

Trend Study 2-37-06

Study site name: Rock Creek Riparian .

Vegetation type: Riparian .

Compass bearing: line 1 (24°M), line 2 (43°M), line 3 (47°M), line 4 (48°M), line 5 (72°M).

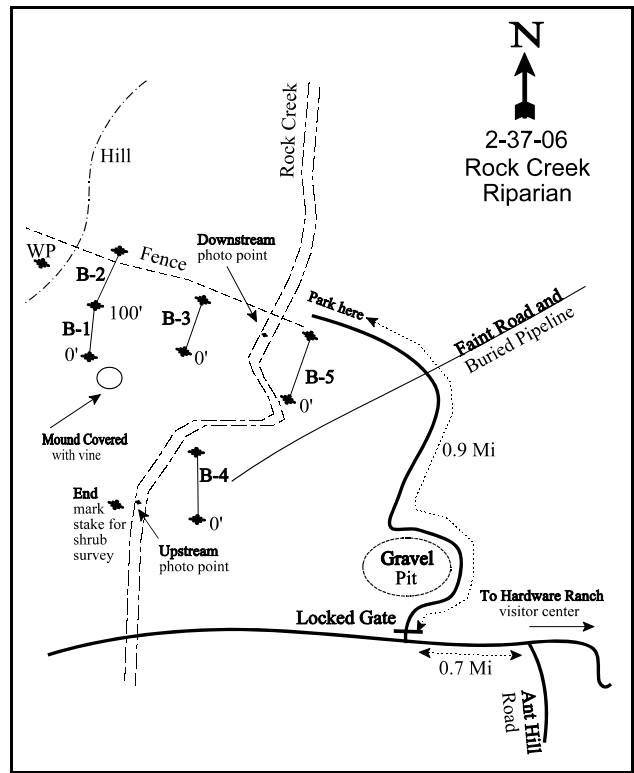
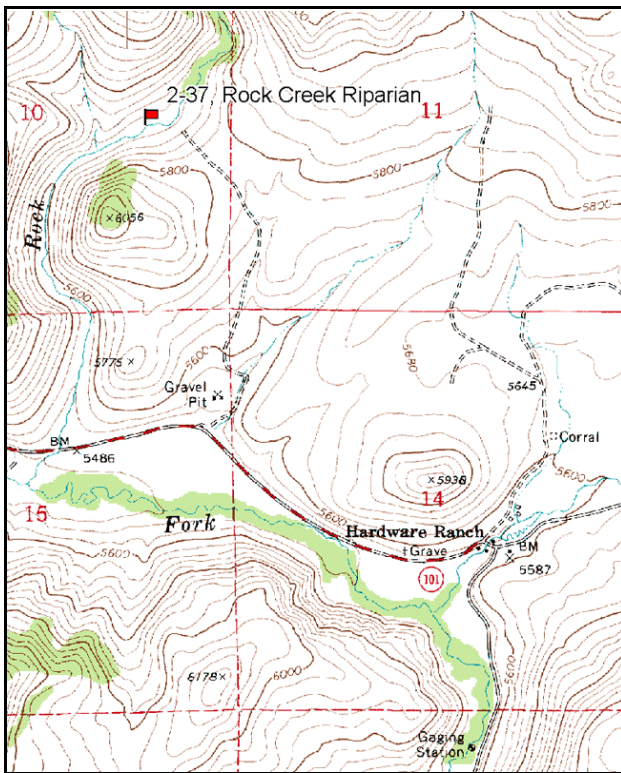
Quadrat placement: Quadrats were placed every 5 feet on the left side of the baseline.

Woody species regeneration: 8 foot pole centered over water edge. Start at fence on east bank of the creek and go to full high post. Same for the west bank. Count all shrubs and classify age and form class.

Photo: Downstream photo taken in the stream just north of line 5 100' stake. The upstream photo was taken at the full high post marking the end of the stream transect.

LOCATION DESCRIPTION

From the corner of the Ant Hill road turnoff, travel down Blacksmith Fork Canyon 0.7 miles and turn right. Go through a locked gate (you'll need a WRP key to open the gate), around a gravel pit, and travel 0.9 miles to a stopping point. Cross the creek and look for a witness post on the hill side 200 feet across the fence. From the witness post to the 0-foot stake, take a bearing of 122 degrees magnetic and walk 8 paces, 0' stake is marked by browse tag #134. Belt 3 is marked by browse tag #183, belt 4 is marked with #141, and belt 5 by #140.



Map Name: Hardware Ranch

Diagrammatic Sketch

Township 10N, Range 3E, Section 10

UTM (NAD 83) 12T 4607435 N, 451416 E

## DISCUSSION

### Rock Creek Riparian - Trend Study No. 2-37

#### Study Information

This study is located just north of Blacksmith Fork Canyon along Rock Creek (elevation: 5,900 feet, slope: 1%, aspect: southwest). The study was originally established in 1996 to monitor a degraded riparian community. In 2001, the study design was determined to be inadequate to monitor the riparia area correctly and was suspended. In 2006, an intense cattle grazing treatment was implemented to reduce Canada thistle, as part of a study to increase browse on Hardware Ranch. The monitoring design was changed in 2006, but included 200 feet of the original baseline on the west bank of Rock Creek. A woody species regeneration transect (green line method) was established along the stream bank to monitor the affects of grazing on willows and other shrubs. Utilization from livestock has been heavy along the stream bank. In 2001, cattle use was estimated at 54 cow days use/acre (134 cdu/ha). Pellet group data from 2006 was estimated at 80 cow days use/acre (197 cdu/ha). Wildlife use in both years was minimal.

#### Soil

The soil is classified in the Yeates Hollow series, a deep, well drained soil that formed in alluvium, colluvium, and residuum from conglomerate, sandstone, and quartzite (USDA-NRCS 2006). Soil texture is a clay loam with an effective rooting of 20-28 inches. Organic matter is high with a neutral soil reaction of 7.3. Rock is rare both on the surface and within the profile. Little bare ground occurs and erosion is minimal away from the creek. However, erosion around the stream varies from moderate to severe depending on the intensity of grazing and trampling. *Eleocharis* growing directly on the streambank is minimizing erosion at the water's edge.

#### Browse

Browse is limited and accounted for only 3% of the total vegetative cover. Mountain big sagebrush plants are scattered within the ecotone of the narrow riparian corridor, but become dominant on the drier upland. The sagebrush are mostly mature and have been lightly to moderately utilized. The only shrubs in the area which likely receive summer use are the yellow willows. The willows were not abundant enough to properly sample in the shrub density strips, so a woody regeneration species transect (green line method) was implemented along the water's edge (Cowley et al. 2006; Winward 2000). Willows were the most abundant species and averaged 1,936 plants/acre (young and mature age classes) along the stream bank in 2006. Single stem willow were classified as seedling (Cowley et al. 2006; Winward 2000) and they averaged 1,562 plants/acre. Estimates of mature willow in the upland/flood plain area averaged 20 plants/acre. The young and mature wax currant densities were 66 plants/acre along the stream bank and 40 plants/acre on the upland in 2006. Mature and young thinleaf alder densities were 154 plants/acre along the stream; seedling densities were 22 plants/acre. The mature dogwood densities were estimated at 22 plants/acre. No alders or dogwoods were sampled in the upland area. Utilization was moderate to heavy, while thinleaf alder, wax currant, and dogwood received only light use. Some of the willows are tall and partly unavailable to browsing. Several individuals have been highlined in the past.

#### Herbaceous Understory

Perennial grasses are abundant and diverse, but were hard to identify due to the heavy grazing. As a result, all perennial and annual grasses were lumped as either annual or perennial grasses. Common species included: slender wheatgrass, mountain brome, Kentucky bluegrass, and orchardgrass. Perennial grasses averaged 56% cover in 2006. Sedges and rushes were identified to the genus level. Rushes averaged 14% cover in 2006. Forbs were abundant and diverse with 9 annual and 25 perennial species encountered in 2006, which provided 31% cover. Unfortunately, Canada thistle contributed 30% of the forb cover. Other weeds include: dyer's woad, houndstongue, tarweed, and big stinging nettle. Canada thistle and dyer's woad are state-listed noxious weeds and houndstongue is listed as noxious in Wasatch and Sanpete counties. Other abundant forbs included: prickly lettuce, western yarrow, dandelion, goldenrod, and western coneflower.

Grazing Summary

The study had been moderately to heavily grazed just before the monitoring study was read in 2006. The effects of the grazing was most heavy on the perennial grasses; some forbs had been moderately grazed. The Canada thistle and goldenrod inflorescences and basal rosettes had been removed by the cattle, but the stems of both species remained. Coneflower, *Eleocharis*, flannel mullein, yarrow, stinging nettle, and houndstongue had not been grazed at all at the time of the reading in 2006.

In 2006, the willow and currant had both been moderately browsed by cattle.

HERBACEOUS TRENDS --

Management unit 02 , Study no: 37

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Carex sp.	3	.18
G	Eleocharis sp.	3	.03
G	Perennial grass	440	42.26
G	Juncus balticus	181	13.88
Total for Annual Grasses		0	0
Total for Perennial Grasses		627	56.36
Total for Grasses		627	56.36
F	Achillea millefolium	111	3.78
F	Aster sp.	10	.18
F	Unknown boraginaceae (a)	2	.15
F	Cirsium arvense	184	9.31
F	Clematis ligusticifolia	-	.03
F	Collomia linearis (a)	1	.00
F	Cynoglossum officinale	21	.58
F	Descurainia pinnata (a)	1	.00
F	Epilobium brachycarpum (a)	1	.03
F	Equisetum arvense	58	.53
F	Erodium cicutarium (a)	2	.00
F	Geranium richardsonii	7	.24
F	Gnaphalium palustre (a)	3	.03
F	Iliamna rivularis	2	.01
F	Isatis tinctoria	3	.03
F	Lappula occidentalis (a)	4	.06
F	Lactuca serriola	118	2.21
F	Madia glomerata (a)	5	.03
F	Medicago lupulina	17	.28
F	Melilotus officinalis	28	.33
F	Navarretia sp.	2	.00
F	Polygonum aviculare (a)	4	.16

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
F	Potentilla gracilis	34	.87
F	Ranunculus testiculatus (a)	3	.00
F	Rudbeckia occidentalis	50	4.07
F	Schoenocrambe linifolia	1	.00
F	Smilacina stellata	28	.39
F	Solidago sp.	44	2.34
F	Taraxacum officinale	122	4.16
F	Tragopogon dubius	27	.82
F	Trifolium gymnocarpon	16	.42
F	Urtica dioica	4	.09
F	Verbascum thapsus	1	.15
F	Vicia americana	7	.06
F	Viola sp.	2	.03
Total for Annual Forbs		26	0.48
Total for Perennial Forbs		897	30.99
Total for Forbs		923	31.47

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

#### BROWSE TRENDS --

Management unit 02 , Study no: 37

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Alnus incana	2	.41
B	Artemisia tridentata vaseyana	1	.15
B	Ribes aureum	13	.63
B	Rosa woodsii	1	1.25
B	Salix lutea	0	.15
Total for Browse		17	2.59

CANOPY COVER, LINE INTERCEPT --  
 Management unit 02 , Study no: 37

Species	Percent Cover
	'06
Alnus incana	3.00
Artemisia tridentata vaseyana	.28
Ribes aureum	.13
Rosa woodsii	.90
Salix lutea	7.83

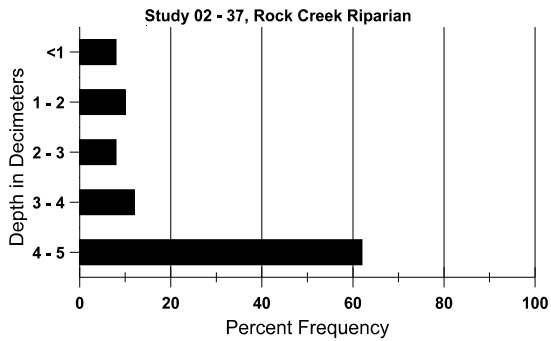
BASIC COVER --  
 Management unit 02 , Study no: 37

Cover Type	Average Cover %
	'06
Vegetation	79.28
Rock	.01
Pavement	.05
Litter	19.09
Cryptogams	.03
Bare Ground	13.32

SOIL ANALYSIS DATA --  
 Herd Unit 02, Study no: 37, Rock Creek Riparian

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
23.0	50.0 (18.1)	7.3	42.2	31.4	26.4	4.8	31.0	243.2	1.7

**Stoniness Index**



PELLET GROUP DATA --

Management unit 02 , Study no: 37

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Cattle	31	80 (197)
Sheep	-	1 (3)

BROWSE CHARACTERISTICS --

Management unit 02 , Study no: 37

		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>Artemisia tridentata vaseyana</i>												
06	<b>80</b>	-	40	40	-	-	25	0	-	-	0	30/36
<i>Ribes aureum</i>												
06	<b>40</b>	-	20	-	20	-	0	0	50	-	0	62/54
<i>Rosa woodsii</i>												
06	<b>1120</b>	-	40	1020	60	-	0	25	5	4	4	15/14
<i>Salix lutea</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-
<i>Symphoricarpos oreophilus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	47/48

GREENLINE SHRUB DENSITIES--

Management unit 02 , Study no: 37

		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>Alnus incana</i>												
06	<b>66</b>	22	44	22	-	-	0	0	-	-	0	-/-
<i>Cornus sp.</i>												
06	<b>22</b>	-	-	22	-	-	0	0	-	-	0	-/-
<i>Ribes aureum</i>												
06	<b>44</b>	-	-	44	-	-	0	0	-	-	-	-/-
<i>Salix lutea</i>												
06	<b>1100</b>	836	792	308	-	-	42	32	-	-	-	-/-

Values calculated from shrubs measured within 4 ft of each side of the stream's edge for 500 ft. Age classification is based upon: Seedling=1 stem; Young=2 to 10 stems; Mature=>10 stems; Dead=no living stems.

Trend Study 2R-15-06

Study site name: Curtis Ridge Control.

Vegetation type: Mountain Big Sagebrush.

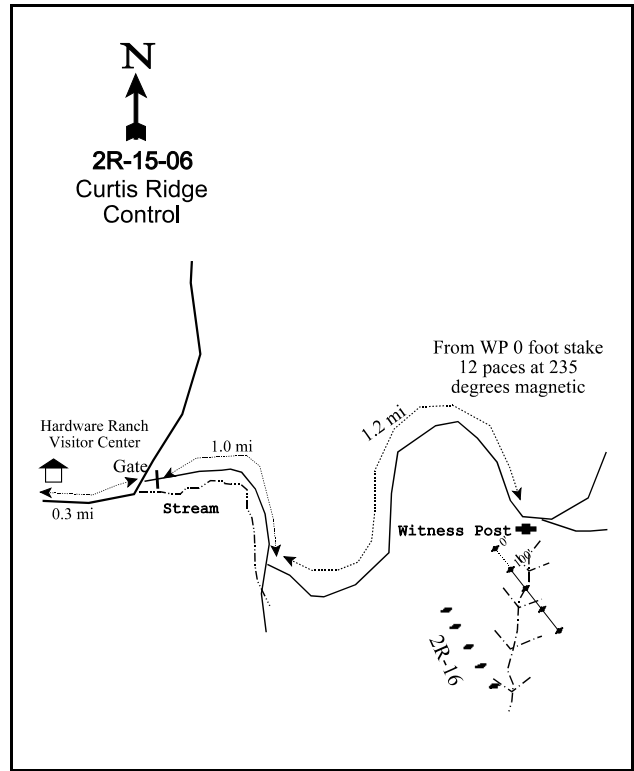
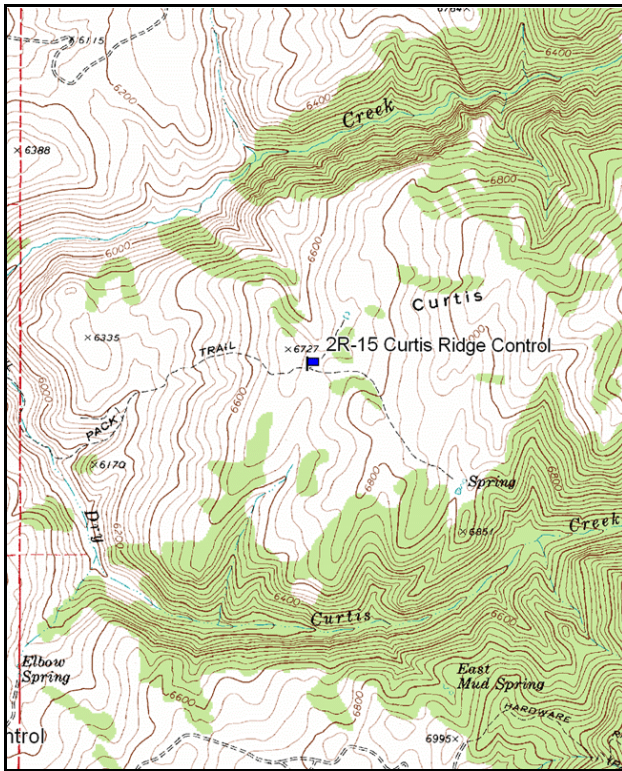
Compass bearing: frequency baseline 148 degrees magnetic.

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

No Rebar

LOCATION DESCRIPTION

From the Hardware Ranch Visitor Center drive 0.3 miles to a fork in the road and a gate. Take a right through a gate (this road follows a stream a short ways). Proceed 1.0 miles to a fork. Take a left and drive 1.2 miles to a witness post on the right. From the witness post walk 12 paces at 235 degrees magnetic to the 0' stake with browse tag #144.



Map name: Hardware Ranch

Diagrammatic Sketch

Township 10N , Range 4E , Section Unsurveyed .

UTM (NAD 83) 12T 4605932N 456276E

## DISCUSSION

### Curtis Ridge Control - Study No. 2R-15

#### Study Information

This study was established as part of an intensive grazing project conducted on Hardware Ranch to improve browse composition. It was positioned approximately 600 feet north of the Curtis Ridge (2R-16) study on Curtis Ridge, 2 miles east of the Hardware Ranch visitor's center (elevation: 6,700 feet, slope: 4%, aspect: south). The vegetation type is mountain big sagebrush and low sagebrush with belts 3 and 4 in a meadow type. The study was established prior to the intensive grazing treatment which was scheduled to take place later in the summer and an electric fence was to be built around the study area before the grazing treatment. The companion study (2R-16) will remain in the grazing treatment area. The 2006 pellet group transect data estimates were 8 elk, 3 deer, and 17 cow days use/acre (20 edu/ha, 7 ddu/ha, and 43 cdu/ha). The cattle use was from the previous summer and deer and elk use was from spring or early summer.

#### Soil

The soil is in the Curtis Creek-Goring series complex, which consists of a brown to dark brown, slightly to medium acidic, silt loam to loam A horizon; reddish brown and yellowish red, heavy loam and silty clay to light sandy loam B2t horizon with prismatic structure over calcareous red sandstone at a depth of 18 inches (USDA-NRCS 2006). The soil texture is a clay loam with a neutral pH (6.7). The effective rooting depth was nearly 12 inches. Relative vegetation and litter cover were 81% combined and relative bare ground cover was 17% in 2006. The erosion condition class in 2006 was stable.

#### Browse

The browse component is made up of low sagebrush and mountain big sagebrush. In 2006, low sagebrush density was 9,080 plants/acre, 76% of which were mature, 16% were young, and 6% were decadent. Plants classified as dying made up 4% of the population. Use was light and vigor was good. The density of mountain big sagebrush in 2006 was 1,640 plants/acre, 71% were mature, 7% were young, and 22% were decadent. Plants classified as dying made up 7% of the population. Use was also light and vigor was good. Saskatoon serviceberry and antelope bitterbrush were also sampled at low densities. Bitterbrush had been moderate to heavily hedged. Western juniper was sampled at 20 plants/acre.

#### Herbaceous Understory

The herbaceous understory is diverse. Thirteen perennial grass/grasslike species were sampled in 2006. Nineteen perennial forbs and 10 annual forbs were sampled as well in 2006. Grasses provided 15% cover in 2006 and Letterman needlegrass was dominant (6% cover); alpine fescue, prairie junegrass, bulbous bluegrass, and Sandberg bluegrass all provided more than 1% cover in 2006.

Forbs provided 24% cover in 2006. An aster species provided 9% cover and western yarrow provided 7% cover; pale agoseris, lambstongue groundsel, and Douglas knotweed all provided greater than 1% cover. Cluster tarweed was sampled in 2006.

The Desirable Components Index score in 2006 was excellent due to excellent browse cover, good perennial grass cover, and excellent perennial forb cover.

