

Trend Study 10-16-05

Study site name: West Horse Pasture .

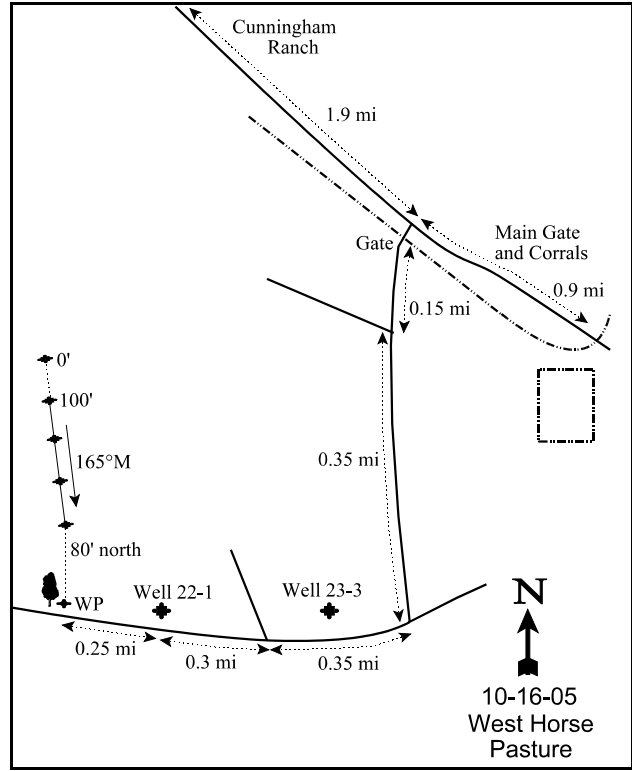
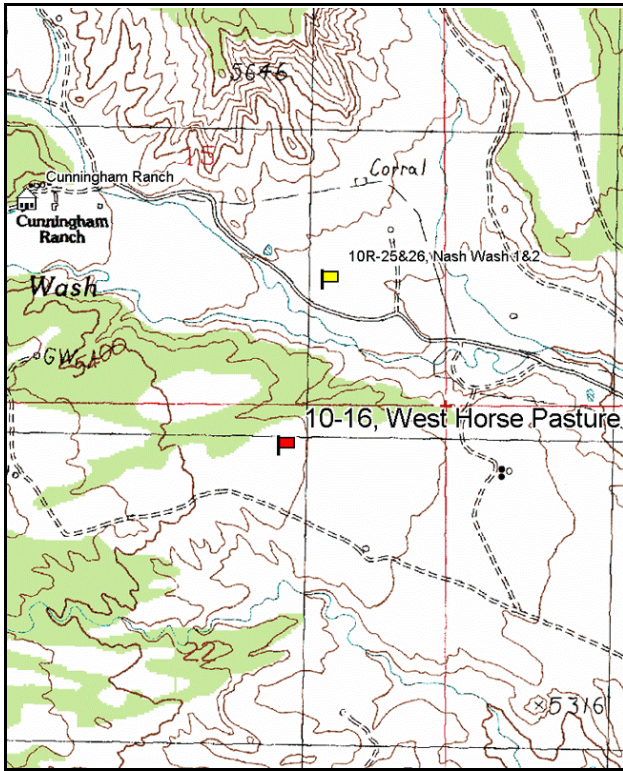
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (28ft).

LOCATION DESCRIPTION

From the main gate at Cunningham Ranch travel south 1.9 miles to a fork and turn right. Go through a gate (100 yards) and proceed 0.15 miles to a fork at the top of a hill. Stay left and go 0.35 miles to a "T" intersection. Turn right and go 0.35 miles past a well [NP Energy #23-3] to a fork. Stay left and travel northwest 0.3 miles to another well [NP Energy #22-1]. Continue northwest for 0.25 miles to a rebar witness post on the right side of the road next to a small Juniper. The 400-foot stake is 80 feet due north from the witness post. The frequency baseline starts 400 feet north at a rebar tagged with browse tag #7807.



