	0	0	-	-	0	1/2

		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)
Pinus edulis												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**40**	-	40	-	-	-	0	0	-	-	0	-/-
03	**140**	-	120	20	-	-	0	0	-	-	0	-/-
08	**120**	-	100	20	-	-	0	0	-	-	17	-/-
Sclerocactus sp.												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**20**	-	-	20	-	-	0	0	-	-	0	2/4
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-