2006 winter range condition (DC Index) – excellent (84) Mid-level potential scale



HERBACEOUS TRENDS --  
Management unit 02R, Study no: 15

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron dasystachyum	18	.11
G	Agropyron spicatum	5	.00
G	Agropyron trachycaulum	15	.77
G	Carex sp.	17	.27
G	Festuca ovina	54	2.05
G	Koeleria cristata	101	1.57
G	Melica bulbosa	34	.68
G	Poa bulbosa	43	1.48
G	Poa fendleriana	12	.21
G	Poa pratensis	26	.44
G	Poa secunda	59	1.12
G	Sitanion hystrix	20	.31
G	Stipa lettermani	169	6.00
Total for Annual Grasses		0	0
Total for Perennial Grasses		573	15.06
Total for Grasses		573	15.06
F	Achillea millefolium	250	7.04
F	Agoseris glauca	129	1.35
F	Allium acuminatum	76	.39
F	Aster sp.	230	9.47
F	Calochortus nuttallii	1	.00
F	Collomia linearis (a)	13	.05
F	Comandra pallida	2	.03
F	Collinsia parviflora (a)	33	.16
F	Crepis acuminata	1	.03
F	Epilobium brachycarpum (a)	41	.18
F	Eriogonum umbellatum	8	.36
F	Geranium richardsonii	15	.79
F	Holosteum umbellatum (a)	6	.01
F	Lappula occidentalis (a)	2	.03
F	Lomatium sp.	1	.03
F	Lupinus argenteus	2	.38
F	Madia glomerata (a)	37	.11
F	Mertensia sp.	1	.03
F	Microsteris gracilis (a)	21	.03
F	Orthocarpus luteus (a)	31	.14

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
F	Orthocarpus purpureo-albus (a)	1	.00
F	Polygonum douglasii (a)	131	1.27
F	Potentilla gracilis	2	.03
F	Senecio integerrimus	85	1.03
F	Stellaria longipes	5	.30
F	Taraxacum officinale	23	.26
F	Tragopogon dubius	2	.03
F	Viola sp.	5	.06
F	Zigadenus paniculatus	7	.06
Total for Annual Forbs		316	2.02
Total for Perennial Forbs		845	21.73
Total for Forbs		1161	23.76

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

#### BROWSE TRENDS --

Management unit 02R, Study no: 15

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier alnifolia	1	-
B	Artemisia arbuscula	68	16.84
B	Artemisia tridentata vaseyana	34	8.76
B	Eriogonum heracleoides	0	-
B	Juniperus scopulorum	1	1.16
B	Purshia tridentata	13	3.49
B	Rosa woodsii	2	.15
B	Symphoricarpos oreophilus	6	.30
Total for Browse		125	30.70

CANOPY COVER, LINE INTERCEPT --

Management unit 02R, Study no: 15

Species	Percent Cover
	'06
Amelanchier alnifolia	.38
Artemisia arbuscula	22.10
Artemisia tridentata vaseyana	9.81
Chrysothamnus viscidiflorus viscidiflorus	.01
Juniperus osteosperma	3.68
Purshia tridentata	3.08
Rosa woodsii	.28
Symphoricarpos oreophilus	1.21

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 02R, Study no: 15

Species	Average leader growth (in)
	'06
Artemisia arbuscula	1.3
Artemisia tridentata vaseyana	1.7
Purshia tridentata	1.8

BASIC COVER --

Management unit 02R, Study no: 15

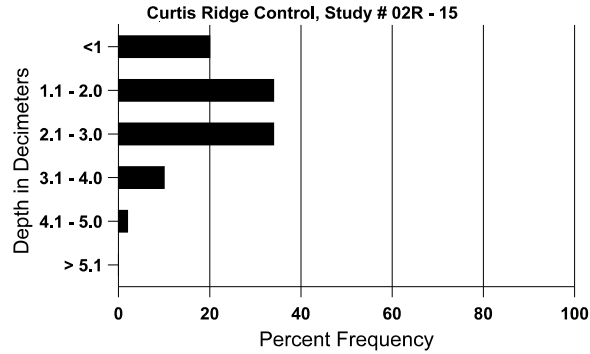
Cover Type	Average Cover %
	'06
Vegetation	61.28
Rock	1.12
Pavement	.60
Litter	37.91
Cryptogams	.52
Bare Ground	20.86

SOIL ANALYSIS DATA --

Herd Unit 2R, Study # 15, Study Name: Curtis Ridge Control

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
11.5	65 (23.2)	6.7	26.6	36.2	37.3	3.12	12.1	217.6	0.7

# Stoniness Index



## PELLET GROUP DATA --

Management unit 02R, Study no: 15

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Elk	1	8 (20)
Deer	5	3 (7)
Cattle	6	17 (43)

## BROWSE CHARACTERISTICS --

Management unit 02R, Study no: 15

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier alnifolia</i>												
06	<b>40</b>	-	20	20	-	-	0	0	-	-	0	33/35
<i>Artemisia arbuscula</i>												
06	<b>9080</b>	960	1460	7060	560	120	8	0	6	4	5	12/20
<i>Artemisia tridentata vaseyana</i>												
06	<b>1640</b>	180	120	1160	360	200	7	0	22	7	7	30/44
<i>Eriogonum heracleoides</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	7/10
<i>Juniperus scopulorum</i>												
06	<b>20</b>	20	20	-	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
06	<b>380</b>	120	-	280	100	20	16	42	26	11	11	24/52
<i>Rosa woodsii</i>												
06	<b>40</b>	-	20	20	-	-	0	0	-	-	0	27/19
<i>Symphoricarpos oreophilus</i>												
06	<b>280</b>	100	20	240	20	20	0	0	7	7	7	19/30

Trend Study 2R-16-06

Study site name: Curtis Ridge Control .

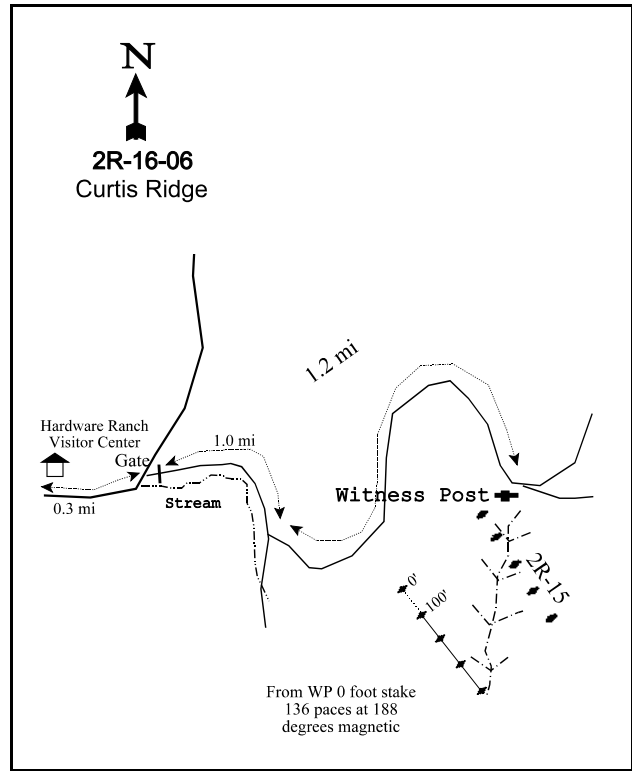
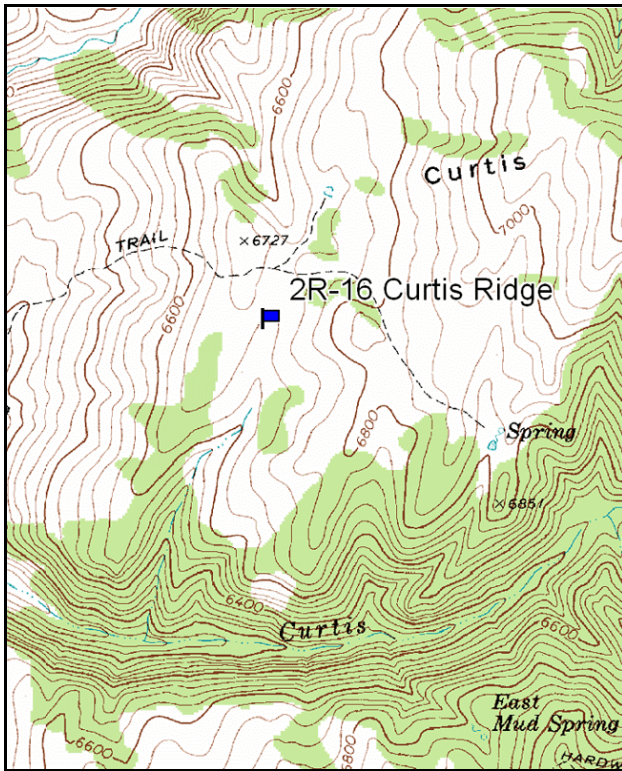
Vegetation type: Mountain Big Sagebrush.

Compass bearing: frequency baseline 334 degrees magnetic.

Frequency belt placement: line 1(11ft & 95), line 2(34 ft & 71), line 3(59 ft).  
No Rebar

LOCATION DESCRIPTION

From the Hardware Ranch Visitor Center drive 0.3 miles to a fork in the road. Take a right through a gate (this road follows a stream a short ways). Proceed 1.0 miles to a fork. Take a left and drive 1.2 miles to a witness post on the right. From the witness post walk 136 paces at 188 degrees magnetic to the 0' stake with browse tag #143.



Map name: Hardware Ranch

Diagrammatic Sketch

Township 10N , Range 4E , Section Unsurveyed .

UTM (NAD 83) 12T 4605754N 456243E

## DISCUSSION

### Curtis Ridge - Study No. 2R-16

#### Study Information

This study was established as part of an intensive grazing project conducted on Hardware Ranch to improve browse composition. It was positioned approximately 600 feet south of the Curtis Ridge Control (2R-15) study on Curtis Ridge, 2 miles east of the Hardware Ranch visitor's center (elevation: 6,700 feet, slope: 7%, aspect: south). The vegetation type is mountain big sagebrush and low sagebrush with belt 1 in a meadow type. The study was established prior to the intensive grazing treatment which was scheduled to take place later in the summer. The companion study (2R-15) will not be grazed and will act as a control. The 2006 pellet group transect data estimates were 11 elk, 17 deer, and 17 cow days use/acre (26 edu/ha, 41 ddu/ha, and 73 cdu/ha). The cattle use was from the previous summer and deer and elk use was from spring or early summer.

#### Soil

The soil is in the Curtis Creek-Goring series complex, which consists of a brown to dark brown, slightly to medium acidic, silt loam to loam A horizon; reddish brown and yellowish red, heavy loam and silty clay to light sandy loam B2t horizon with prismatic structure over calcareous red sandstone at a depth of 18 inches (USDA-NRCS 2006). The soil texture is a clay loam with a neutral pH (6.7). The effective rooting depth was nearly 12 inches. Relative vegetation and litter cover were 82% combined and relative bare ground cover was 15% in 2006. The erosion condition class in 2006 was stable.

#### Browse

The browse component is made up of low sagebrush and mountain big sagebrush. In 2006, low sagebrush density was 9,920 plants/acre, 74% of which were mature, 10% were young, and 16% were decadent. Plants classified as dying made up 7% of the population. Use was light and vigor was good. The density of mountain big sagebrush in 2006 was 2,080 plants/acre, 78% were mature, 5% were young, and 17% were decadent. Plants classified as dying made up 3% of the population. Use was also light and vigor was good. Saskatoon serviceberry and antelope bitterbrush were also sampled at low densities. Bitterbrush had been heavily hedged.

#### Herbaceous Understory

The herbaceous understory is diverse. Fourteen perennial grass/grasslike species were sampled in 2006. Fifteen perennial forbs and 8 annual forbs were sampled as well in 2006. Grasses provided 9% cover in 2006 and Letterman needlegrass was dominant (3% cover); prairie junegrass and Kentucky bluegrass provided more than 1% cover in 2006.

Forbs provided 21% cover in 2006. An aster species and western yarrow provided 7% cover; lambstongue groundsel and sulfur eriogonum provided greater than 1% cover. Cluster tarweed was sampled in 2006.

The Desirable Components Index score in 2006 was good due to excellent browse cover, moderate perennial grass cover, and excellent perennial forb cover.

2006 winter range condition (DC Index) – good (72) Mid-level potential scale

HERBACEOUS TRENDS --  
Management unit 02R, Study no: 16

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron dasystachyum	81	.67
G	Agropyron spicatum	5	.00
G	Agropyron trachycaulum	11	.33
G	Carex sp.	4	.01
G	Danthonia unispicata	3	.03
G	Festuca ovina	29	.80
G	Koeleria cristata	61	1.03
G	Melica bulbosa	51	.47
G	Poa bulbosa	13	.25
G	Poa fendleriana	5	.03
G	Poa pratensis	66	1.28
G	Poa secunda	49	.75
G	Sitanion hystrix	5	.20
G	Stipa lettermani	113	3.42
Total for Annual Grasses		0	0
Total for Perennial Grasses		496	9.31
Total for Grasses		496	9.31
F	Achillea millefolium	242	6.99
F	Agoseris glauca	77	.82
F	Allium acuminatum	75	.47
F	Aster sp.	217	6.54
F	Astragalus sp.	6	.03
F	Astragalus utahensis	3	.03
F	Collomia linearis (a)	25	.08
F	Comandra pallida	1	.03
F	Collinsia parviflora (a)	27	.08
F	Epilobium brachycarpum (a)	30	.23
F	Eriogonum umbellatum	18	2.20
F	Galium sp.	4	.00
F	Geranium richardsonii	21	.41
F	Holosteum umbellatum (a)	1	.00
F	Lactuca serriola	3	.00
F	Madia glomerata (a)	31	.10
F	Microsteris gracilis (a)	17	.05
F	Orthocarpus luteus (a)	18	.47
F	Polygonum douglasii (a)	85	.49

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
F	<i>Senecio integerrimus</i>	102	1.41
F	<i>Taraxacum officinale</i>	8	.07
F	<i>Tragopogon dubius</i>	6	.01
F	<i>Zigadenus paniculatus</i>	2	.00
Total for Annual Forbs		234	1.52
Total for Perennial Forbs		785	19.05
Total for Forbs		1019	20.57

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

#### BROWSE TRENDS --

Management unit 02R, Study no: 16

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	<i>Amelanchier alnifolia</i>	1	-
B	<i>Artemisia arbuscula</i>	67	23.64
B	<i>Artemisia tridentata vaseyana</i>	37	11.61
B	<i>Eriogonum heracleoides</i>	3	.30
B	<i>Purshia tridentata</i>	6	.56
B	<i>Symphoricarpos oreophilus</i>	1	-
Total for Browse		115	36.12

#### CANOPY COVER, LINE INTERCEPT --

Management unit 02R, Study no: 16

Species	Percent Cover
	'06
<i>Artemisia arbuscula</i>	30.00
<i>Artemisia tridentata vaseyana</i>	9.93
<i>Eriogonum heracleoides</i>	.30
<i>Purshia tridentata</i>	.86



KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 02R, Study no: 16

Species	Average leader growth (in)
	'06
Artemisia arbuscula	1.1
Artemisia tridentata vaseyana	1.9
Purshia tridentata	1.8

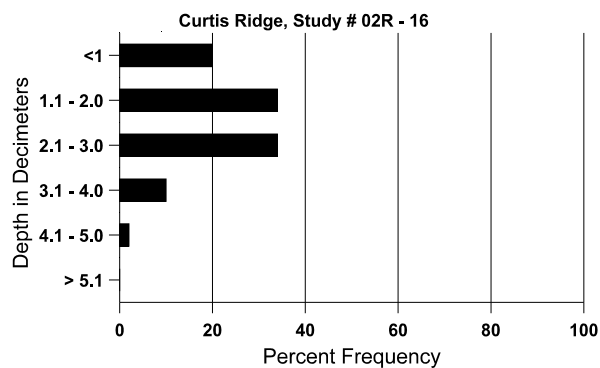
BASIC COVER --  
Management unit 02R, Study no: 16

Cover Type	Average Cover %
	'06
Vegetation	57.42
Rock	2.23
Pavement	1.29
Litter	44.17
Cryptogams	.06
Bare Ground	18.74

SOIL ANALYSIS DATA --  
Herd Unit 2R, Study # 16, Study Name: Curtis Ridge

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	ppm P	ppm K	dS/m
5.67	65 (23.2)	6.7	26.6	36.2	37.3	3.12	12.1	217.6	0.7

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 02R, Study no: 16

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	2	-
Elk	13	11 (26)
Deer	9	17 (41)
Cattle	9	30 (73)

BROWSE CHARACTERISTICS --  
 Management unit 02R, 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)
<i>Amelanchier alnifolia</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	17/20
<i>Artemisia arbuscula</i>												
06	<b>9920</b>	200	1000	7380	1540	280	5	0	16	7	7	12/21
<i>Artemisia tridentata vaseyana</i>												
06	<b>2080</b>	80	100	1620	360	140	3	0	17	3	3	24/35
<i>Eriogonum heracleoides</i>												
06	<b>60</b>	-	-	60	-	-	0	0	-	-	0	11/21
<i>Purshia tridentata</i>												
06	<b>140</b>	-	-	100	40	20	0	86	29	-	0	25/49
<i>Symphoricarpos oreophilus</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	14/17

## DISCUSSION

### Grazing Comparison of Curtis Ridge Control (2R-15) and Curtis Ridge (2R-16)

#### 2006 Pretreatment

The two studies area quite similar due to their close proximity. The control study has slightly more diversity than the treatment study. At the control study in 2006, 19 perennial forb, 10 annual forb, and 6 browse species were sampled; 15 perennial forb, 8 annual forb, and 4 browse species were sampled at the treatment study. The grass and forb cover were also slightly higher at the control. However, one more species of grass was sampled at the treatment study than the control and the treatment browse cover was slightly higher than the control.

Preferred browse cover was nearly 36% at the treatment study and 29% at the control. The densities of low and mountain big sagebrush were both higher at the treatment study.

The DCI score for the treatment study was lower than that of the control because of the lower perennial grass cover.

Trend Study 2R-17-06

Study site name: Hardware Plateau Control.

Vegetation type: Grass/Big Sagebrush.

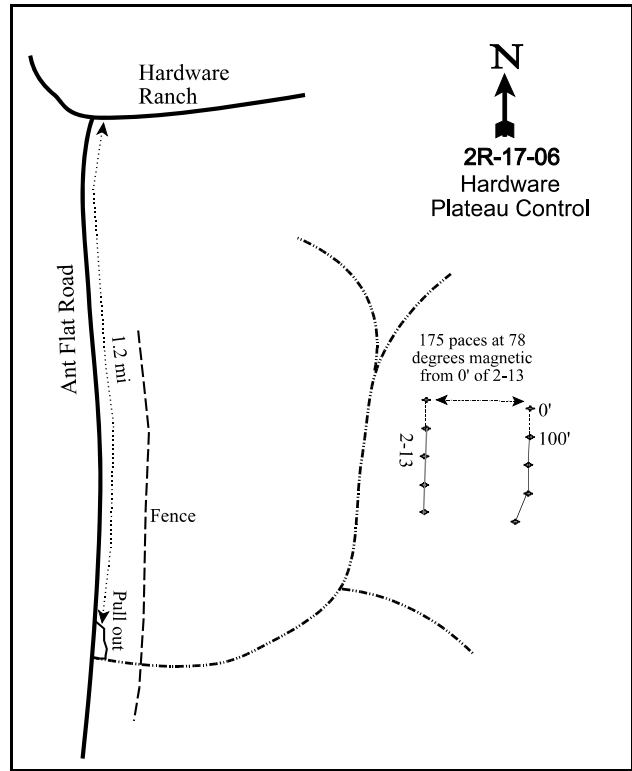
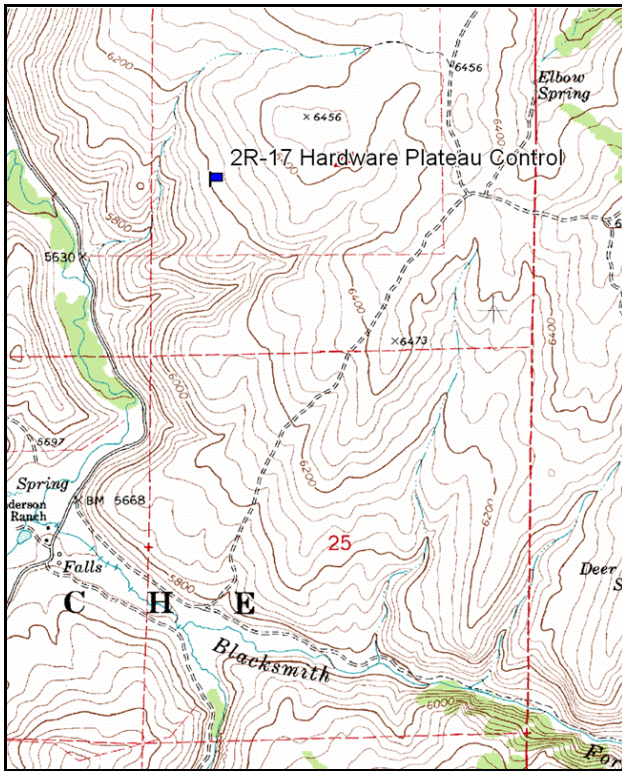
Compass bearing: frequency baseline 145 degrees magnetic.

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

No Rebar

LOCATION DESCRIPTION

From Hardware Ranch, proceed south on the Ant Flat road for 1.2 miles. This mileage should end at a sign that reads: "Welcome to Hardware Ranch Game Management Area." Stop here. Walk up the bottom of the wash (to the east of the sign) 365 paces, to the second very definite fork in the drainage. From the point where the wash divides, take a bearing of 80 degrees magnetic and walk 32 paces to the 0-foot stake for the Hardware Plateau site 02-13 , marked by browse tab #7984. From there the 0' stake is ~175 paces at 78 degrees magnetic marked with a red browse tag #277.