Map Name: Sego Canyon

Diagrammatic Sketch

Township 20S , Range 21E , Section 22

GPS: NAD 27, UTM 12S 4323935 N, 622913 E

## DISCUSSION

### West Horse Pasture - Trend Study No. 10-16

The West Horse Pasture transect is located south of Nash Wash and samples critical deer winter range. This large, open Wyoming big sagebrush flat is surrounded by junipers and eroded steep cliffs to the north and west. The elevation at the site is 5,380 feet. The bench is nearly flat, draining to the southeast by an ephemeral wash. Not only is this a critical deer winter concentration area, it also supports many other uses including cattle and sheep grazing, oil and gas exploration and production, mining, and associated human activity. Pellet group transects located in the Horse Pasture area showed an average use of 58 deer days use/acre (143 ddu/ha) between 1981 and 1986 (Jense et al. 1986). From 1986 through 1990, the last time this pellet transect was read, use averaged 39 deer days use/acre (95 ddu/ha) (Jense et al. 1991). Pellet group data from 2000 estimated 58 deer days use/acre (143 ddu/ha) and 5 elk days use/acre (12 edu/ha). Data from 2005 estimated 38 deer days use/acre (94 ddu/ha), 9 elk days use/acre (22 edu/ha), and 2 cow days use/acre (4cdu/ha). In 1986, four antler drops were found. Cover for deer is provided by a nearby dense stand of mature Utah Juniper. Antler rubs on trees were noted in 2005.

There was some evidence of surface erosion and a gully runs between the 300 and 400 foot baseline stakes. Soil loss in the past is evident by a high degree of soil movement from interspaces and subsequent pedestaling around the base of the shrubs. Litter build-up is also evident on mounds beneath shrub crowns. Cryptogams are mossy-like and are present under almost the entire area under the shrub crowns. Soil texture is a sandy clay loam. Effective rooting depth is estimated at about 15 inches. A profile stoniness index estimated from penetrometer readings shows a compact layer between 12-16 inches in depth. Very little rock is present in the profile, thus this index is a measure of the depth to a hardpan not actual rock. The soil is slightly alkaline (pH of 7.4) and both phosphorus and potassium levels are low (3.8 ppm P and 57.6 ppm K) (Tiedemann and Lopez 2004).

The key browse species is Wyoming big sagebrush. Wyoming big sagebrush cover was 12% in 1995, 15% in 2000, but decreased to 8% in 2005. Density was estimated at 4,300 plants/acre in 1995. This estimate was taken with the larger sampling design, which gives much better estimates for species with discontinuous and/or clumped distributions. Since 1995, sagebrush density has declined to 3,500 plants/acre in 2000 and to 3,140 plants/acre in 2005. Decadence was about 26% in both 1995 and 2000. In 2005, 71% of the population was classified as decadent with 50% classified as dying. Recruitment from young plants has been very poor, which means there are not enough young plants to replace those that are dying. In 1986, forage availability was limited due to severe hedging. Heavy use was displayed on 93% of the population in 1986, decreased to 50% in 1995, 23% in 2000, and increased to 67% in 2005. The high amounts of cheatgrass on this site may be preventing the establishment of seedling and young plants.

Broom snakeweed density and cover have been reflective of precipitation patterns. It was very abundant in 1995. Snakeweed was rare in 2000 during drought conditions, then density and cover increased in 2005. Spiny hopsage was sampled in 1986, but was not after the change in sampling design used beginning in mid-1992. It is still on the site as height and crown measurements were taken in other sampling years. There are some scattered young pinyon and juniper trees throughout the flat, but they do not appear to be encroaching into the area. Point-quarter data in 2000 estimated 5 pinyon and 13 juniper trees/acre.

As reported in 1986, the grass composition has been dominated by cheatgrass in the past, with perennial grasses being relatively scarce. Cheatgrass was sampled in every quadrat in 1995 (100%), but due to the dry conditions in 2000, had a reduced quadrat frequency to 70%. In 2005, it was again sampled in every quadrat. Cheatgrass cover was over 50% in 2005. This puts this site at risk for fire, which would destroy the sagebrush population. Perennial grasses have not been very abundant. Galleta and bottlebrush squirreltail have been the most abundant perennials. Scarlet globemallow and timber poisonvetch are the most abundant perennial forbs. Woolly plantain was the most abundant forb in 2005.

## 1986 APPARENT TREND ASSESSMENT

Wyoming big sagebrush on the site is sustaining severe heavy use and data indicates an apparent declining trend in vigor, age structure, and forage production. Ninety-eight percent of the sagebrush population is mature or decadent. The primary management objective should be to promote sagebrush seed production to enhance the opportunity for recruitment, but this is difficult with the high density of competing winter annuals in a very dry summer environment. Plant vigor needs to improve in order for seed production to occur. A combination of management practices could take place for this to happen. Grazing pressure on sagebrush must be greatly reduced. A thinning project designed to open up the stand could help reduce intraspecific competition and open up space for seedling establishment, however the cheatgrass could become more of a problem without competition from the sagebrush. Key browse species should be seeded in conjunction with the thinning treatment.