Map name: Hardware Ranch

Diagrammatic Sketch

Township 10N, Range 3E, Section 24

UTM (NAD 83) 12T 4604170 N, 453603 E

## DISCUSSION

### Hardware Plateau Control - Study No. 2R-17

#### Study Information

This study was established on Hardware Plateau approximately 1 mile southeast of the Hardware Ranch office (elevation: 6,200 feet, slope: 22%, aspect: west). It was established as part of an intensive grazing project conducted on Hardware Ranch to improve browse composition. As of July 2006, it had been completely excluded from cattle grazing using an electric fence. This study is to act as a control in a comparison with the permanent Range Trend study Hardware Plateau (2-13), which is located 570 feet to the west (down slope). In 2006, the pellet group estimates were 38 elk, 58 deer, and 32 cow days use/acre (94 edu/ha, 58 ddu/ha, and 79 cdu/ha). Elk and deer pellets were from fall and winter use. The cow pats were remnants of grazing from previous years (none from the 2006 season) and were sampled to show historic use.

#### Soil

Soils in this area are classified in Yeates Hollow series (USDA-NRCS 2006). These are moderately shallow soils where bedrock is normally encountered at about 4 feet in depth. Derived from quartzite and sandstone, the Yeates soil has poor permeability and runoff is normally quite rapid. Roots penetrate to bedrock and soil reaction ranges from neutral to slightly acidic (Erickson and Mortensen, 1974). The soil texture is loam with a neutral pH (7.0). The effective rooting depth was estimated at 14 inches and the upper soil profile and soil surface are rocky. The combined relative cover of vegetation, litter, and cryptogamic crust (protective ground cover) is 81% and relative bare ground cover is only 5%. Due to the high protective ground cover, little erosion is occurring. The 2006 erosion condition class rating was stable.

#### Browse

Browse is sparse and the key browse species, mountain big sagebrush and antelope bitterbrush, provided less than 1% cover combined in 2006. Mountain big sagebrush density was 40 plants/acre and low sagebrush and antelope bitterbrush densities were 20 plants/acre.

#### Herbaceous Understory

The herbaceous understory is dominated by bluebunch wheatgrass, which provided 20% cover in 2006. Seven species of grasses were sampled, 2 of which were annuals. Annual grasses provided less than 1% cover. Oniongrass and Sandbergs bluegrass both provided substantial cover (1 and 4%, respectively). Twenty-six species of forbs were sampled in 2006, 14 of which were annuals. Perennial forbs provided 14% cover. Western yarrow, aster, and desert parsley all provided substantial cover. Annual forbs provided 11% cover, 4% was provided by storksbill.

The 2006 Desirable Components Index score was poor due to low browse cover.

2006 winter range condition (DC Index) – poor (41) Mid-level potential scale

#### HERBACEOUS TRENDS --

Management unit 02R, Study no: 17

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron spicatum	305	20.13
G	Bromus japonicus (a)	10	.03
G	Bromus tectorum (a)	138	.59
G	Koeleria cristata	1	.03

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Melica bulbosa	38	1.43
G	Poa bulbosa	11	.94
G	Poa secunda	222	3.05
Total for Annual Grasses		148	0.62
Total for Perennial Grasses		577	25.60
Total for Grasses		725	26.22
F	Achillea millefolium	51	2.49
F	Agoseris glauca	69	.51
F	Alyssum alyssoides (a)	19	.07
F	Allium sp.	28	.09
F	Artemisia ludoviciana	1	.03
F	Aster sp.	106	4.72
F	Astragalus sp.	8	.16
F	Collomia linearis (a)	97	.29
F	Collinsia parviflora (a)	197	.69
F	Crepis acuminata	3	.03
F	Draba sp. (a)	63	.19
F	Epilobium brachycarpum (a)	144	1.58
F	Eriogonum cernuum (a)	91	3.90
F	Erodium cicutarium (a)	190	3.75
F	Erigeron pumilus	4	.30
F	Galium aparine (a)	2	.00
F	Hackelia patens	21	.54
F	Holosteum umbellatum (a)	196	.85
F	Lappula occidentalis (a)	33	.05
F	Lactuca serriola	7	.02
F	Lomatium sp.	129	4.82
F	Madia glomerata (a)	3	.00
F	Microsteris gracilis (a)	89	.34
F	Polygonum douglasii (a)	21	.05
F	Ranunculus testiculatus (a)	29	.11
F	Tragopogon dubius	19	.31
Total for Annual Forbs		1174	11.92
Total for Perennial Forbs		446	14.06
Total for Forbs		1620	25.98

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

BROWSE TRENDS --

Management unit 02R, Study no: 17

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier alnifolia	0	-
B	Artemisia arbuscula	1	-
B	Artemisia tridentata vaseyana	2	.38
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Gutierrezia sarothrae	3	.30
B	Purshia tridentata	1	.30
Total for Browse		7	0.98

CANOPY COVER, LINE INTERCEPT --  
Management unit 02R, Study no: 17

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	.10
Purshia tridentata	.23

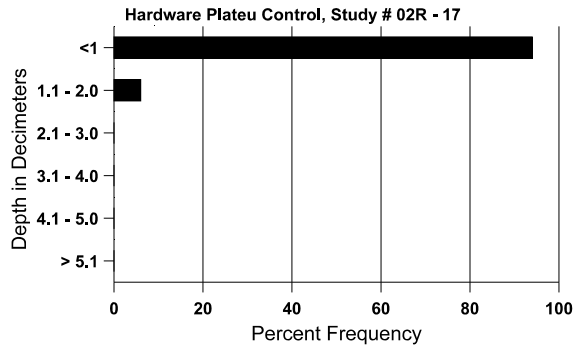
BASIC COVER --  
Management unit 02R, Study no: 17

Cover Type	Average Cover %
	'06
Vegetation	46.63
Rock	13.80
Pavement	2.02
Litter	27.45
Cryptogams	21.06
Bare Ground	6.31

SOIL ANALYSIS DATA --  
Herd Unit 2R, Study # 17, Study Name: Hardware Plateau Control

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	ppm P	ppm K	dS/m
5.67	-	7.0	38.6	35.2	26.3	3.1	30.0	332.8	0.8

# Stoniness Index



## PELLET GROUP DATA --

Management unit 02R, Study no: 17

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	14	-
Moose	1	-
Elk	33	38 (94)
Deer	28	58 (142)
Cattle	6	32 (79)

## BROWSE CHARACTERISTICS --

Management unit 02R, Study no: 17

		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>Amelanchier alnifolia</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	21/26
<i>Artemisia arbuscula</i>												
06	<b>20</b>	-	-	-	20	-	100	0	100	100	100	10/22
<i>Artemisia tridentata vaseyana</i>												
06	<b>40</b>	-	-	40	-	120	50	0	-	-	0	30/42
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	9/11
<i>Gutierrezia sarothrae</i>												
06	<b>140</b>	-	40	100	-	-	0	0	-	-	0	9/12
<i>Purshia tridentata</i>												
06	<b>20</b>	-	-	-	20	20	0	100	100	-	0	32/58



## DISCUSSION

### Grazing Comparison of Hardware Plateau Control (2R-17) and Hardware Plateau (2-13)

#### 2006 Pretreatment

The Control and Range Trend studies are not comparable. The control fence was placed 300-400 feet too far to the east on the top of the plateau. The Range Trend study is located on the steep 50% slope below the fenced control area that is on a 22% slope. The cattle had heavily grazed the area around the control fence, but had stopped abruptly at the edge of the ridge, which left a distinctive line. It was also obvious that the cattle had very lightly grazed the Hardware Plateau study. The composition of browse was not comparable either. In previous readings, the browse cover at Hardware Plateau study was 4-6% and the browse cover of the Control was less than 1%.

Trend Study 02R-18-06

Study site name: Pole Hollow Control .

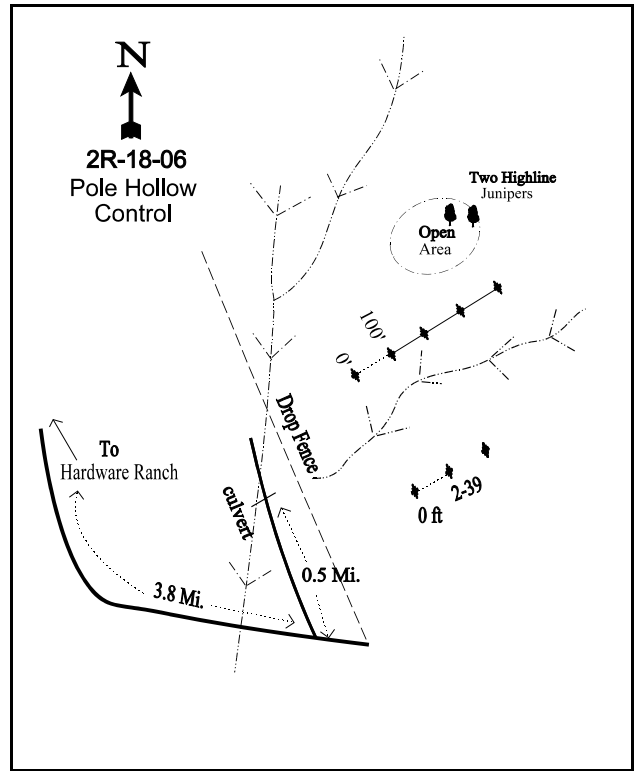
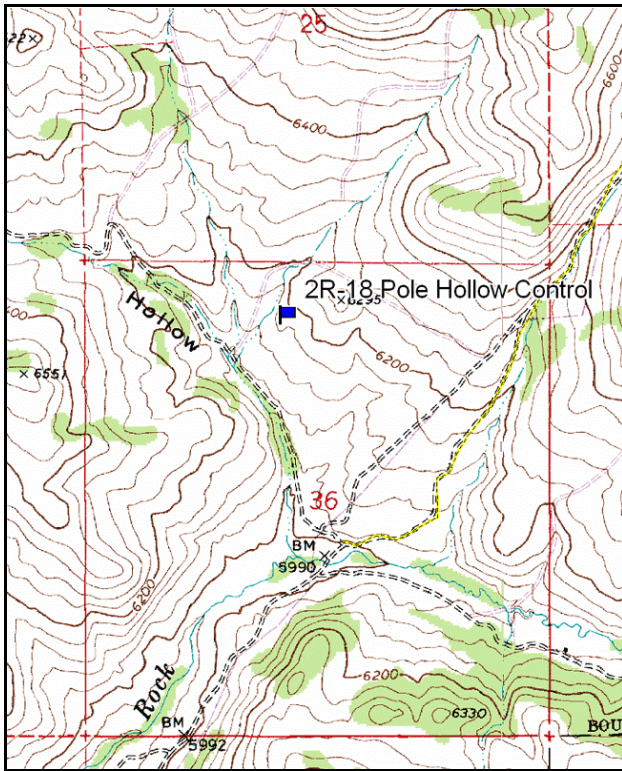
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 13 degrees magnetic.

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

LOCATION DESCRIPTION

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Take a left and travel up Pole Hollow for 0.5 miles to a culvert. From the open area, walk 105 paces at a bearing of approximately 65 degrees magnetic to the 0-foot baseline stake. The baseline runs at a bearing of 13 degrees magnetic. Browse tag #159.



Map name: Boulder Mountain

Diagrammatic Sketch

Township 11N , Range 3E , Section 36

UTM (NAD 83) 12T, 4611293N 454070E

## DISCUSSION

### Pole Hollow Control - Study No. 2R-18

#### Study Information

This study was established in Pole Hollow approximately 3.5 miles north of the Hardware Ranch office (elevation: 6,200 feet, slope: 12%, aspect: southwest). It was established as part of an intensive grazing project conducted on Hardware Ranch to improve browse composition. This study is to act as a fenced control in a comparison with the permanent Range Trend study Pole Hollow Spring (2-39), which is located 300 feet to the east on an adjacent ridge. Cattle had not been allowed to graze the area yet for the season when the study was read in 2006. In 2006, the pellet group estimates were 2 elk, 11 deer, 15 cow, and 1 moose days use/acre (5 edu/ha, 26 ddu/ha, 38 cdu/ha, and 2 mdu/ha). Sage grouse pellets were also sampled at a rate of 26 pellets/acre. The cow pats were remnants of grazing from previous years.

#### Soil

The soil is a shallow clay loam with an effective rooting depth of 16 inches. The soil organic matter is high at 6% and has a neutral pH (6.9). A small percentage of gravel occurs in the soil profile. The dense vegetation prevents erosion. In 2006, relative protective ground cover (vegetation, litter, and cryptogams) was 89% and relative bare ground cover was only 10%. The majority of the vegetation cover is provided by perennial species. The 2006 soil erosion condition class rating was stable.

#### Browse

The plant community is dominated by dense shrubs. The key browse species are saskatoon serviceberry, mountain big sagebrush, and antelope bitterbrush. In 2006, sagebrush and bitterbrush provided 17% cover. Sagebrush density was 4,320 plants/acre, 80% of which are mature and 17% are decadent. Young plants make up 3% of the population and plants classified as dying make up 5% of the population. Use on the sagebrush in 2006 was light to moderate. Sagebrush leader growth averaged 2.1 inches in 2006. The bitterbrush density was 960 plants/acre in 2006, 92% of which were mature and the other 8% were decadent. Use on the sagebrush was light to moderate in 2006. Bitterbrush leader growth averaged 3.6 inches in 2006. Serviceberry density was 320 plants/acre in 2006, 69% of which were mature, 19% were young, and 13% were decadent. Use in 2006 was moderate to heavy. Serviceberry leader growth averaged 5.1 inches in 2006.

Other browse specie sampled include: stickyleaf low rabbitbrush, oregon grape, chokecherry, currant, Wood's rose, and snowberry.

#### Herbaceous Understory

The herbaceous understory is dominated by a diverse community of perennial grasses and forbs. Fifteen species of grasses, 2 of which were annuals, and 36 species of forbs, 10 of which were annuals, were sampled in 2006. Perennial grasses provided 14% cover combined in 2006. The dominant perennial grasses in 2006 were bluebunch wheatgrass at 6% cover, Kentucky bluegrass at 3% cover, and Letterman's needlegrass at 2% cover. Combined perennial forb cover was nearly 23% in 2006. The dominant perennial forbs in 2006 included: Western yarrow at 5% cover; pacific aster at 6% cover; bastard toadflax at 2% cover; silvery lupine at 3% cover; and low penstemon, showy goldeneye, and mule's ear at 1% cover. Cheatgrass and Japanese brome were sampled in 2006, but provided less than 1% cover combined.

The 2006 Desirable Components Index score was good to excellent due to excellent browse cover and excellent perennial grass and forb cover.

2006 winter range condition (DC Index) – good to excellent (80) Mid-level potential scale

HERBACEOUS TRENDS --

Management unit 02R, Study no: 18

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron spicatum	176	5.77
G	Bromus inermis	2	.15
G	Bromus japonicus (a)	15	.33
G	Bromus tectorum (a)	8	.30
G	Carex sp.	14	.27
G	Koeleria cristata	30	.57
G	Melica bulbosa	1	.01
G	Poa bulbosa	15	.39
G	Poa fendleriana	7	.18
G	Poa pratensis	161	2.75
G	Poa secunda	15	.94
G	Sitanion hystrix	11	.19
G	Stipa columbiana	3	.03
G	Stipa lettermani	103	2.48
G	Stipa pinetorum	5	.38
Total for Annual Grasses		23	0.63
Total for Perennial Grasses		543	14.13
Total for Grasses		566	14.77
F	Achillea millefolium	95	4.53
F	Agoseris glauca	1	.03
F	Allium sp.	110	.62
F	Artemisia ludoviciana	7	.59
F	Aster chilensis	208	5.76
F	Astragalus convallarius	23	.64
F	Balsamorhiza macrophylla	1	.15
F	Castilleja chromosa	-	.06
F	Calochortus nuttallii	8	.04
F	Cirsium undulatum	2	.15
F	Collomia linearis (a)	22	.05
F	Comandra pallida	68	1.54
F	Collinsia parviflora (a)	5	.01
F	Cordylanthus ramosus (a)	61	2.23
F	Cryptantha sp.	3	.00
F	Epilobium brachycarpum (a)	16	.05
F	Eriogonum umbellatum	12	.54
F	Geranium richardsonii	10	.64

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
F	Holosteum umbellatum (a)	1	.00
F	Lactuca serriola	5	.41
F	Lomatium sp.	7	.09
F	Lupinus argenteus	59	2.96
F	Machaeranthera canescens	2	.03
F	Madia glomerata (a)	3	.01
F	Microsteris gracilis (a)	1	.00
F	Navarretia intertexta (a)	1	.03
F	Penstemon humilis	30	1.18
F	Phlox longifolia	1	.03
F	Potentilla diversifolia	7	.21
F	Polygonum douglasii (a)	5	.01
F	Senecio integerrimus	6	.09
F	Taraxacum officinale	4	.04
F	Tragopogon dubius	5	.04
F	Veronica biloba (a)	1	.00
F	Viguiera multiflora	51	1.05
F	Wyethia amplexicaulis	10	1.11
Total for Annual Forbs		116	2.41
Total for Perennial Forbs		735	22.60
Total for Forbs		851	25.01

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

BROWSE TRENDS --

Management unit 02R, Study no: 18

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier alnifolia	15	1.85
B	Artemisia tridentata vaseyana	83	17.21
B	Chrysothamnus viscidiflorus viscidiflorus	65	2.60
B	Juniperus scopulorum	1	.38
B	Mahonia repens	17	.25
B	Prunus virginiana	1	.15
B	Purshia tridentata	35	16.52
B	Ribes sp.	0	-
B	Rosa woodsii	10	.54
B	Symphoricarpos oreophilus	46	8.00
Total for Browse		273	47.51

CANOPY COVER, LINE INTERCEPT --

Management unit 02R, Study no: 18

Species	Percent Cover
	'06
Amelanchier alnifolia	1.25
Artemisia tridentata vaseyana	22.46
Chrysothamnus viscidiflorus viscidiflorus	3.65
Mahonia repens	.28
Prunus virginiana	.03
Purshia tridentata	18.91
Rosa woodsii	.51
Symphoricarpos oreophilus	11.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 02R, Study no: 18

Species	Average leader growth (in)
	'06
Amelanchier alnifolia	5.1
Artemisia tridentata vaseyana	2.1
Purshia tridentata	3.6

BASIC COVER --

Management unit 02R, Study no: 18

Cover Type	Average Cover % '06
Vegetation	69.62
Rock	1.14
Pavement	.20
Litter	48.26
Bare Ground	13.27

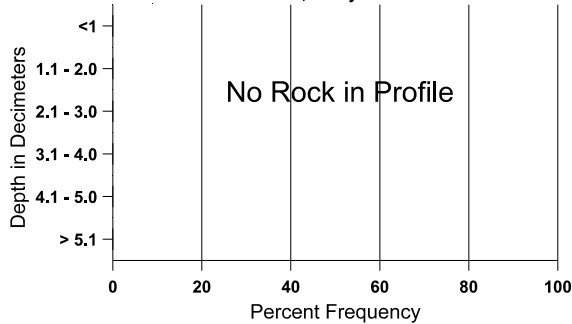
SOIL ANALYSIS DATA --

Herd Unit 2R, Study # 18, Study Name: Pole Hollow Control

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
16.42	62 (16.14)	6.9	33.3	31.8	34.9	5.9	34.7	352.0	0.9

### Stoniness Index

Pole Hollow Control, Study # 02R - 18



PELLET GROUP DATA --

Management unit 02R, Study no: 18

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Elk	2	2 (5)
Deer	4	11 (26)
Cattle	3	15 (38)

BROWSE CHARACTERISTICS --  
Management unit 02R, Study no: 18

		Age class distribution (plants per acre)					Utilization					
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier alnifolia</i>												
06	<b>320</b>	20	60	220	40	-	13	31	13	-	0	29/28
<i>Artemisia tridentata vaseyana</i>												
06	<b>4320</b>	300	120	3460	740	220	15	0	17	5	5	29/35
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>2500</b>	-	160	2200	140	-	0	.80	6	4	5	17/18
<i>Juniperus scopulorum</i>												
06	<b>20</b>	20	-	20	-	-	0	0	-	-	0	49/33
<i>Mahonia repens</i>												
06	<b>1560</b>	-	-	1560	-	-	0	0	-	-	0	4/5
<i>Prunus virginiana</i>												
06	<b>40</b>	40	-	40	-	-	0	0	-	-	0	9/5
<i>Purshia tridentata</i>												
06	<b>960</b>	20	-	880	80	-	40	13	8	2	2	33/57
<i>Ribes sp.</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	56/26
<i>Rosa woodsii</i>												
06	<b>640</b>	-	100	540	-	-	0	0	-	-	0	13/10
<i>Symphoricarpos oreophilus</i>												
06	<b>2420</b>	280	240	2140	40	-	.82	0	2	-	0	35/34



## DISCUSSION

### Grazing Comparison of Pole Hollow Control (2R-18) and Pole Hollow Spring (2-39)

#### 2006 Pretreatment

The two studies are very comparable, however the brush is very dense and many not show significant increases in browse following the intensive grazing treatment. The browse cover is very similar between the two studies. The Pole Hollow Spring study had higher sagebrush cover, but lower perennial grass and forb cover in 2006. This is reflected in the slightly higher relative bare ground cover on the Pole Hollow Spring study.

Browse composition was slightly different between the studies. Gambel oak was sampled on the Pole Hollow Spring study, but not on the control. However, currant and chokecherry were sampled on the control, but not the Pole Hollow Spring study.

Trend Study 2R-19-06

Study site name: Squaw Flat South.

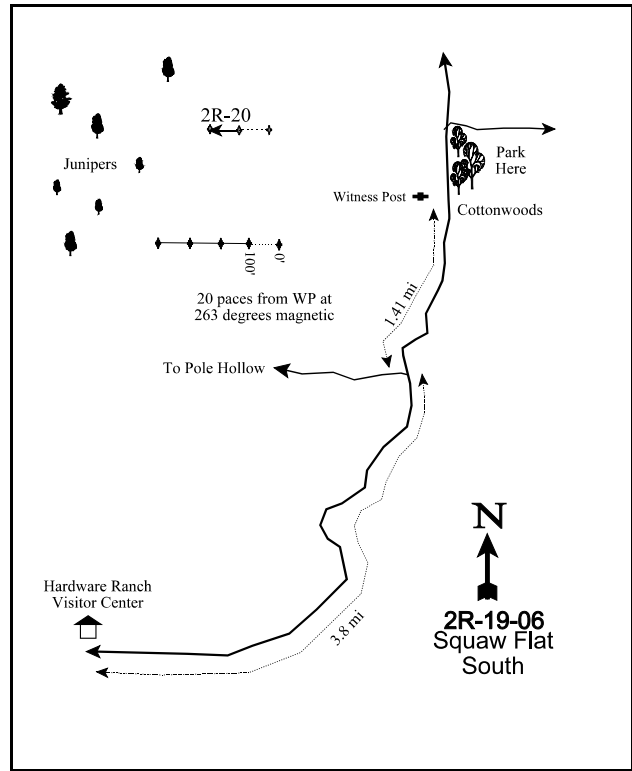
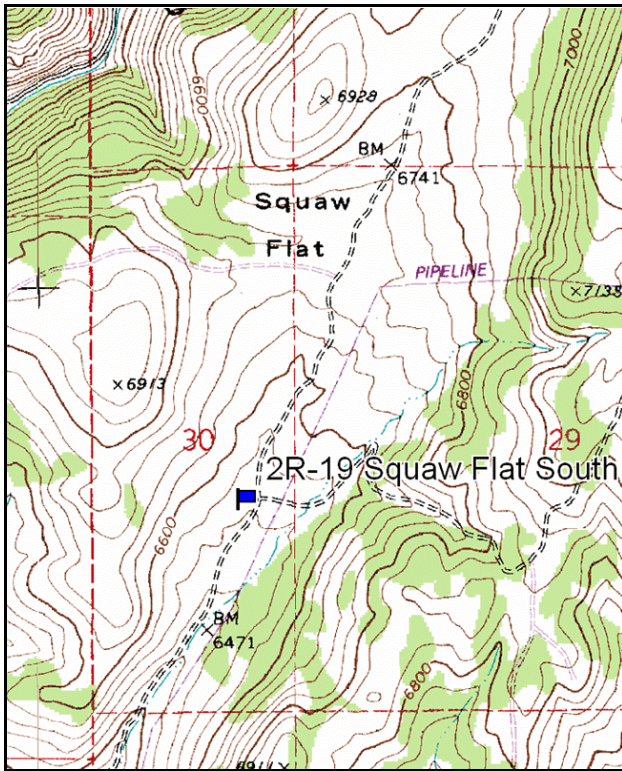
Vegetation type: Low Sagebrush.

Compass bearing: frequency baseline 282 degrees magnetic.

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

LOCATION DESCRIPTION

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. From there stay straight for another 1.4 miles to a witness post on the left side of the road. Park next to the stand of large cottonwoods on the right. From the witness post walk 20 paces at 263 degrees magnetic to the 0 foot stake with browse tag #157.



Map name: Boulder Mountain

Diagrammatic Sketch

Township 11N, Range 4E, Section 30.

UTM (NAD 83) 12T 4612233N 455438E

## DISCUSSION

### Squaw Flat South - Study No. 2R-19

#### Study Information

This study was established as part of an intensive grazing project conducted on Hardware Ranch to improve browse composition. It is located approximately 4 miles north of the Hardware Ranch Visitor's Center and just south of the USFS boundary (elevation: 6,550 feet, slope: 11%, aspect: south). This study was established on an area dominated by mule's ear, bulbous bluegrass, and low sagebrush. The purpose of the grazing project was to intensively graze the mule's ear and grasses and stimulate the growth of browse species. A parallel companion study, Squaw Flat North (2R-20), was established 140 feet to the north. As of the 2006 reading, neither study had been designated as control or treatment and electric fence had not been installed. The 2006 pellet group transect estimates were 1 elk, 2 deer, 5 cow, and 1 sheep days use/acre (3 edu/ha, 5 ddu/ha, 13 cdu/ha, and 3 sdu/ha). Cow pats sampled were from the previous summer.

#### Soil

The soil is in the Goring-Obay complex series, which consists of brown to dark grayish brown, slightly acidic, silt loam A horizons and thick, reddish brown, slightly acidic, silty clay B2t horizons with prismatic structure and brown, mildly alkaline, silty clay C horizons (USDA-NRCS 2006). The soil texture is a loam with a neutral pH (7.1). The effective rooting depth is 8 inches and the soil profile is very rocky. The combined relative vegetation and litter cover are 79% and relative bare ground cover is 2%. The soil erosion condition class rating was stable in 2006.

#### Browse

Low sagebrush is the dominant browse species. It provided 24% cover in 2006 with a density of 16,280 plants/acre. Mature individuals made up 77% of the population in 2006; young plants made up 2% and decadent made up 21%. Plants classified as dying made up 8% of the population. The average sagebrush height was 11 inches and use was light. Saskatoon serviceberry was also sampled at a very low density, but was very heavily hedged.

#### Herbaceous Understory

The herbaceous understory is dominated by two species, bulbous bluegrass and mule's ear. Bulbous bluegrass provided 24% cover and mule's ear provided 16%. Other grasses which provided substantial grass cover include: blubunch wheatgrass (1% cover), Sandberg bluegrass (2% cover), and Letterman needlegrass (6% cover). Overall, 11 species of grasses, all of which were perennial, were sampled in 2006. Seven species of forbs were sampled, 2 of which were annuals.

The 2006 Desirable Components Index score was good due to excellent browse cover, moderate desirable perennial grass cover, and excellent perennial forb cover.

2006 winter range condition (DC Index) – good (70) Mid-level potential scale

#### HERBACEOUS TRENDS --

Management unit 02R, Study no: 19

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron spicatum	105	1.25
G	Agropyron trachycaulum	1	.03
G	Danthonia unispicata	13	.36

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Koeleria cristata	5	.06
G	Melica bulbosa	5	.04
G	Poa bulbosa	417	24.14
G	Poa pratensis	10	.10
G	Poa secunda	78	1.83
G	Sitanion hystrix	5	.03
G	Stipa columbiana	9	.33
G	Stipa lettermani	177	6.19
Total for Annual Grasses		0	0
Total for Perennial Grasses		825	34.39
Total for Grasses		825	34.39
F	Achillea millefolium	25	.61
F	Agoseris glauca	40	.11
F	Allium sp.	5	.01
F	Aster chilensis	31	.52
F	Epilobium brachycarpum (a)	11	.05
F	Madia glomerata (a)	23	.37
F	Wyethia amplexicaulis	173	15.98
Total for Annual Forbs		34	0.42
Total for Perennial Forbs		274	17.25
Total for Forbs		308	17.68

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

#### BROWSE TRENDS --

Management unit 02R, Study no: 19

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier alnifolia	1	-
B	Artemisia arbuscula	99	23.88
B	Eriogonum heracleoides	0	.00
B	Symphoricarpos oreophilus	0	-
Total for Browse		100	23.88

CANOPY COVER, LINE INTERCEPT --  
 Management unit 02R, Study no: 19

Species	Percent Cover
	'06
Artemisia arbuscula	28.85

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 02R, Study no: 19

Species	Average leader growth (in)
	'06
Artemisia arbuscula	0.7

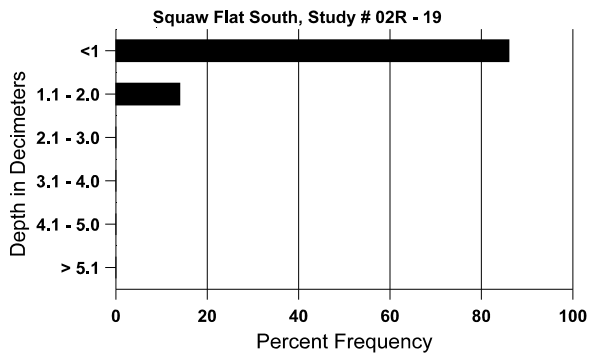
BASIC COVER --  
 Management unit 02R, Study no: 19

Cover Type	Average Cover %
	'06
Vegetation	63.14
Rock	20.35
Pavement	.54
Litter	27.97
Cryptogams	.79
Bare Ground	1.77

SOIL ANALYSIS DATA --  
 Herd Unit 2R, Study # 19, Study Name: Squaw Flat South

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
8.43	72.4 (9.84)	7.1	38.0	37.4	24.6	3.4	19.3	211.2	0.7

### Stoniness Index



PELLET GROUP DATA --

Management unit 02R, Study no: 19

Type	Quadrat Frequency	Days use per acre (ha)
	'06	
Elk	-	1 (3)
Deer	2	2 (5)
Cattle	2	5 (13)
Sheep	-	1 (3)

BROWSE CHARACTERISTICS --

Management unit 02R, Study no: 19

		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>Amelanchier alnifolia</i>												
06	<b>20</b>	-	-	20	-	-	0	100	-	-	0	23/39
<i>Artemisia arbuscula</i>												
06	<b>16280</b>	380	320	12580	3380	820	0	0	21	8	8	11/18
<i>Eriogonum heracleoides</i>												
06	<b>0</b>	20	-	-	-	-	0	0	-	-	0	-/-
<i>Symphoricarpos oreophilus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	10/26

Trend Study 2R-20-06

Study site name: Squaw Flat North.

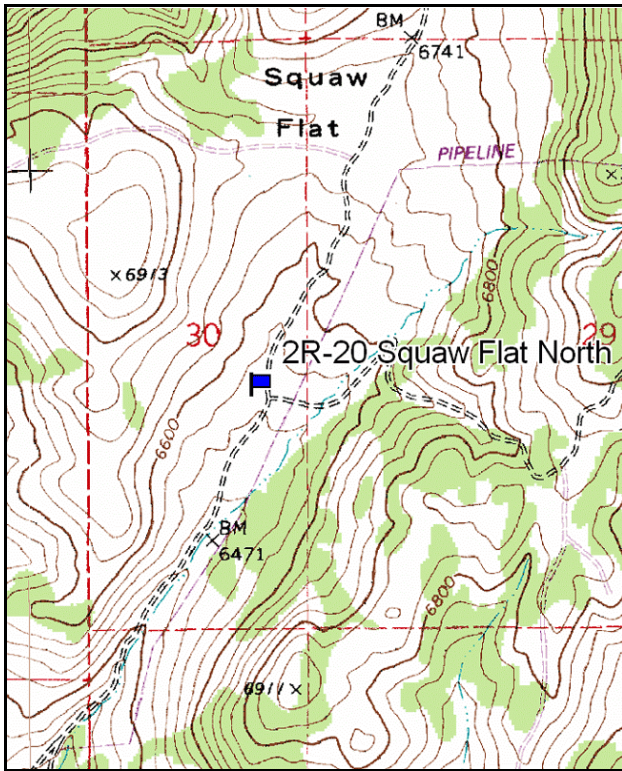
Vegetation type: Low Sagebrush.

Compass bearing: frequency baseline 294 degrees magnetic.

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

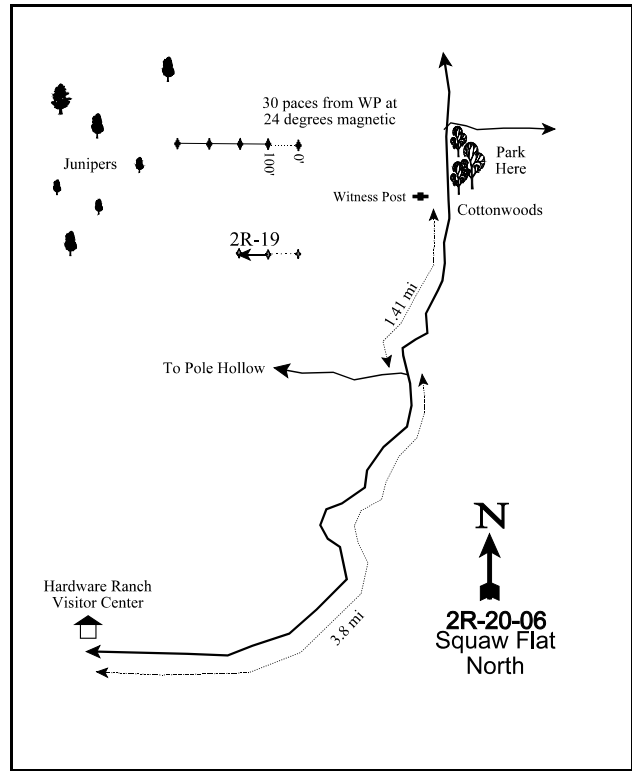
LOCATION DESCRIPTION

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. From there stay straight for another 1.4 miles to a witness post on the left side of the road. Park next to the stand of large cottonwoods on the right. From the witness post walk 30 paces at 24 degrees magnetic to the 0 foot stake with browse tag #158.



Map name: Boulder Mountain

Township 11N, Range 4E, Section 30.



Diagrammatic Sketch

UTM (NAD 83) 12T 4612274N 455472E

## DISCUSSION

### Squaw Flat North - Study No. 2R-20

#### Study Information

This study was established as part of an intensive grazing project conducted on Hardware Ranch to improve browse composition. It is located approximately 4 miles north of the Hardware Ranch Visitor's Center and just south of the USFS boundary (elevation: 6,550 feet, slope: 9%, aspect: south). This study was established on an area dominated by mule's ear, bulbous bluegrass, and low sagebrush. The purpose of the grazing project was to intensively graze the mule's ear and grasses and stimulate the growth of browse species. A parallel companion study, Squaw Flat South (2R-19), was established 140 feet to the south. As of the 2006 reading, neither study had been designated as control or treatment and electric fence had not been installed. The 2006 pellet group transect estimates were 5 elk, 1 deer, 5 cow, and 1 sheep days use/acre (13 edu/ha, 2 ddu/ha, 13 cdu/ha, and 3 sdu/ha). Cow pats sampled were from the previous summer.

#### Soil

The soil is in the Goring-Obay complex series, which consists of brown to dark grayish brown, slightly acidic, silt loam A horizons and thick, reddish brown, slightly acidic, silty clay B2t horizons with prismatic structure and brown, mildly alkaline, silty clay C horizons (USDA-NRCS 2006). The soil texture is a loam with a neutral pH (7.1). The effective rooting depth is 8 inches and the soil profile is very rocky. The combined relative vegetation and litter cover are 72% and relative bare ground cover is 3%. The soil erosion condition class rating was stable in 2006.

#### Browse

Low sagebrush is the dominant browse species. It provided 21% cover in 2006 with a density of 10,980 plants/acre. Mature individuals made up 77% of the population in 2006; young plants made up 3% and decadent made up 20%. Plants classified as dying made up 10% of the population. The average sagebrush height was 10 inches and use was light. Saskatoon serviceberry was also sampled at a very low density, but was moderately hedged.

#### Herbaceous Understory

The herbaceous understory is dominated by two species, bulbous bluegrass and mule's ear. Bulbous bluegrass provided 25% cover and mule's ear provided 16%. Other grasses which provided substantial grass cover include: blubunch wheatgrass (3% cover), oniongrass (1% cover), Sandberg bluegrass (4% cover), and Letterman needlegrass (2% cover). Overall, 8 species of grasses, all of which were perennial, were sampled in 2006. Ten species of forbs were sampled, 3 of which were annuals.

The 2006 Desirable Components Index score was good due to excellent browse cover, moderate desirable perennial grass cover, and excellent perennial forb cover.

2006 winter range condition (DC Index) – good (71) Mid-level potential scale

#### HERBACEOUS TRENDS --

Management unit 02R, Study no: 20

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron spicatum	143	2.73
G	Agropyron trachycaulum	-	.00
G	Melica bulbosa	47	1.41



T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Poa bulbosa	401	25.13
G	Poa fendleriana	2	.00
G	Poa pratensis	1	.03
G	Poa secunda	139	4.11
G	Stipa lettermani	63	1.72
Total for Annual Grasses		0	0
Total for Perennial Grasses		796	35.17
Total for Grasses		796	35.17
F	Achillea millefolium	21	.33
F	Agoseris glauca	20	.07
F	Allium sp.	8	.02
F	Aster chilensis	20	.21
F	Delphinium nuttallianum	3	.00
F	Epilobium brachycarpum (a)	16	.08
F	Erigeron divergens	1	.03
F	Holosteum umbellatum (a)	2	.00
F	Madia glomerata (a)	24	.72
F	Wyethia amplexicaulis	146	10.39
Total for Annual Forbs		42	0.81
Total for Perennial Forbs		219	11.08
Total for Forbs		261	11.89

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

#### BROWSE TRENDS --

Management unit 02R, Study no: 20

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier alnifolia	3	.03
B	Artemisia arbuscula	99	20.85
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Juniperus scopulorum	1	-
B	Mahonia repens	0	-
B	Purshia tridentata	0	-
B	Symphoricarpos oreophilus	0	-
Total for Browse		103	20.88

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 02R, Study no: 20

Species	Average leader growth (in)
	'06
Artemisia arbuscula	0.9

CANOPY COVER, LINE INTERCEPT --  
Management unit 02R, Study no: 20

Species	Percent Cover
	'06
Amelanchier alnifolia	.50
Artemisia arbuscula	21.93

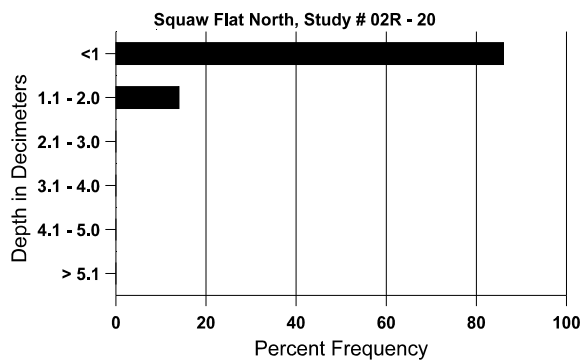
BASIC COVER --  
Management unit 02R, Study no: 20

Cover Type	Average Cover %
	'06
Vegetation	63.62
Rock	26.38
Pavement	1.33
Litter	21.60
Cryptogams	1.11
Bare Ground	3.23

SOIL ANALYSIS DATA --  
Herd Unit 2R, Study # 20, Study Name: Squaw Flat North

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	ppm P	ppm K	dS/m
8.43	72.4 (9.84)	7.1	38.0	37.4	24.6	3.4	19.3	211.2	0.7

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 02R, Study no: 20

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Sheep	1	1 (3)
Elk	2	5 (13)
Deer	1	1 (2)
Cattle	2	5 (13)

BROWSE CHARACTERISTICS --  
 Management unit 02R, Study no: 20

		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>Amelanchier alnifolia</i>												
06	<b>60</b>	-	-	60	-	-	100	0	-	-	0	24/39
<i>Artemisia arbuscula</i>												
06	<b>10980</b>	620	360	8440	2180	760	5	0	20	10	13	10/19
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	9/14
<i>Juniperus scopulorum</i>												
06	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
<i>Mahonia repens</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	4/7
<i>Purshia tridentata</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	18/46
<i>Symphoricarpos oreophilus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	17/33

## DISCUSSION

### Grazing Comparison of Squaw Flat South (2R-19) and Squaw Flat North (2R-20)

#### 2006 Pretreatment

As of the reading of the two studies in the middle of July 2006, cattle had not grazed them. The mule's ear was beginning to dry out and become extremely unpalatable for cattle.

The two studies area quite similar due to their close proximity. There appear to be no significant differences between grass cover values between the studies. Perennial forb cover is 6% higher at the Squaw Flat South study. The low sagebrush cover is 3% higher and density is about 5,300 plants/scre higher at the South study than the North study. Otherwise, the two studies are near identical.

The DCI scores of the two studies were nearly identical.

Trend Study 3R-2-06

Study site name: Middle Fork Spray .

Vegetation type: Mountain Big Sagebrush .