## 1995 TREND ASSESSMENT

Although the Wyoming big sagebrush is not as heavily hedged as in the past (93% vs 50%) and percent decadence in the population has decreased (55% vs 27%), 98% of the population still remains classified as mature or decadent. The broom snakeweed density, judging from its composition, appears to be relatively stable, although it is shifting to a more mature age structure. This leads to a stable browse trend. As mentioned in 1986, management objectives should be to promote sagebrush seed production. Concurrently, the herbaceous understory would benefit if the Wyoming big sagebrush population were thinned, but more importantly there should be fewer winter annuals for the herbaceous species and sagebrush seedlings to compete with. Wyoming big sagebrush now contributes over 12% of the vegetation cover. With this high of a cover value from Wyoming big sagebrush, the herbaceous understory production would be reduced and anything more than an annual herbaceous understory should be expected. The increase in sum of nested frequency for galleta and bottlebrush, which are good to fair forage in the spring, and the increase in sum of nested frequency for perennial forbs, indicates a slightly upward herbaceous understory trend. Although this trend is slightly upward, this is still a poor composition and is nonetheless dominated by annual species. An active gully is located in the center of the study site, but shows some signs of healing. Elsewhere on the site, there is not much evidence of erosion, mostly due to the dense cheatgrass and Wyoming big sagebrush cover. Soil trend for this site is stable for now and the gully should be monitored for further activity. The DCI score is poor due to low browse recruitment, high annual grass cover, and lack of perennial herbaceous plants.

### TREND ASSESSMENT

soil - stable (0)

browse - stable (0)

herbaceous understory - slightly up (+1)

winter range condition (DC Index) - poor (22) Lower potential scale

## 2000 TREND ASSESSMENT

Trend for soil is slightly down due to a large increase in bare ground and decreases in vegetation and litter cover. As a result, the ratio of bare soil to protective ground cover decreased in 2000 and is relatively low at 1:2.1. Interspaces between shrubs show past signs of soil loss and with the decrease in annual species, these are virtually bare making them more susceptible to erosion. Trend for browse is slightly down. The population of Wyoming big sagebrush decreased 19% from 4,300 plants/acre to 3,500 in 2005. Young recruitment remains low at 1% which could translate into a decreasing population in the future if the decadent, dying plants die-off. Dying individuals increased slightly. Heavy use has decreased again in 2000 to 23% of the population, down from 50% in 1995. Trend for the herbaceous understory is slightly up as sum of nested frequency for perennial species slightly increased and cheatgrass decreased in 2000. Cheatgrass is likely to return when timing of precipitation is better. The DCI score improved to fair to good to fair, due to an increase in browse cover, an increase in perennial grass cover, and a decrease in annual grass cover.

TREND ASSESSMENT

soil - slightly down (-1)

browse - slightly down (-1)

herbaceous understory - slightly up (+1)

winter range condition (DC Index) - fair to good (45) Lower potential scale

2005 TREND ASSESSMENT

The soil trend is slightly up due to increased vegetation cover from cheatgrass and lower amounts of bare ground. The browse trend is down. Wyoming big sagebrush density declined 10% to 3,140 plants/acre. However, the proportion of the population classified as mature decreased by 67%. Cover declined from 15% to 8%. Decadence increased to 71%, while 50% of the population was classified as dying. There were very few young plants to replace those that are dying. The high amounts of annuals like cheatgrass make it very difficult for sagebrush to persist with no replacement plants. Heavy use also increased from a quarter of the population to two-thirds of the population. Broom snakeweed increased with the improved moisture patterns in 2005. The herbaceous understory trend is down. Cheatgrass increased significantly and is a major fire risk. Sum of nested frequency for perennial grasses and forbs combined declined 31%. The DCI score decreased to very poor due to a decrease in browse cover, a decrease in perennial grass cover, an increase in decadence, and an increase in annual grass cover.