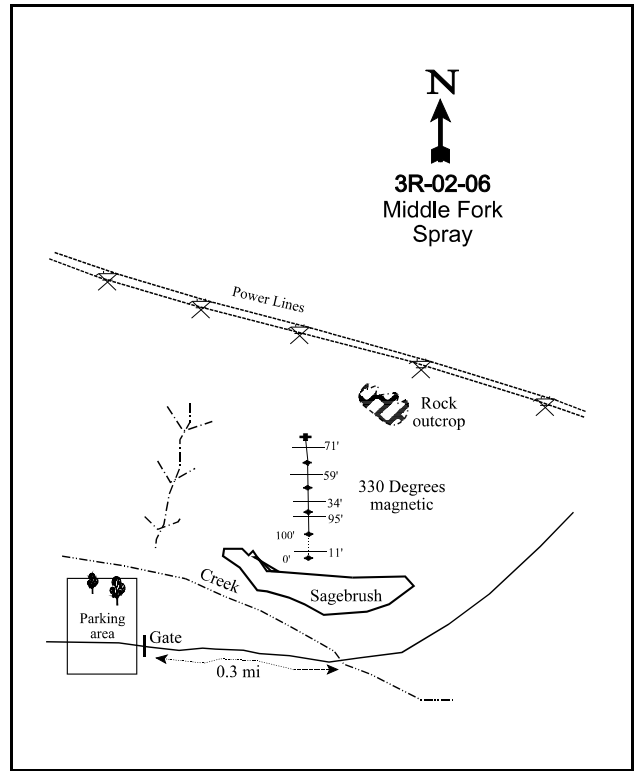
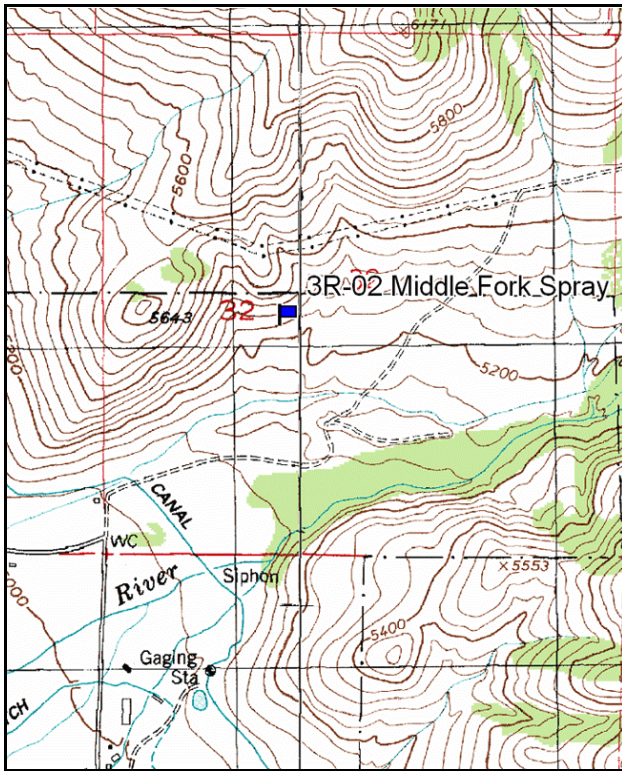
Compass bearing: frequency baseline 330 degrees magnetic.

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

No Rebar.

LOCATION DESCRIPTION

From the parking lot at the Middle Fork WMA drive through the gate 0.3 miles to a creek that crosses the road. From the creek and road crossing walk at 300 degrees magnetic to the base of the hill just above the sagebrush to the 0 foot stake with a browse tag #195.



Map name: Browns Hole

Diagrammatic Sketch

Township 11S, Range 4E, Section 30 .

UTM (NAD 83) 12T 4572268N 437082E

## DISCUSSION

### Middle Fork Spray - Study No. 3R-2

#### Study Information

This study was established to monitor a treatment in Middle Fork canyon, approximately three miles northeast of Huntsville (elevation: 5,240 feet, slope: 38%, aspect: southeast). The vegetation appears to have been dominated by mountain big sagebrush, but is now dominated by weedy grasses. The planned treatment was to spray herbicide to control cheatgrass and bulbous bluegrass and aerially seed with desirable species. The area is heavily used by elk. The 2006 pellet group transect data estimates were 33 elk and 6 deer days use/acre (81 edu/ha and 15 ddu/ha). All pellets were from winter use.

#### Soil

The soil is in the Durfee series, which consists of deep, well drained soils that formed in material weathered from sandstone and quartzite on very steep mountain slopes (USDA-NRCS 2006). The effective rooting depth is only 6 inches and the soil profile is very rocky. The combined relative vegetation and litter cover was 82% in 2006. Relative bare ground cover was only 4% in 2006. Erosion is not a problem and the soil erosion condition class was stable in 2006.

#### Browse

No browse species were sampled in the cover or density measurements in 2006. Mountain big sagebrush, prickly pear cactus, and Wood's rose were sampled in the height/crown measurements, however.

#### Herbaceous Understory

The herbaceous understory is dominated by grasses. Total grass cover was 35% in 2006. Cheatgrass provided 13% cover with a quadrat frequency of 98% in 2006. Bulbous bluegrass provided 14% cover with a quadrat frequency of 75%. The rest of grass cover was provided by bluebunch wheatgrass, at 8% cover. The forb composition is also weedy. Total forb cover was 15% in 2006. Dyer's woad was sampled in one quadrat in 2006. Common forbs desirable to big game include: Arrowleaf balsamroot, prickly lettuce, and yellow salsify. Arrowleaf balsamroot provided 4% cover, yellow salsify provided 2% cover, and prickly lettuce provided 1% cover in 2006.

The 2006 Desirable Components Index score was very poor due to the lack of browse cover, high annual grass cover, and low perennial grass cover.

2006 winter range condition (DC Index) – very poor (14) Mid-level potential scale

#### HERBACEOUS TRENDS --

Management unit 03R, Study no: 2

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron spicatum	140	7.58
G	Aristida purpurea	3	.00
G	Bromus japonicus (a)	6	.03
G	Bromus tectorum (a)	400	13.47
G	Poa bulbosa	278	13.86
G	Poa secunda	12	.27
Total for Annual Grasses		406	13.51

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
	Total for Perennial Grasses	433	21.73
	Total for Grasses	839	35.24
F	<i>Achillea millefolium</i>	4	.15
F	<i>Agoseris glauca</i>	3	.00
F	<i>Artemisia ludoviciana</i>	9	.39
F	<i>Aster</i> sp.	18	1.14
F	<i>Balsamorhiza sagittata</i>	32	4.00
F	<i>Castilleja</i> sp.	5	.06
F	<i>Cirsium</i> sp.	3	.06
F	<i>Crepis acuminata</i>	5	.06
F	<i>Cymopterus</i> sp.	8	.04
F	<i>Epilobium brachycarpum</i> (a)	160	2.31
F	<i>Erodium cicutarium</i> (a)	34	.53
F	<i>Grindelia squarrosa</i>	3	.06
F	<i>Holosteum umbellatum</i> (a)	3	.00
F	<i>Isatis tinctoria</i>	2	.15
F	<i>Lappula occidentalis</i> (a)	10	.09
F	<i>Lactuca serriola</i>	50	1.31
F	<i>Lepidium</i> sp. (a)	5	.04
F	<i>Lupinus argenteus</i>	2	.03
F	<i>Madia glomerata</i> (a)	69	1.87
F	<i>Phlox longifolia</i>	30	.12
F	<i>Polygonum douglasii</i> (a)	1	.00
F	<i>Sisymbrium altissimum</i> (a)	-	.00
F	<i>Taraxacum officinale</i>	2	.15
F	<i>Tragopogon dubius</i>	122	2.29
F	<i>Verbascum blattaria</i>	2	.06
	Total for Annual Forbs	282	4.86
	Total for Perennial Forbs	300	10.10
	Total for Forbs	582	14.97

BASIC COVER --

Management unit 03R, Study no: 2

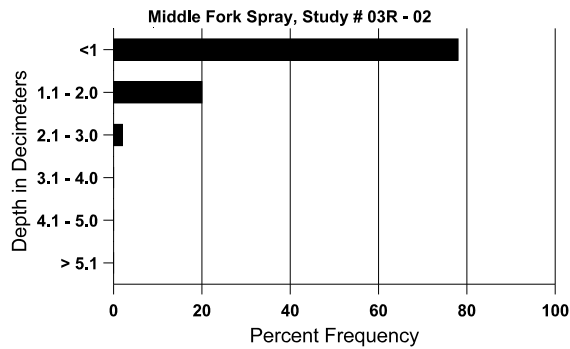
Cover Type	Average Cover % '06
Vegetation	50.45
Rock	14.40
Pavement	1.36
Litter	39.61
Cryptogams	.01
Bare Ground	4.82

SOIL ANALYSIS DATA --

Herd Unit 3R, Study # 2, Study Name: Middle Fork Spray

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
6.14	88.6 (7.32)	-	-	-	-	-	-	-	-

Stoniness Index



PELLET GROUP DATA --

Management unit 03R, Study no: 2

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Elk	8	33 (81)
Deer	10	6 (15)



BROWSE CHARACTERISTICS --  
 Management unit 03R, Study no: 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)
<i>Artemisia tridentata vaseyana</i>												
06	0	-	-	-	-	-	0	0	-	-	0	26/34
<i>Opuntia sp.</i>												
06	0	-	-	-	-	-	0	0	-	-	0	8/27
<i>Rosa woodsii</i>												
06	0	-	-	-	-	-	0	0	-	-	0	24/25

Trend Study 4R-3-06

Study site name: Clay Pit North Slope .

Vegetation type: Mountain Big Sagebrush .

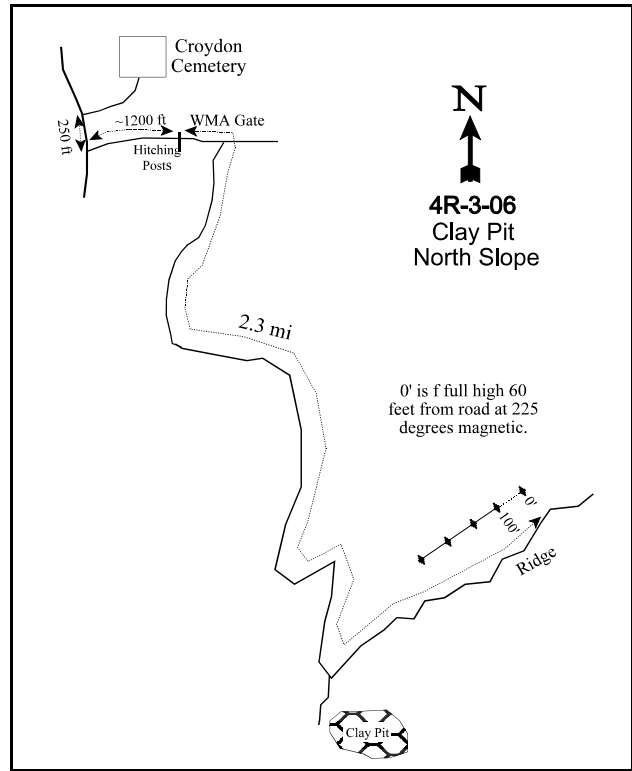
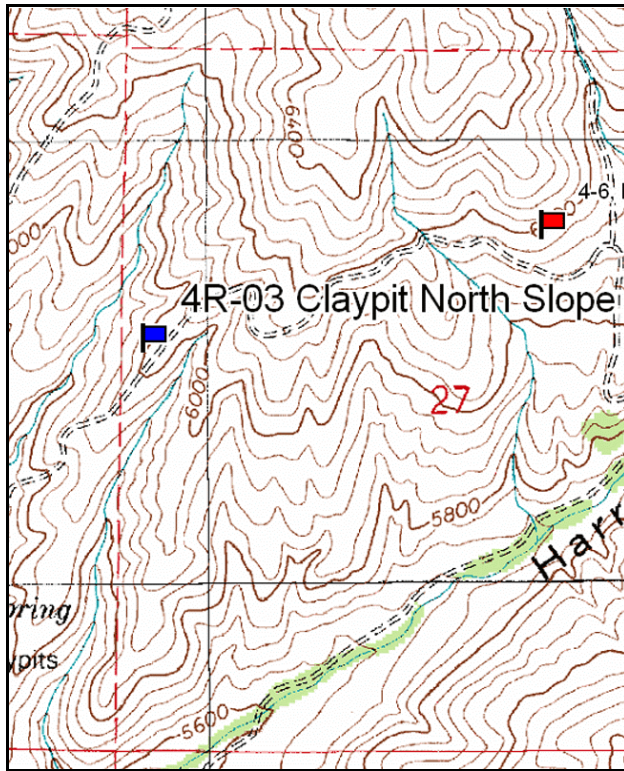
Compass bearing: frequency baseline 215 degrees magnetic.

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

LOCATION DESCRIPTION

About 250 feet from the Croydon cemetery road turn left onto a dirt road and drive approximately 1200 feet to the WMA gate. From the WMA gate, drive 2.3 miles staying right through the first fork in the road immediately after the WMA gate, then where the road splits to the right to a clay mine at about 1.8 miles stay left to a full high 0 ft stake on the left about 60 ft from the road. No browse tag.

\*\*\* Only read cover and nested frequency on belt 1.



Map name: Henefer

Diagrammatic Sketch

Township 4N , Range 4E , Section 27 .

UTM (NAD 83) 12T 4544720N 458791E

## DISCUSSION

### Claypit North Slope - Study No. 4R-3

#### Study Information

This study is located in a mountain big sagebrush community and winter range approximately 1.5 miles southeast of Croydon in the Echo-Henefer Wildlife Management Area (elevation: 6,000 feet, slope: 30%, aspect: northwest). The study was established in 2006 to monitor the effects of the sagebrush defoliator moth (*Aroga websterii*) on sagebrush populations. The defoliator moth had effected several sagebrush populations in northern Utah and the study was to monitor long-term effects of the pest. Two other studies, Claypit South Slope (4R-4) and Croydon Cemetery (4R-5), were also established in the area. On all 3 studies, browse density and line intercept cover were read on all 5 belts, but cover and nested frequency were only read on belt 1. The area is heavily utilized by big game. The 2006 pellet group data estimates were 15 elk, 96 deer, and 3 cow days use/acre (38 edu/ha, 236 ddu/ha, and 7 cdu/ha).

#### Soil

The soil is in the Horrocks-Cutoff complex series, which is moderately deep, well drained, moderately permeable and formed in glacial deposits, residuum, and colluvium derived from andesite, quartzite, sandstone, and conglomerate (USDA-NRCS 2006). The soil texture is a sandy clay loam with a neutral pH (7). The combined relative protective ground cover was 87% in 2006. Relative bare ground cover was 6% in 2006. Soil erosion is minimal.

#### Browse

The browse component is dominated by mountain big sagebrush, which provided 13% line intercept cover in 2006. The sagebrush density was 2,800 plants/acre with 36% of the individuals classified as decadent. Nineteen percent of the individuals were classified as dying. The reason for the high decadence and dying percentages is the infestation of the sagebrush defoliator moth (*Aroga websterii*). The moth had infested 64% of the population (1,780 plants/acre) in 2006. Sagebrush average leader growth was 2.6 inches in 2006. White rubber rabbitbrush and stickleaf low rabbitbrush were also sampled in 2006.

#### Herbaceous Understudy

The herbaceous understory was not completely sampled due to only sampling belt 1. Crested wheatgrass and Sandberg bluegrass were the dominant species in 2006. Cheatgrass was not sampled in 2006.

Desirable Components Index scores were not sampled for this study due to the different methods used to collect cover information.

#### HERBACEOUS TRENDS --

Management unit 04R, Study no: 3

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	52	3.18
G	Agropyron intermedium	4	.06
G	Agropyron smithii	-	.00
G	Agropyron spicatum	8	.24
G	Poa pratensis	1	.03
G	Poa secunda	51	1.75
Total for Annual Grasses		0	0

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
Total for Perennial Grasses		116	5.27
Total for Grasses		116	5.27
F	Alyssum alyssoides (a)	14	.03
F	Allium sp.	6	.01
F	Arabis sp.	5	.06
F	Collomia linearis (a)	4	.01
F	Collinsia parviflora (a)	27	.07
F	Cryptantha sp.	-	.00
F	Cymopterus sp.	5	.09
F	Gayophytum ramosissimum(a)	3	.00
F	Vicia americana	41	.55
F	Zigadenus paniculatus	2	.03
Total for Annual Forbs		48	0.11
Total for Perennial Forbs		59	0.75
Total for Forbs		107	0.87

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

#### BROWSE TRENDS --

Management unit 04R, Study no: 3

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata vaseyana	74	4.61
B	Chrysothamnus nauseosus albicaulis	2	-
B	Chrysothamnus viscidiflorus viscidiflorus	43	.36
Total for Browse		125	4.98

#### CANOPY COVER, LINE INTERCEPT --

Management unit 04R, Study no: 3

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	12.98
Chrysothamnus nauseosus albicaulis	1.76
Chrysothamnus viscidiflorus viscidiflorus	2.68

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 04R, Study no: 3

Species	Average leader growth (in)
	'06
Artemisia tridentata vaseyana	2.6

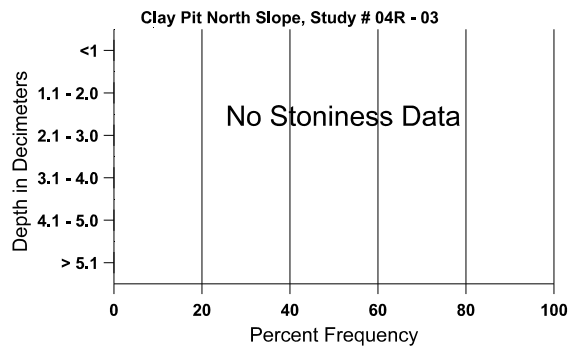
BASIC COVER --  
Management unit 04R, Study no: 3

Cover Type	Average Cover %
	'06
Vegetation	11.69
Rock	.91
Pavement	.89
Litter	10.26
Cryptogams	1.16
Bare Ground	1.63

SOIL ANALYSIS DATA --  
Herd Unit 4R, Study # 3, Study Name: Clay Pit North Slope

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
-	-	7.0	53.3	21.8	24.9	2.1	29.1	364.8	0.7

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 04R, Study no: 3

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	5	-
Elk	3	15 (38)
Deer	8	96 (236)
Cattle	2	3 (7)

BROWSE CHARACTERISTICS --  
 Management unit 04R, Study no: 3

		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>Artemisia tridentata vaseyana</i>												
06	<b>2800</b>	140	200	1600	1000	300	26	5	36	19	19	37/47
<i>Chrysothamnus nauseosus albicaulis</i>												
06	<b>40</b>	20	-	40	-	-	0	0	-	-	0	30/38
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>1600</b>	40	40	1540	20	-	0	0	1	-	0	13/16

Trend Study 4R-4-06

Study site name: Clay Pit South Slope .

Vegetation type: Mountain Big Sagebrush .

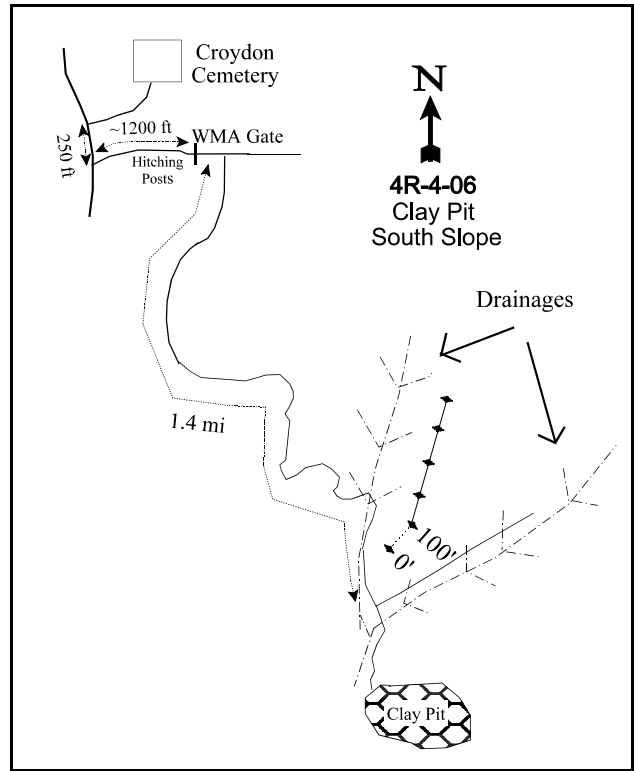
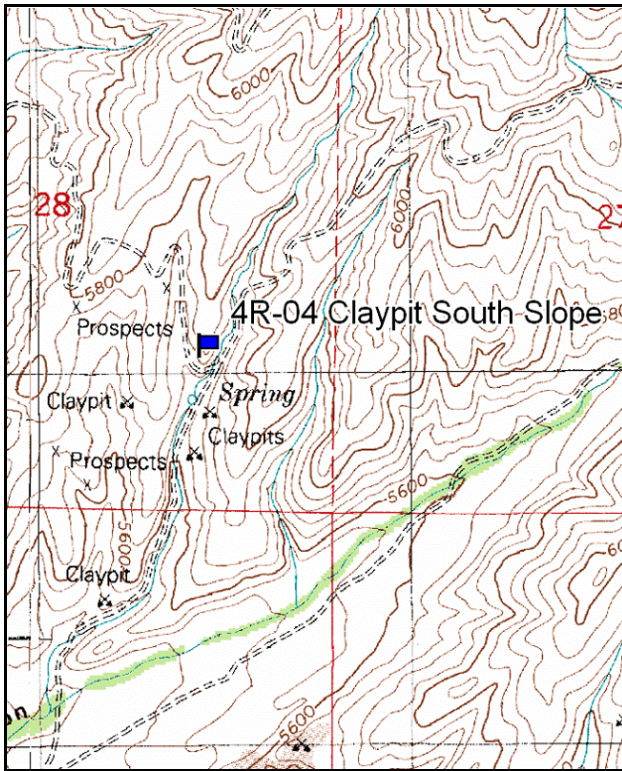
Compass bearing: frequency baseline 0'-100' 15 degrees magnetic 100'-500' 5 degrees magnetic.

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

LOCATION DESCRIPTION

About 250 feet from the Croydon cemetery road turn left onto a dirt road and drive approximately 1200 feet to a WMA gate. From the WMA gate, drive 1.4 miles staying right through the first fork in the road immediately after the WMA gate, stop where two drainages meet and the road takes a sharp bend. The 0 foot stake is a full high on the ridge to the left. No browse tag.

\*\*\* Only read cover and nested frequency on belt 1.



Map name: Henefer

Diagrammatic Sketch

Township 4N , Range 4E , Section 28 .

UTM (NAD 83) 12T 4544242N 458367E

## DISCUSSION

### Claypit South Slope - Study No. 4R-4

#### Study Information

This study is located in a mountain big sagebrush community and winter range approximately 1.5 miles southeast of Croydon in the Echo-Henefer Wildlife Management Area (elevation: 5,700 feet, slope: 20%, aspect: southeast). The study was established in 2006 to monitor the effects of the sagebrush defoliator moth (*Aroga websterii*) on sagebrush populations. The defoliator moth had effected several sagebrush populations in northern Utah and the study was to monitor long-term effects of the pest. Two other studies, Claypit North Slope (4R-3) and Croydon Cemetery (4R-5), were also established in the area. On all 3 studies, browse density and line intercept cover were read on all 5 belts, but cover and nested frequency were only read on belt 1. The area is heavily utilized by big game. The 2006 pellet group data estimates were 36 elk, 47 deer, and 6 cow days use/acre (88 edu/ha, 116 ddu/ha, and 14 cdu/ha).

#### Soil

The soil is in the Horrocks-Cutoff complex series, which is moderately deep, well drained, moderately permeable and formed in glacial deposits, residuum, and colluvium derived from andesite, quartzite, sandstone, and conglomerate (USDA-NRCS 2006). The soil texture is a loam with a neutral pH (7.1). The combined relative protective ground cover was 72% in 2006. Relative bare ground cover was 11% in 2006. The soil erosion condition class rating was slight in 2006.

#### Browse

The browse component is dominated by mountain big sagebrush, which provided 5% line intercept cover in 2006. The sagebrush density was 1,240 plants/acre with 48% of the individuals classified as decadent. Fifteen percent of the individuals were classified as dying. The reason for the high decadence and dying percentages is the infestation of the sagebrush defoliator moth (*Aroga websterii*). The moth had infested 81% of the plants (1,000 plants/acre) still living when the study was read and 1,280 plants/acre were killed (or apparently killed) by the moth in 2006. Sagebrush average leader growth was 1.9 inches in 2006. This study was more severely impacted by the moth than the Claypit North Slope (4R-3) study. White rubber rabbitbrush, broom snakeweed, and prickly pear cactus were also sampled in 2006.

#### Herbaceous Understudy

The herbaceous understory was not completely sampled due to only sampling belt 1. Intermediate wheatgrass and cheatgrass were the dominant species in 2006.

Desirable Components Index scores were not sampled for this study due to the different methods used to collect cover information.

#### HERBACEOUS TRENDS --

Management unit 04R, Study no: 4

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	5	.44
G	Agropyron intermedium	33	1.25
G	Agropyron smithii	11	.45
G	Agropyron spicatum	9	.51
G	Bromus tectorum (a)	81	2.32
G	Poa secunda	24	.19



T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Vulpia octoflora</i> (a)	2	.00
Total for Annual Grasses		83	2.33
Total for Perennial Grasses		82	2.86
Total for Grasses		165	5.19
F	<i>Allium</i> sp.	3	.00
F	<i>Collinsia parviflora</i> (a)	13	.03
F	<i>Draba</i> sp. (a)	3	.01
F	<i>Helianthus annuus</i> (a)	1	.00
F	<i>Holosteum umbellatum</i> (a)	1	.00
Total for Annual Forbs		18	0.04
Total for Perennial Forbs		3	0.00
Total for Forbs		21	0.05

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

#### BROWSE TRENDS --

Management unit 04R, Study no: 4

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	<i>Artemisia tridentata vaseyana</i>	38	.96
B	<i>Chrysothamnus nauseosus albicaulis</i>	5	.63
B	<i>Gutierrezia sarothrae</i>	10	.03
B	<i>Opuntia</i> sp.	9	
Total for Browse		62	1.62

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 04R, Study no: 4

Species	Average leader growth (in)
	'06
<i>Artemisia tridentata vaseyana</i>	1.9

CANOPY COVER, LINE INTERCEPT --  
 Management unit 04R, Study no: 4

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	5.44
Chrysothamnus nauseosus albicaulis	.36

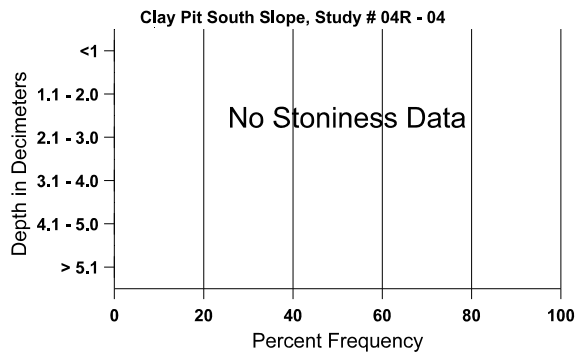
BASIC COVER --  
 Management unit 04R, Study no: 4

Cover Type	Average Cover %
	'06
Vegetation	6.99
Rock	2.12
Pavement	1.56
Litter	8.89
Cryptogams	.10
Bare Ground	2.38

SOIL ANALYSIS DATA --  
 Herd Unit 4R, Study # 4, Study Name: Clay Pit South Slope

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
-	-	7.1	43.3	31.8	24.9	2.2	26.8	368.0	0.7

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 04R, Study no: 4

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	3	-
Elk	2	36 (88)
Deer	7	47 (116)
Cattle	1	6 (14)

BROWSE CHARACTERISTICS --  
 Management unit 04R, Study no: 4

		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>Artemisia tridentata vaseyana</i>												
06	<b>1240</b>	-	40	600	600	1280	37	10	48	15	16	24/37
<i>Chrysothamnus nauseosus albicaulis</i>												
06	<b>140</b>	-	20	120	-	40	0	0	-	-	0	28/29
<i>Gutierrezia sarothrae</i>												
06	<b>200</b>	-	-	200	-	-	0	0	-	-	0	9/10
<i>Opuntia sp.</i>												
06	<b>220</b>	-	40	180	-	-	0	0	-	-	0	5/10

Trend Study 4R-5-06

Study site name: Croydon Cemetery .

Vegetation type: Mountain Big Sagebrush .

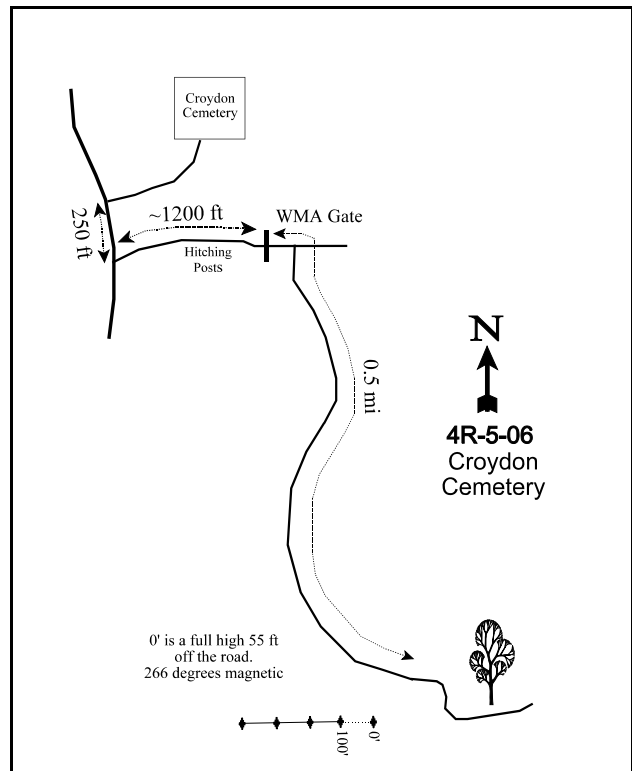
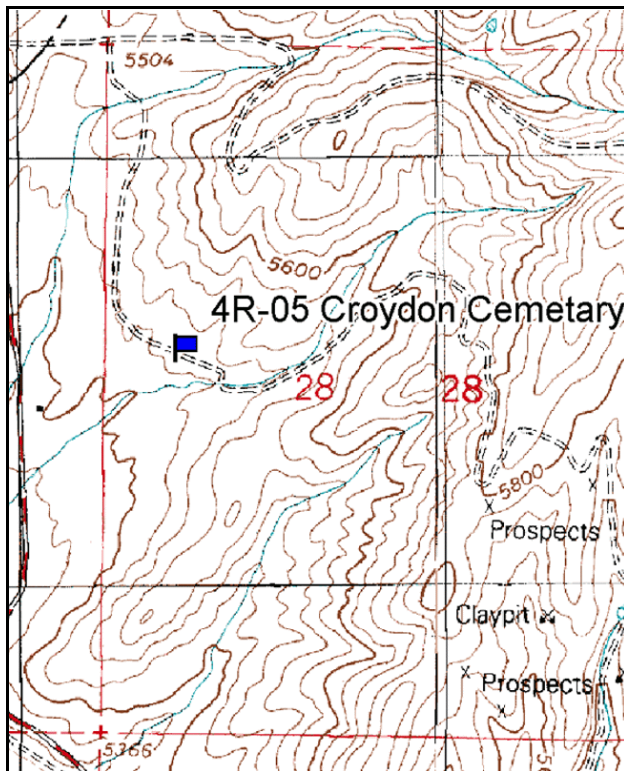
Compass bearing: frequency baseline 266 degrees magnetic.

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

Rebar: Belts 1-4 are on 0' Belt 5 is on 1'

LOCATION DESCRIPTION

About 250 feet from the Croydon cemetery road turn left onto a dirt road and drive approximately 1200 feet to a WMA gate. From the WMA gate, drive 0.5 miles staying right through the first fork in the road immediately after the WMA gate. 0 foot stake is a full high 55 feet off the road. No browse tag.



Map name: Devils Slide

Diagrammatic Sketch

Township 4N , Range 4E , Section 28 .

UTM (NAD 83) 12T 4544725N 457306E

## DISCUSSION

### Croydon Cemetery - Study No. 4R-5

#### Study Information

This study is located in a mountain big sagebrush community and winter range approximately 1 mile southeast of Croydon in the Echo-Henefer Wildlife Management Area (elevation: 5,450 feet, slope: 4%, aspect: southwest). The study was established in 2006 to monitor the effects of the sagebrush defoliator moth (*Aroga websterii*) on sagebrush populations. The defoliator moth had effected several sagebrush populations in northern Utah and the study was to monitor long-term effects of the pest. Two other studies, Claypit North Slope (4R-3) and Claypit South Slope (4R-4), were also established in the area. On all 3 studies, browse density and line intercept cover were read on all 5 belts, but cover and nested frequency were only read on belt 1. The area is heavily utilized by big game. The 2006 pellet group data estimates were 3 elk, 46 deer, and 12 cow days use/acre (7 edu/ha, 114 ddu/ha, and 29 cdu/ha).

#### Soil

The soil is in the Manila-Ant Flats complex series, which is very deep, well drained, slowly permeable and formed in colluvium, residuum, and alluvium from calcareous sandstone and sedimentary rocks (USDA-NRCS 2006). The soil texture is a clay loam with a mildly alkaline pH (7.7). The combined relative protective ground cover was 73% in 2006. Relative bare ground cover was 26% in 2006. The soil erosion condition class rating was moderate in 2006 due to an active gully near and a large amount of active erosion on the study.

#### Browse

The browse component is dominated by mountain big sagebrush, which provided 16% line intercept cover in 2006. The sagebrush density was 3,380 plants/acre with 58% of the individuals classified as decadent. Eighteen percent of the individuals were classified as dying. The reason for the high decadence and dying percentages is the infestation of the sagebrush defoliator moth (*Aroga websterii*). The moth had infested 73% of the plants (2,460 plants/acre) still living when the study was read and 500 plants/acre were killed (or apparently killed) by the moth in 2006. Sagebrush average leader growth was 2.2 inches in 2006. This study was more severely impacted by the moth than the Claypit North Slope (4R-3) study, but less impacted than Claypit South Slope. White rubber rabbitbrush, broom snakeweed, and stickyleaf low rabbitbrush were also sampled in 2006.

#### Herbaceous Understudy

The herbaceous understory was not completely sampled due to only sampling belt 1. Crested wheatgrass and bulbous bluegrass were the dominant species in 2006.

Desirable Components Index scores were not sampled for this study due to the different methods used to collect cover information.

#### HERBACEOUS TRENDS --

Management unit 04R, Study no: 5

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	56	2.23
G	Poa bulbosa	59	4.09
G	Poa secunda	7	.06
Total for Annual Grasses		0	0

Type	Species	Nested Frequency	Average Cover %
		'06	'06
	Total for Perennial Grasses	122	6.38
	Total for Grasses	122	6.38
F	Alyssum alyssoides (a)	2	.00
F	Cordylanthus sp. (a)	4	.09
F	Helianthus annuus (a)	2	.00
F	Tragopogon dubius	-	.00
	Total for Annual Forbs	8	0.10
	Total for Perennial Forbs	0	0.00
	Total for Forbs	8	0.10

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

#### BROWSE TRENDS --

Management unit 04R, Study no: 5

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata vaseyana	86	2.84
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus viscidiflorus	6	-
B	Gutierrezia sarothrae	28	.12
	Total for Browse	121	2.96

#### CANOPY COVER, LINE INTERCEPT --

Management unit 04R, Study no: 5

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	15.69
Gutierrezia sarothrae	.75

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 04R, Study no: 5

Species	Average leader growth (in)
	'06
Artemisia tridentata vaseyana	2.2

BASIC COVER --

Management unit 04R, Study no: 5

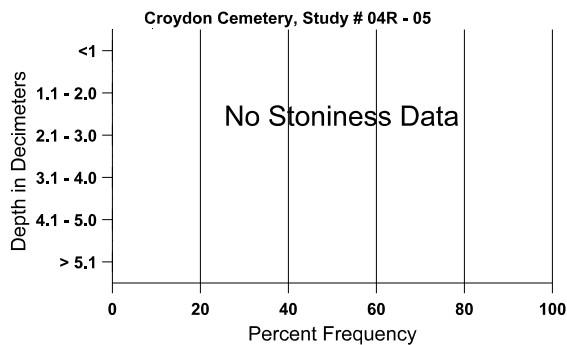
Cover Type	Average Cover % '06
Vegetation	9.80
Rock	.07
Pavement	.11
Litter	6.51
Cryptogams	.22
Bare Ground	5.78

SOIL ANALYSIS DATA --

Herd Unit 4R, Study # 5, Study Name: Croydon Cemetery

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
-	-	7.7	28.0	42.7	29.3	1.9	31.1	323.2	0.7

### Stoniness Index



PELLET GROUP DATA --

Management unit 04R, Study no: 5

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	3	-
Elk	-	3 (7)
Deer	4	46 (114)
Cattle	1	12 (29)

BROWSE CHARACTERISTICS --  
 Management unit 04R, 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)
<i>Artemisia tridentata vaseyana</i>												
06	<b>3380</b>	140	60	1360	1960	1080	30	5	58	18	18	28/34
<i>Chrysothamnus nauseosus albicaulis</i>												
06	<b>20</b>	-	20	-	-	-	0	0	-	-	0	56/74
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>140</b>	-	-	140	-	-	43	29	-	-	0	10/13
<i>Gutierrezia sarothrae</i>												
06	<b>1040</b>	20	60	980	-	-	0	0	-	-	0	8/10



Trend Study 7R-2-06

Study site name: Kamas SFH.

Vegetation type: Mountain Big Sagebrush .

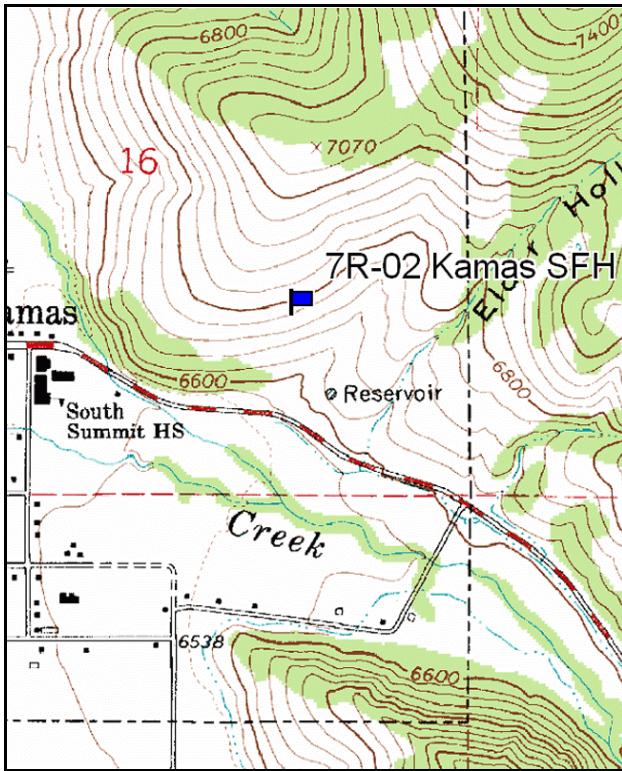
Compass bearing: frequency baseline 39 degrees magnetic.

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

No Rebar

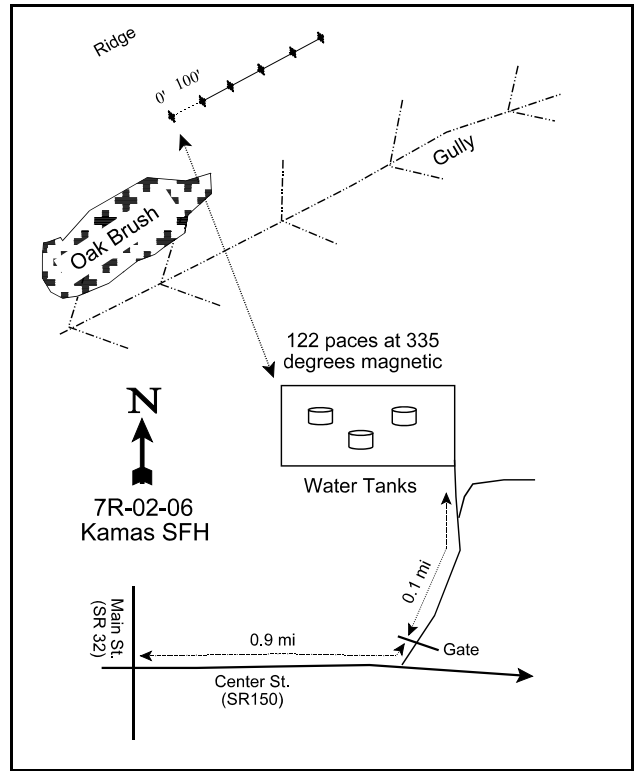
LOCATION DESCRIPTION

From the intersection of Main Street (SR 32) and Center Street (SR 150) in Kamas, turn east onto Center Street for 0.9 miles. Turn left (north) where you'll come to a gate. Through the gate drive 0.1 miles to the south east corner of some fenced off water tanks. From there walk to the north west corner and walk 122 paces at a bearing of 335 degrees magnetic to the 0 foot stake with browse tag #177.



Map name: Kamas

Township 2S, Range 6E, Section 16.



Diagrammatic Sketch

UTM (NAD 83) 12T 4499252N 477457E

## DISCUSSION

### Kamas SFH - Study No. 7R-2

#### Study Information

This study was established to monitor a treatment on Sportsmen for Habitat land in the foothills east of Kamas (elevation: 6,800 feet, slope: 30%, aspect: southeast). The vegetation appears to have been dominated by mountain big sagebrush, but is now dominated by weedy grasses and forbs. The planned treatment was to spray herbicide to control cheatgrass and bulbous bluegrass and aurally seed with desirable species. The area is heavily used by elk and deer. The 2006 pellet group transect data estimates were 32 elk , 102 deer, and 9 cow days use/acre (78 edu/ha, 251 ddu/ha, and 22 cdu/ha). Mos pelletst were from winter use, but some spring and fall use was sampled.

#### Soil

The soil is in the Horrocks-Cutoff complex series, which is moderately deep, well drained, moderately permeable and formed in glacial deposits, residuum, and colluvium derived from andesite, quartzite, sandstone, and conglomerate (USDA-NRCS 2006). The effective rooting depth is 19 inches. The soil texture is a loam with a neutral pH (6.8). The combined relative protective ground cover was 64% in 2006. Relative bare ground cover was 8% in 2006. Relative rock cover was 26% in 2006. The soil erosion condition class rating was stable in 2006.

#### Browse

The density of preferred browse species is low. Saskatoon serviceberry and mountain big sagebrush were the only preferred browse species sampled in 2006. Serviceberry was only measured in the height/crown measurements and sagebrush were sampled at 20 plants/acre, all of which were mature. All showed moderate use. Other browse species sampled include: Rubber rabbitbrush, stickyleaf low rabbitbrush, hawthorn, broom snakeweed, oregon grape, prickly pear cactus, snowberry, and gray horsebrush. Broom snakeweed density was 1,980 plants/acre in 2006.

#### Herbaceous Understory

The herbaceous understory is dominated by weedy species. Cheatgrass provided 10% cover and bulbous bluegrass cover was 15% in 2006. Crested wheatgrass provided 1% cover. The forbs composition is very weedy. Storksbill provided 4% cover in 2006. Other weedy species which provide substantial cover include willowweed and hairy goldenaster. Silvery lupine provided 3% cover in 2006.