TREND ASSESSMENT

soil - slightly up (+1)

browse - down (-2)

herbaceous understory - down (-2)

winter range condition (DC Index) - very poor (-6) Lower potential scale

HERBACEOUS TRENDS --

Management unit 10 , Study no: 16

T y p e	Species	Nested Frequency				Average Cover %		
		'86	'95	'00	'05	'95	'00	'05
G	Bromus tectorum (a)	-	<sub>b</sub> 374	<sub>a</sub> 196	<sub>b</sub> 379	12.08	1.44	51.08
G	Hilaria jamesii	<sub>a</sub> 2	<sub>b</sub> 50	<sub>b</sub> 51	<sub>b</sub> 44	1.25	3.73	.91
G	Oryzopsis hymenoides	1	3	5	6	.15	.44	.82
G	Sitanion hystrix	<sub>a</sub> 3	<sub>b</sub> 42	<sub>b</sub> 63	<sub>a</sub> 14	.44	1.58	.40
G	Sporobolus cryptandrus	<sub>b</sub> 12	<sub>a</sub> -	<sub>ab</sub> 2	<sub>a</sub> -	-	.03	-
G	Vulpia octoflora (a)	-	<sub>a</sub> 10	<sub>a</sub> -	<sub>b</sub> 67	.01	-	.75
Total for Annual Grasses		0	384	196	446	12.10	1.44	51.83
Total for Perennial Grasses		18	95	121	64	1.83	5.78	2.14
Total for Grasses		18	479	317	510	13.94	7.22	53.97
F	Astragalus convallarius	5	12	7	9	.17	.21	.48
F	Astragalus moencopensis	1	-	-	-	-	-	-
F	Astragalus sp.	<sub>a</sub> 3	<sub>b</sub> 28	<sub>a</sub> 3	<sub>a</sub> 5	.05	.00	.01
F	Castilleja linariaefolia	-	6	3	-	.16	.00	-
F	Calochortus nuttallii	<sub>a</sub> -	<sub>a</sub> 3	<sub>a</sub> 1	<sub>b</sub> 20	.00	.00	.08

Type	Species	Nested Frequency				Average Cover %		
		'86	'95	'00	'05	'95	'00	'05
F	<i>Delphinium nuttallianum</i>	-	-	-	2	-	-	.00
F	<i>Descurainia pinnata</i> (a)	-	<sub>a</sub> 11	<sub>a</sub> -	<sub>b</sub> 16	.02	-	.13
F	<i>Draba</i> sp. (a)	-	1	-	1	.00	-	.00
F	<i>Erigeron pumilus</i>	1	-	5	-	-	.04	-
F	<i>Gilia hutchinifolia</i> (a)	-	<sub>a</sub> 8	<sub>a</sub> -	<sub>b</sub> 34	.02	-	.20
F	<i>Holosteum umbellatum</i> (a)	-	<sub>b</sub> 21	<sub>a</sub> -	<sub>a</sub> -	.06	-	-
F	<i>Lappula occidentalis</i> (a)	-	<sub>b</sub> 31	<sub>a</sub> -	<sub>c</sub> 61	.05	-	.34
F	<i>Leucelene ericoides</i>	-	1	3	3	.00	.03	.03
F	<i>Lepidium</i> sp. (a)	-	<sub>c</sub> 51	<sub>a</sub> -	<sub>b</sub> 27	.11	-	.59
F	<i>Oenothera</i> sp.	-	5	-	-	.01	-	-
F	<i>Phlox longifolia</i>	<sub>a</sub> -	<sub>b</sub> 19	<sub>b</sub> 21	<sub>a</sub> -	.04	.04	-
F	<i>Plantago patagonica</i> (a)	-	<sub>c</sub> 129	<sub>a</sub> 2	<sub>b</sub> 183	.30	.00	3.93
F	<i>Schoenocrambe linifolia</i>	-	-	1	-	-	.00	-
F	<i>Sphaeralcea coccinea</i>	<sub>a</sub> 20	<sub>ab</sub> 28	<sub>b</sub> 43	<sub>ab</sub> 38	.16	1.57	1.12
F	<i>Townsendia</i> sp.	-	-	-	3	-	-	.00
F	Unknown forb-perennial	3	-	-	-	-	-	-
Total for Annual Forbs		0	252	2	322	0.58	0.00	5.20
Total for Perennial Forbs		33	102	87	80	0.61	1.92	1.74
Total for Forbs		33	354	89	402	1.19	1.93	6.94