The 2006 Desirable Components Index score was very poor due to the lack of browse cover, high annual grass cover, and low perennial grass cover.

2006 winter range condition (DC Index) – very poor (7) Mid-level potential scale

#### HERBACEOUS TRENDS --

Management unit 07R, Study no: 2

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	44	1.34
G	Bromus tectorum (a)	349	10.29
G	Poa bulbosa	287	15.02
G	Poa pratensis	5	.33
Total for Annual Grasses		349	10.29

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
	Total for Perennial Grasses	336	16.69
	Total for Grasses	685	26.98
F	<i>Alyssum alyssoides</i> (a)	220	.98
F	<i>Arabis</i> sp.	3	.00
F	<i>Artemisia ludoviciana</i>	72	3.81
F	<i>Camelina microcarpa</i> (a)	3	.00
F	<i>Cirsium undulatum</i>	3	.07
F	<i>Collinsia parviflora</i> (a)	57	.09
F	<i>Draba</i> sp. (a)	37	.06
F	<i>Epilobium brachycarpum</i> (a)	71	1.25
F	<i>Eriogonum cernuum</i> (a)	5	.01
F	<i>Erodium cicutarium</i> (a)	187	3.98
F	<i>Eriogonum racemosum</i>	9	.33
F	<i>Helianthella uniflora</i>	6	.03
F	<i>Heterotheca villosa</i>	181	9.28
F	<i>Holosteum umbellatum</i> (a)	106	.35
F	<i>Lactuca serriola</i>	1	.00
F	<i>Lithospermum ruderale</i>	-	.00
F	<i>Lupinus argenteus</i>	21	2.59
F	<i>Phlox longifolia</i>	1	.00
F	<i>Ranunculus testiculatus</i> (a)	5	.01
F	<i>Salsola iberica</i> (a)	7	.07
F	<i>Sisymbrium altissimum</i> (a)	1	.00
F	<i>Solidago</i> sp.	15	1.36
F	<i>Tragopogon dubius</i>	6	.06
F	<i>Viguiera multiflora</i>	6	.48
	Total for Annual Forbs	699	6.84
	Total for Perennial Forbs	324	18.06
	Total for Forbs	1023	24.91

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

BROWSE TRENDS --

Management unit 07R, Study no: 2

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier alnifolia	0	-
B	Artemisia tridentata vaseyana	1	.63
B	Chrysothamnus nauseosus	0	-
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Crataegus sp.	1	-
B	Gutierrezia sarothrae	53	1.97
B	Mahonia repens	6	.48
B	Opuntia sp.	9	.24
B	Opuntia sp.	1	-
B	Symphoricarpos oreophilus	0	-
Total for Browse		71	3.32

CANOPY COVER, LINE INTERCEPT --

Management unit 07R, Study no: 2

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	.65
Crataegus sp.	.11
Gutierrezia sarothrae	1.64
Mahonia repens	.25
Opuntia sp.	.60
Symphoricarpos oreophilus	.03

BASIC COVER --

Management unit 07R, Study no: 2

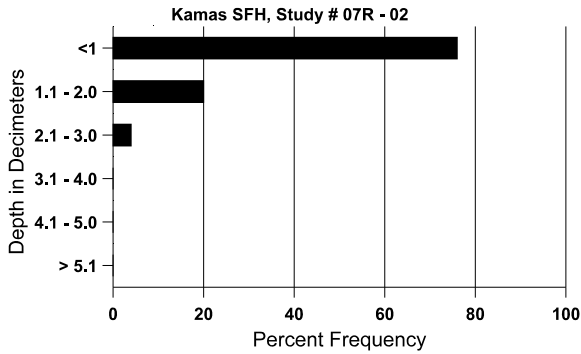
Cover Type	Average Cover %
	'06
Vegetation	55.41
Rock	29.02
Pavement	3.23
Litter	16.53
Cryptogams	.42
Bare Ground	8.78

SOIL ANALYSIS DATA --

Herd Unit 7R, Study # 2, Study Name: Kamas SFH

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
-	75 (8.35)	6.8	43.0	32.7	24.3	3.8	46.5	560.0	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 07R, Study no: 2

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	26	-
Elk	18	32 (78)
Deer	42	102 (251)
Cattle	1	9 (22)

BROWSE CHARACTERISTICS --

Management unit 07R, Study no: 2

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier alnifolia</i>												
06	0	-	-	-	-	-	0	0	-	-	0	49/51
<i>Artemisia tridentata vaseyana</i>												
06	20	-	-	20	-	-	100	0	-	-	0	24/40
<i>Chrysothamnus nauseosus</i>												
06	0	-	-	-	-	-	0	0	-	-	0	28/42
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	0	-	-	-	-	-	0	0	-	-	0	11/28
<i>Crataegus sp.</i>												
06	20	-	20	-	-	-	0	0	-	-	0	41/21

		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>Gutierrezia sarothrae</i>												
06	<b>1980</b>	20	440	1500	40	40	0	0	2	1	1	8/11
<i>Mahonia repens</i>												
06	<b>2600</b>	-	280	2320	-	-	0	0	-	-	0	3/4
<i>Opuntia sp.</i>												
06	<b>200</b>	-	60	120	20	-	0	0	10	10	10	5/15
<i>Symphoricarpos oreophilus</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	25/53
<i>Tetradymia canescens</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	15/44

Trend Study 9R-11-06

Study site name: Blue Mountain Burn.

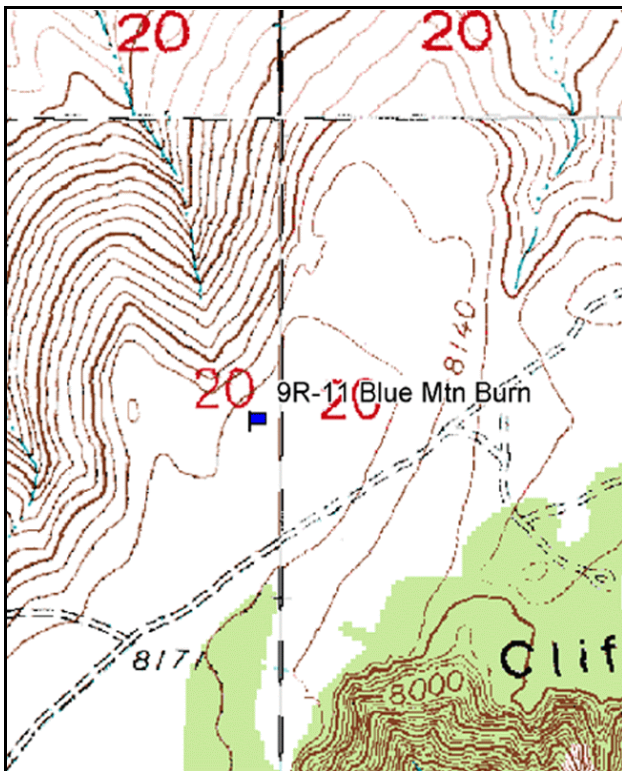
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 0' - 300' 44 degrees magnetic, 300' - 500' 48 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5(95 ft).  
No Rebar

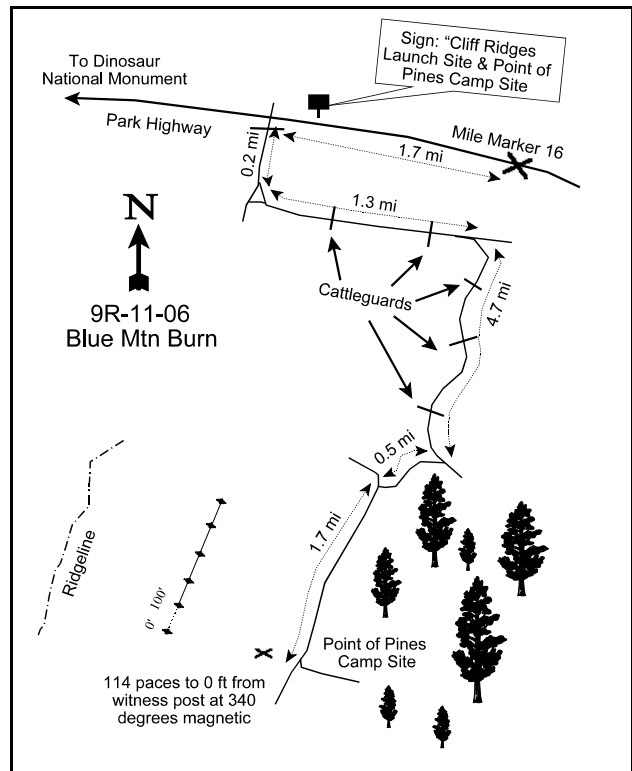
LOCATION DESCRIPTION

On Park Highway in Dinosaur National Monument drive to mile marker 16. From mile marker 16 drive 1.7 miles west to a turn off to the left (south). From there go 0.2 miles to a fork, take a left for 1.3 miles, you will cross 2 cattle guards and come to another fork. Turn right and drive 4.7 miles crossing 3 cattle guards come to another fork and take another right. Drive 0.5 miles to another fork and go left. From there drive 1.7 miles to a witness post on the right (west) side of the road. The 0 foot stake is 114 paces from the witness post at 340 degrees magnetic with browse tag #151.



Map name: Cliff Ridge

Township 5S , Range 25E , Section 20 .



Diagrammatic Sketch

UTM (NAD 83) 12T 4470572N 659080E

## DISCUSSION

### Blue Mountain Burn - Study No. 9R-11

#### Study Information

This study is located 11 miles east of Jensen near the west edge of Cliff Ridge (elevation: 8,180 feet, slope: 2%, aspect: northwest). It was established to monitor the effects of a prescribed fire treatment in a mountain big sagebrush community. The fire was to burn a section of the west face of the ridge as well as the west half of the ridge top. The study is located with summer range. The 2006 pellet groups transect data estimates were 21 elk, 3 deer, and 25 cow days use/acre (51 edu/ha, 8 ddu/ha, and 61 cdu/ha). Elk and deer pellet groups were from spring and early summer use. Cattle pats were from the current spring and previous summer.

#### Soil

The soil is in the Cortyzack-Duffymont series complex. The Cortyzack series is found on hills and consists of very deep, well drained soils formed in eolian deposits and slop alluvium derived from sandstone. The Duffymont series is located on plateaus, mesas, hills, and mountain slopes and consists of very shallow to shallow, well to somewhat excessively drained soils formed in slope alluvium and collium derive from sandstone (USDA-NRCS 2006). The soil texture is a sandy clay loam with a neutral pH (7.2). The effective rooting depth is nearly 12 inches. Relative bare ground cover was 21% and the combined relative cover of litter and vegetation was 76% in 2006. It is anticipated that bare ground cover will increase for a time after the burn. The erosion condition class rating was stable in 2006.

#### Browse

The browse is dominated by mountain big sagebrush. Sagebrush cover was 21% in 2006. Sagebrush density was 4,540 plants/acre, 68% of which were mature individuals. Young and decadent individuals each made up 16% of the population. Plants classified as dying only made up 5% of the population in 2006. Sagebrush leader growth was 1.4 inches in 2006. The other preferred browse species were saskatoon serviceberry, true mountain mahogany, and antelope bitterbrush. Bitterbrush density was 300 plants/acre in 2006. Mature plants made up 67% of the population, young made up 13%, and plants classified as decadent made up 20%. Utilization of the bitterbrush was light to moderate and the average height was about 2 feet. Bitterbrush average leader growth was 2.7 inches in 2006. The serviceberry density was only 80 plants/acre, but many individuals were very large (8-10 feet tall), despite smaller height/crown measurements. Most serviceberry plants were moderately hedged in 2006, but average leader growth was 4.6 inches. Mountain mahogany density was only 20 plants/acre, all of which were mature and use was light.

#### Herbaceous Understory

The herbaceous understory is diverse with 10 species of perennial grasses, 1 species of annual grass, 30 species of perennial forbs, and 5 species of annual forbs. Western wheatgrass, prairie junegrass, and needle-and-thread grass are the dominant perennial grasses. Needle-and-thread provided 7% cover, prairie junegrass provided 5% cover, and western wheatgrass provided 1% cover in 2006. Cheatgrass was sampled in one quadrat in 2006. Tufted milkvetch and low penstemon provided the most forb cover with 2% and 1% in 2006, respectively. The most abundant forb species was longleaf phlox, which was sampled in 35% of the quadrats in 2006.

The diverse suite of perennial herbaceous species could help the community resist invasion from weeds following the burn.



HERBACEOUS TRENDS --

Management unit 09R, Study no: 11

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron smithii	118	1.12
G	Agropyron spicatum	26	.37
G	Bromus inermis	3	.00
G	Bromus tectorum (a)	3	.00
G	Carex sp.	3	.03
G	Koeleria cristata	154	5.30
G	Oryzopsis hymenoides	8	.36
G	Poa pratensis	3	.15
G	Poa secunda	56	.49
G	Sitanion hystrix	7	.04
G	Stipa comata	171	7.01
Total for Annual Grasses		3	0.00
Total for Perennial Grasses		549	14.89
Total for Grasses		552	14.90
F	Agoseris glauca	58	.48
F	Antennaria rosea	2	.15
F	Arabis sp.	1	.00
F	Astragalus convallarius	6	.21
F	Astragalus spatulatus	34	2.27
F	Aster sp.	14	.36
F	Chaenactis douglasii	16	.29
F	Collomia linearis (a)	2	.00
F	Comandra pallida	54	.65
F	Collinsia parviflora (a)	9	.01
F	Crepis acuminata	2	.03
F	Cryptantha sp.	34	.79
F	Delphinium nuttallianum	12	.06
F	Erysimum asperum	11	.19
F	Erigeron eatonii	2	.03
F	Eriogonum umbellatum	9	.24
F	Ipomopsis aggregata	10	.09
F	Lappula occidentalis (a)	31	.14
F	Linum lewisii	18	.11
F	Lithospermum ruderae	4	.03
F	Lomatium triternatum	5	.01
F	Lupinus argenteus	8	.37

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
F	<i>Machaeranthera canescens</i>	8	.19
F	<i>Microsteris gracilis</i> (a)	3	.00
F	<i>Penstemon comarrhenus</i>	4	.21
F	<i>Penstemon humilis</i>	58	1.37
F	<i>Petradoria pumila</i>	5	.18
F	<i>Phlox austromontana</i>	9	.12
F	<i>Phlox longifolia</i>	90	.76
F	<i>Phacelia sericea</i>	26	.41
F	<i>Polygonum douglasii</i> (a)	23	.05
F	<i>Senecio integerrimus</i>	1	.03
F	<i>Senecio multilobatus</i>	20	.31
F	<i>Trifolium</i> sp.	49	.26
F	<i>Zigadenus paniculatus</i>	1	.00
Total for Annual Forbs		68	0.21
Total for Perennial Forbs		571	10.29
Total for Forbs		639	10.51

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

#### BROWSE TRENDS --

Management unit 09R, Study no: 11

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	<i>Amelanchier alnifolia</i>	4	2.82
B	<i>Artemisia tridentata vaseyana</i>	87	20.70
B	<i>Cercocarpus montanus</i>	1	1.74
B	<i>Chrysothamnus depressus</i>	0	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	2	.00
B	<i>Eriogonum heracleoides</i>	1	-
B	<i>Eriogonum microthecum</i>	27	.68
B	<i>Gutierrezia sarothrae</i>	11	.26
B	<i>Purshia tridentata</i>	14	5.35
B	<i>Symphoricarpos oreophilus</i>	1	-
B	<i>Tetradymia canescens</i>	2	.00
Total for Browse		150	31.58

CANOPY COVER, LINE INTERCEPT --  
 Management unit 09R, Study no: 11

Species	Percent Cover '06
Amelanchier alnifolia	3.66
Artemisia tridentata vaseyana	26.46
Cercocarpus montanus	2.20
Eriogonum microthecum	.21
Gutierrezia sarothrae	.81
Purshia tridentata	4.08

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 09R, Study no: 11

Species	Average leader growth (in) '06
Amelanchier alnifolia	4.6
Artemisia tridentata vaseyana	1.4
Purshia tridentata	2.7

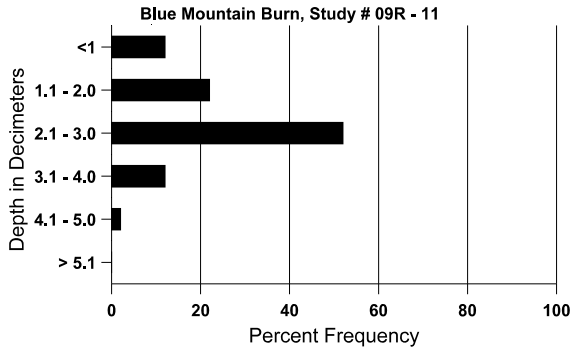
BASIC COVER --  
 Management unit 09R, Study no: 11

Cover Type	Average Cover % '06
Vegetation	50.29
Rock	1.54
Pavement	1.91
Litter	40.68
Cryptogams	.21
Bare Ground	24.88

SOIL ANALYSIS DATA --  
 Herd Unit 9R, Study # 11, Study Name: Blue Mountain Burn

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
11.7	64 (14.25)	7.2	52.3	25.4	22.3	4.4	25.7	310.4	0.7

# Stoniness Index



PELLET GROUP DATA --  
Management unit 09R, Study no: 11

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	23	-
Horse	1	-
Grouse	1	-
Elk	7	21 (51)
Deer	5	3 (8)
Cattle	12	25 (61)

BROWSE CHARACTERISTICS --  
Management unit 09R, Study no: 11

		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>Amelanchier alnifolia</i>												
06	<b>80</b>	-	20	60	-	-	75	0	-	-	0	44/53
<i>Artemisia tridentata vaseyana</i>												
06	<b>4540</b>	3320	720	3080	740	960	5	0	16	5	6	26/36
<i>Cercocarpus montanus</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	59/50
<i>Chrysothamnus depressus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	6/7
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>40</b>	-	20	20	-	-	50	0	-	-	0	13/23
<i>Eriogonum heracleoides</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	4/9

		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>Eriogonum microthecum</i>												
06	<b>1160</b>	40	240	880	40	-	22	22	3	-	0	7/13
<i>Gutierrezia sarothrae</i>												
06	<b>2240</b>	140	240	2000	-	-	0	0	-	-	0	5/10
<i>Purshia tridentata</i>												
06	<b>300</b>	60	40	200	60	20	47	0	20	13	13	23/66
<i>Symphoricarpos oreophilus</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	18/42
<i>Tetradymia canescens</i>												
06	<b>40</b>	-	40	-	-	-	50	0	-	-	0	7/10

Trend Study 9R-12-06

Study site name: West Stuntz.

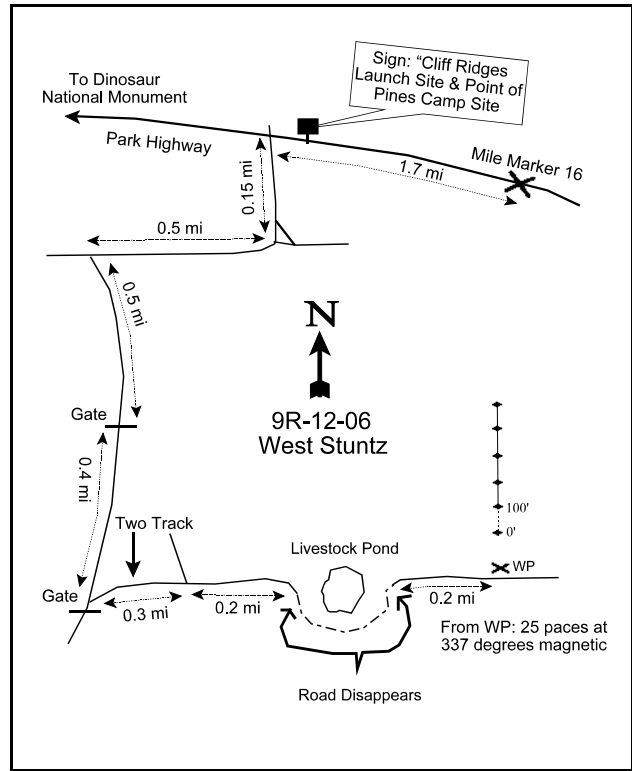
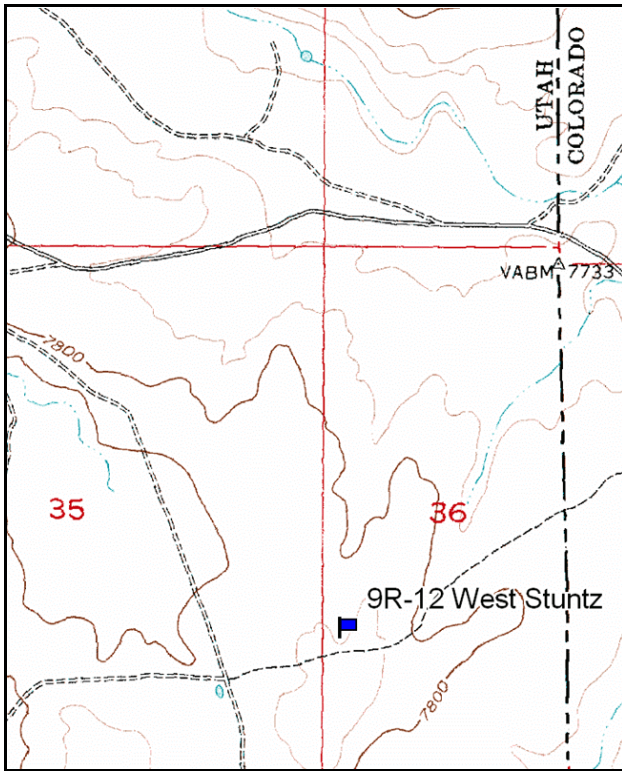
Vegetation type: Mountain.Big Sagebrush .