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

#### BROWSE TRENDS --

Management unit 10 , Study no: 16

Type	Species	Strip Frequency			Average Cover %		
		'95	'00	'05	'95	'00	'05
B	<i>Artemisia tridentata wyomingensis</i>	84	80	77	12.32	15.15	8.03
B	<i>Atriplex canescens</i>	0	1	0	-	-	-
B	<i>Gutierrezia sarothrae</i>	97	34	71	7.67	.23	3.80
B	<i>Opuntia</i> sp.	9	10	11	.00	.09	.58
Total for Browse		190	125	159	20.01	15.48	12.43

CANOPY COVER, LINE INTERCEPT --  
 Management unit 10 , Study no: 16

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	7.71
Gutierrezia sarothrae	4.00
Opuntia sp.	.45

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 10 , Study no: 16

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	1.2

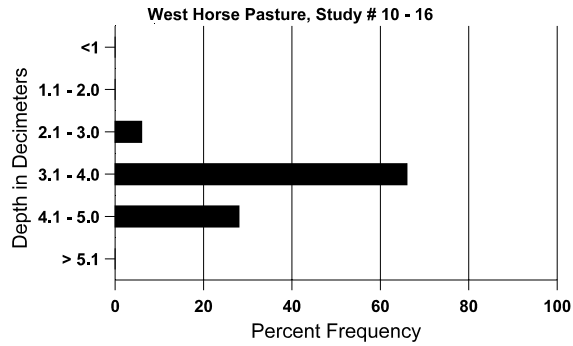
BASIC COVER --  
 Management unit 10 , Study no: 16

Cover Type	Average Cover %			
	'86	'95	'00	'05
Vegetation	24.50	36.40	27.21	68.36
Rock	0	.07	.01	.04
Pavement	0	0	.12	.01
Litter	48.00	45.56	33.00	18.70
Cryptogams	0	1.89	2.98	.63
Bare Ground	27.50	29.78	51.00	20.34

SOIL ANALYSIS DATA --  
 Herd Unit 10, Study # 16, Study Name: West Horse Pasture

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
15.4	63.8 (15.5)	7.4	50.0	24.0	26.0	0.7	3.8	57.6	0.5

## Stoniness Index



### PELLET GROUP DATA --

Management unit 10 , Study no: 16

Type	Quadrat Frequency		
	'95	'00	'05
Rabbit	49	30	16
Elk	-	3	1
Deer	44	66	24
Cattle	-	-	-

Days use per acre (ha)	
'00	'05
-	-
5 (12)	9 (22)
58 (143)	38 (94)
-	2 (4)

### BROWSE CHARACTERISTICS --

Management unit 10 , Study no: 16

		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)
86	<b>2799</b>	-	66	1200	1533	-	5	93	55	1	21	12/14
95	<b>4300</b>	-	100	3060	1140	760	43	50	27	16	16	17/30
00	<b>3500</b>	-	20	2580	900	580	58	23	26	19	19	16/26
05	<b>3140</b>	180	40	860	2240	920	25	67	71	50	51	19/28
<i>Atriplex canescens</i>												
86	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
95	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
00	<b>20</b>	-	-	20	-	-	100	0	-	-	0	-/-
05	<b>0</b>	-	-	-	-	-	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)
<i>Grayia spinosa</i>												
86	<b>266</b>	-	-	66	200	-	0	100	75	-	25	13/17
95	<b>0</b>	-	-	-	-	-	0	0	0	-	0	10/20
00	<b>0</b>	-	-	-	-	-	0	0	0	-	0	-/-
05	<b>0</b>	-	-	-	-	-	0	0	0	-	0	20/27
<i>Gutierrezia sarothrae</i>												
86	<b>7533</b>	733	4000	3133	400	-	0	0	5	-	0	10/7
95	<b>15140</b>	580	5280	9820	40	20	0	0	0	.13	.13	12/13
00	<b>1020</b>	40	20	820	180	240	0	0	18	12	12	10/11
05	<b>3880</b>	180	40	3760	80	-	0	0	2	-	0	13/13
<i>Opuntia sp.</i>												
86	<b>0</b>	-	-	-	-	-	0	0	0	-	0	-/-
95	<b>200</b>	-	-	200	-	-	0	0	0	-	0	6/18
00	<b>240</b>	20	-	180	60	-	8	0	25	17	17	5/17
05	<b>360</b>	-	-	360	-	-	0	0	0	-	0	6/23