Compass bearing: frequency baseline 340 degrees mangnetic.

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

LOCATION DESCRIPTION

On Park Highway in Dinosaur National Monument drive to mile marker 16. From mile marker 16 drive 1.7 miles west to a turn off to the left (south). From there go 0.15 miles to a fork and turn right. Go 0.5 miles to another fork and turn left. Drive 0.5 miles to a gate. Go through the gate and drive 0.4 miles to a gate and a two track road to the left (east). Take the two track for 0.3 miles to a fork, stay straight for another 0.2 miles to a livestock pond where the road disappears. Drive around the pond to the two track on the east side. From where the two track starts again drive another 0.2 miles to a witness post on the left (north) side of the road. Walk 25 paces at 337 degrees magnetic to the 0 stake with browse tag #152.



Map name: Stuntz Reservoir

Diagrammatic Sketch

Township 4S , Range 25E , Section 36 .

UTM (NAD 83) 12T 4476766N 664664E

## DISCUSSION

### West Stuntz - Study No. 9R-12

#### Study Information

This study is located approximately 15 miles northeast of Jensen and less than ½ mile west of the Utah/Colorado state line on a dense mountain big sagebrush hill within mule deer summer range (elevation: 7,800 feet, slope: 3-4%, aspect: northwest). The study was established to monitor a mechanical sagebrush thinning treatment in sage grouse brooding habitat. A livestock pond, with several head of cattle surrounding it, was located 1/10 of a mile to the west. A deer was seen on the study in 2006 and several sage grouse were seen while approaching the study, one of which had a brood. In 2006, the estimated pellet groups were 9 elk, 15 deer, and 19 cow days use/acre (23 edu/ha, 38 ddu/ha, and 47 cdu/ha). Sage grouse pellet groups were estimated at 26 pellet groups/acre. Deer and elk pellet groups were from late winter to spring.

#### Soil

The soil is in the Cortyzack-Duffymont series complex. The Cortyzack series is found on hills and consists of very deep, well drained soils formed in eolian deposits and slop alluvium derived from sandstone. The Duffymont series is located on plateaus, mesas, hills, and mountain slopes and consists of very shallow to shallow, well to somewhat excessively drained soils formed in slope alluvium and collium derive from sandstone (USDA-NRCS 2006). The soil texture is a clay loam with a slightly acidic pH (6.5). The effective rooting depth is 12 inches and there is less than 10% rock in the profile. Relative bare ground only provided 13% cover in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) is 1:5. The combined relative cover of vegetation and litter was 86% in 2006. The 2006 soil erosion condition rating was stable. An inactive gully is located near the study.

#### Browse

The very dense mountain big sagebrush is the dominant browse species. It provided 29% cover in 2006. Sagebrush density was 8,840 plants/acre in 2006; 19% of the population were young and 22% were decadent. Vigor was good and use was light. Sagebrush average leader growth was 1.2 inches in 2006. Wyeth eriogonum was sampled in large densities in 2006 both under the sagebrush and in the patchy open areas. Those growing in open areas were smaller and had smaller leaves. Eriogonum density in 2006 was 9,400 plants/acre, most of which were mature. A true mountain mahogany was sampled in the cover measurement and antelope bitterbrush was sampled at a density of 20 plants/acre in 2006. Broom snakeweed was also sampled in 2006.

#### Herbaceous Understory

The herbaceous understory is moderately diverse with 8 species of grasses and grass-like and 26 species of forbs, 8 of which were annuals. Grasses provided 17% cover in 2006. Needle-and-thread grass and Sandberg bluegrass are the dominant grasses. Needle-and-thread provided 12% cover and Sandberg bluegrass provided 5% cover in 2006. These two species make up 96% of the grass cover. Perennial forbs provided 23% cover in 2006. Silvery lupine was the dominant forb with 16% cover and a quadrat frequency of 85% in 2006. Pale agoseris, rose pussytoes, and longleaf phlox also provided substantial cover (1-2% each).

It is apparent from the dense forb cover why this is sage grouse habitat.

HERBACEOUS TRENDS --

Management unit 09R, Study no: 12

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron smithii	13	.04
G	Carex sp.	2	.03
G	Koeleria cristata	38	.32
G	Poa fendleriana	7	.15
G	Poa secunda	155	4.61
G	Sitanion hystrix	4	.04
G	Stipa comata	3	.03
G	Stipa lettermani	315	11.51
Total for Annual Grasses		0	0
Total for Perennial Grasses		537	16.75
Total for Grasses		537	16.75
F	Achillea millefolium	12	.25
F	Agoseris glauca	132	1.40
F	Alyssum alyssoides (a)	4	.00
F	Antennaria rosea	53	1.38
F	Arabis sp.	2	.01
F	Arenaria congesta	101	.89
F	Aster sp.	15	.13
F	Collomia linearis (a)	19	.05
F	Collinsia parviflora (a)	59	.10
F	Delphinium nuttallianum	3	.00
F	Draba sp. (a)	3	.00
F	Erigeron eatonii	44	.37
F	Linum lewisii	3	.01
F	Lomatium sp.	2	.00
F	Lupinus argenteus	217	16.31
F	Microsteris gracilis (a)	32	.08
F	Orthocarpus luteus (a)	4	.03
F	Penstemon comarrhenus	5	.03
F	Penstemon humilis	3	.00
F	Phlox austromontana	1	.00
F	Phlox longifolia	190	1.81
F	Polygonum douglasii (a)	5	.01
F	Ranunculus testiculatus (a)	3	.00
F	Senecio integerrimus	33	.45
F	Trifolium sp.	11	.19



Type	Species	Nested Frequency	Average Cover %
		'06	'06
F	Zigadenus paniculatus	4	.09
Total for Annual Forbs		129	0.30
Total for Perennial Forbs		831	23.40
Total for Forbs		960	23.70

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

#### BROWSE TRENDS --

Management unit 09R, Study no: 12

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata vaseyana	93	28.52
B	Cercocarpus montanus	86	.15
B	Eriogonum heracleoides	5	5.57
B	Gutierrezia sarothrae	1	.33
Total for Browse		185	34.57

#### CANOPY COVER, LINE INTERCEPT --

Management unit 09R, Study no: 12

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	33.28
Eriogonum heracleoides	4.88
Gutierrezia sarothrae	.80

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 09R, Study no: 12

Species	Average leader growth (in)
	'06
Artemisia tridentata vaseyana	1.2

BASIC COVER --

Management unit 09R, Study no: 12

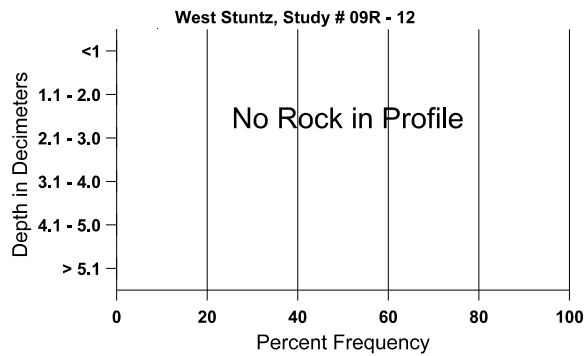
Cover Type	Average Cover %
	'06
Vegetation	58.41
Rock	.30
Pavement	.50
Litter	44.31
Cryptogams	.19
Bare Ground	15.15

SOIL ANALYSIS DATA --

Herd Unit 9R, Study # 12, Study Name: West Stuntz

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
12.4	59.6 (16.06)	6.5	30.3	40.4	29.3	1.9	36.8	444.8	0.8

### Stoniness Index



PELLET GROUP DATA --

Management unit 09R, Study no: 12

Type	Quadrat Frequency	Days use per acre (ha)
	'06	
Rabbit	30	-
Grouse	5	-
Elk	-	9 (23)
Deer	19	15 (38)
Cattle	11	19 (47)

BROWSE CHARACTERISTICS --  
 Management unit 09R, Study no: 12

		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>Artemisia tridentata vaseyana</i>												
06	<b>8840</b>	-	1660	5220	1960	260	.67	0	22	2	2	27/31
<i>Eriogonum heracleoides</i>												
06	<b>9400</b>	380	1820	7460	120	40	7	0	1	.42	.42	3/9
<i>Gutierrezia sarothrae</i>												
06	<b>340</b>	160	20	320	-	20	0	0	-	-	0	6/11
<i>Purshia tridentata</i>												
06	<b>20</b>	-	-	20	-	-	0	100	-	-	0	7/17

Trend Study 9R-13-06

Study site name: Chew Dixie.

Vegetation type: Mountain.Big Sagebrush .

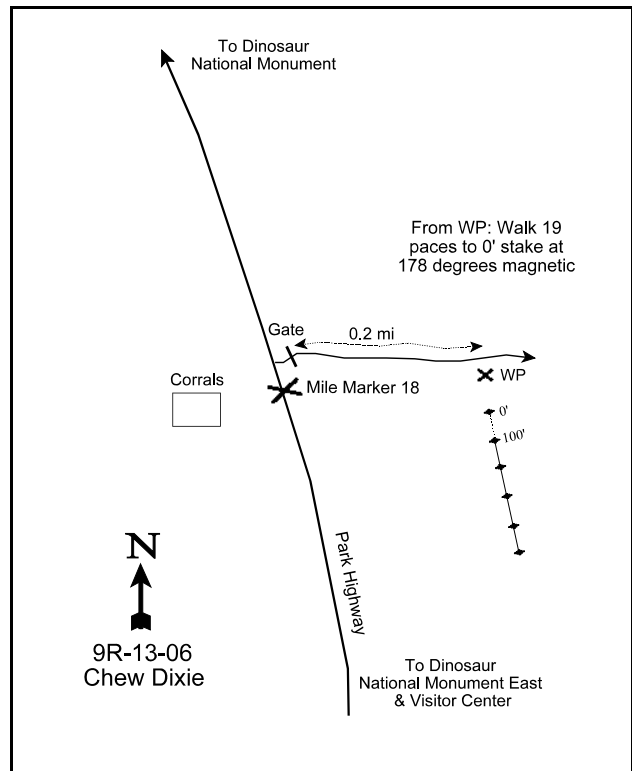
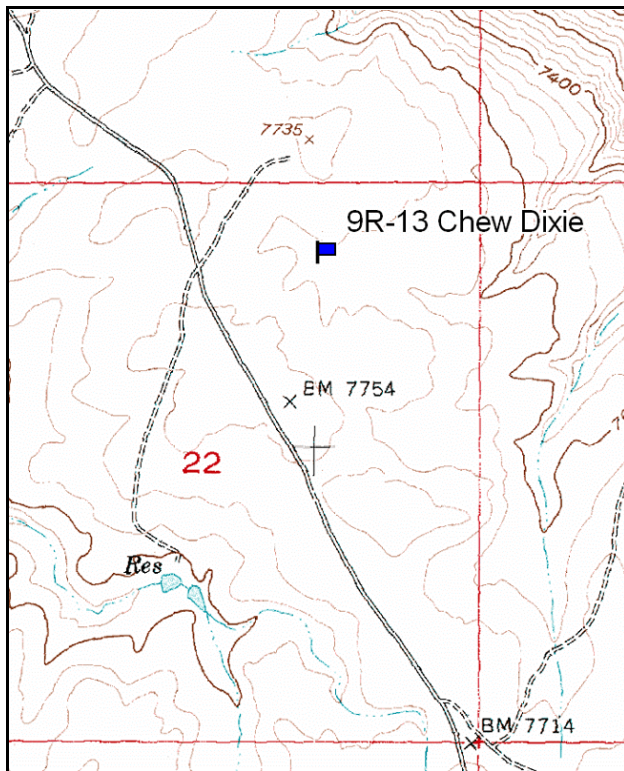
Compass bearing: frequency baseline 125 degrees magnetic.

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

No Rebar

LOCATION DESCRIPTION

Driving north on Park Highway in Dinosaur National Monument from the east drive to mile marker 18. From mile marker 18 take the road to the right (east) immediately after the mile marker to a gate. From the gate drive 0.2 miles to a witness post on the left. The 0 foot stake is 19 paces from the witness post at 178 degrees magnetic with browse tag #149.



Map name: Stuntz Reservoir

Diagrammatic Sketch

Township 4S , Range 25E , Section 22 .

UTM (NAD 83) 12T 4480910N 662455E

## DISCUSSION

### Chew Dixie - Study No. 9R-13

#### Study Information

This study is located approximately 15 miles northeast of Jensen and less than 2 miles west of the Utah/Colorado state line on a dense mountain big sagebrush hill within mule deer summer range (elevation: 7,750 feet, slope: 3-4%, aspect: northwest). The study is just north of the road that leads into the south entrance of Dinosaur National Monument. The study was established to monitor a mechanical sagebrush thinning treatment in sage grouse brooding habitat. A small group of cattle were seen just west of the study in 2006. In 2006, the estimated pellet groups were 3 elk, 10 deer, 20 cow, and 8 horse days use/acre (7 edu/ha, 25 ddu/ha, 48 cdu/ha, 19 hdu/ha). Sage grouse pellet groups were estimated at 78 pellet groups/acre. Deer and elk pellet groups were from late winter to early summer.

#### Soil

The soil is in the Cortyzack-Duffymont series complex. The Cortyzack series is found on hills and consists of very deep, well drained soils formed in eolian deposits and slop alluvium derived from sandstone. The Duffymont series is located on plateaus, mesas, hills, and mountain slopes and consists of very shallow to shallow, well to somewhat excessively drained soils formed in slope alluvium and collium derive from sandstone (USDA-NRCS 2006). The soil texture is a clay loam with a slightly acidic pH (6.3). The effective rooting depth is 11 inches and there is less than 2% rock in the profile. Relative bare ground provided 27% cover in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) is 1:3.1. The combined relative cover of vegetation and litter was 71% in 2006. The 2006 soil erosion condition rating was stable.

#### Browse

The very dense mountain big sagebrush is the dominant browse species. It provided 33% cover in 2006. Sagebrush density was 12,900 plants/acre in 2006; 40% of the population were young and 9% were decadent. Vigor was good and use was light. A very high density of seedlings, 48,780 plants/acre, were sampled in 2006. Sagebrush average leader growth was 1 inch in 2006. The only other browse species sampled in 2006 were saskatoon serviceberry and oregon grape, both of which were sampled at very low densities.

#### Herbaceous Understory

The herbaceous understory is sparse and appears to have been heavily grazed. The understory was composed of 7 perennial grasses, 1 annual grass, 19 perennial forbs, and 8 annual forbs in 2006. Grasses provided nearly 8% cover and forbs provided nearly 9% cover in 2006. The dominant grass species in 2006 included Sandberg bluegrass, which provided 3% cover, and Letterman needlegrass, which provided 2% cover. Cheatgrass was sampled in 2006, but in only 1 quadrat. The dominant forbs were rose pussytoes, which provided 2% cover, and longleaf phlox, which provided nearly 4% cover, in 2006. It is apparent why sage grouse use this area with the number of preferred forbs. Preferred sage grouse forbs sampled on this study include: pale agoseris, rose pussytoes, rockcress, timber poisonvetch, aster, tapertip hawksbeard, Eaton fleabane, silvery lupine, bluebells, little polecat, longleaf phlox, a buttercup, dandelion, and a clover (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

#### HERBACEOUS TRENDS --

Management unit 09R, Study no: 13

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron smithii	101	.76
G	Bromus tectorum (a)	1	.00

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Koeleria cristata	43	.58
G	Poa fendleriana	4	.07
G	Poa secunda	116	3.07
G	Sitanion hystrix	24	.51
G	Stipa lettermani	103	2.40
G	Stipa pinetorum	11	.33
Total for Annual Grasses		1	0.00
Total for Perennial Grasses		402	7.74
Total for Grasses		403	7.75
F	Agoseris glauca	84	.54
F	Allium acuminatum	3	.01
F	Antennaria rosea	32	1.66
F	Arabis sp.	1	.00
F	Artemesia biennis	4	.03
F	Astragalus convallarius	3	.00
F	Aster sp.	3	.15
F	Chenopodium leptophyllum(a)	3	.00
F	Collinsia parviflora (a)	156	.57
F	Cordylanthus ramosus (a)	3	.03
F	Crepis acuminata	7	.04
F	Erigeron eatonii	5	.02
F	Gayophytum ramosissimum(a)	15	.02
F	Lappula occidentalis (a)	14	.03
F	Linum lewisii	1	.00
F	Lupinus argenteus	39	.40
F	Machaeranthera grindelioides	1	.00
F	Mertensia sp.	1	.03
F	Microsteris gracilis (a)	114	.31
F	Phlox longifolia	205	3.52
F	Polygonum douglasii (a)	81	.13
F	Ranunculus jovis	28	.37
F	Ranunculus testiculatus (a)	28	.33
F	Senecio integerrimus	11	.04
F	Taraxacum officinale	16	.08
F	Trifolium sp.	24	.22
F	Zigadenus paniculatus	8	.04
Total for Annual Forbs		414	1.44

Type	Species	Nested Frequency	Average Cover %
		'06	'06
Total for Perennial Forbs		476	7.21
Total for Forbs		890	8.65

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

#### BROWSE TRENDS --

Management unit 09R, Study no: 13

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier alnifolia	1	-
B	Artemisia tridentata vaseyana	93	32.52
B	Mahonia repens	2	.03
Total for Browse		96	32.55

#### CANOPY COVER, LINE INTERCEPT --

Management unit 09R, Study no: 13

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	35.96

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 09R, Study no: 13

Species	Average leader growth (in)
	'06
Artemisia tridentata vaseyana	1.0

#### BASIC COVER --

Management unit 09R, Study no: 13

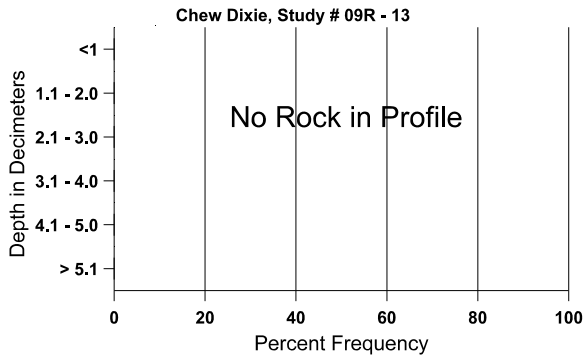
Cover Type	Average Cover %
	'06
Vegetation	43.69
Rock	1.24
Pavement	.80
Litter	38.40
Cryptogams	.10
Bare Ground	30.97

SOIL ANALYSIS DATA --

Herd Unit 9R, Study # 13, Study Name: Chew Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
11.1	67 (12.2)	6.3	32.3	40.4	27.3	3.5	28.6	243.2	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 09R, Study no: 13

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	48	-
Horse	1	8 (9)
Grouse	3	78 pellets/acre
Elk	3	3 (7)
Deer	16	10 (25)
Cattle	6	20 (48)

BROWSE CHARACTERISTICS --

Management unit 09R, 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)
<b>Amelanchier alnifolia</b>												
06	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
<b>Artemisia tridentata vaseyana</b>												
06	<b>12900</b>	48780	5140	6660	1100	440	.46	0	9	2	2	27/34
<b>Mahonia repens</b>												
06	<b>40</b>	-	-	40	-	-	0	0	-	-	50	3/6



Trend Study 10R-36-06

Study site name: Indian Springs Bullhog.

Vegetation type: Pinyon/Juniper/Black Sagebrush .

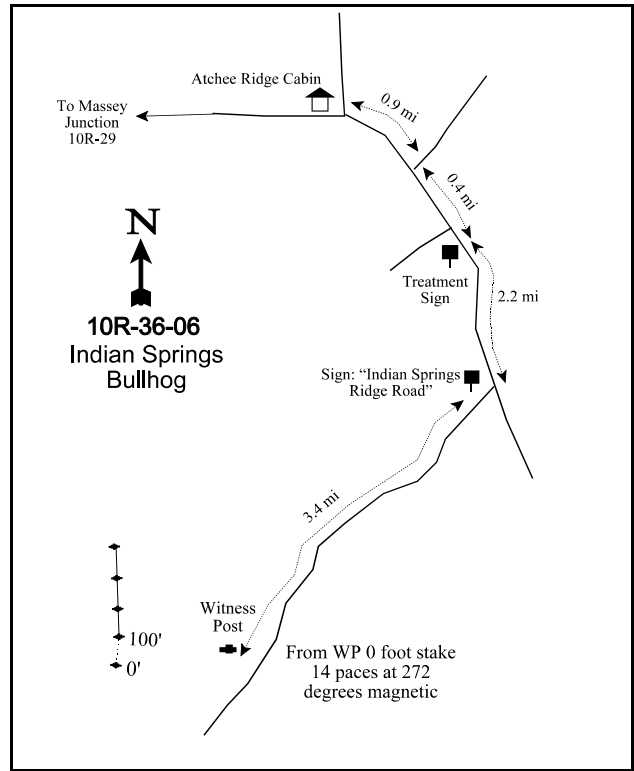
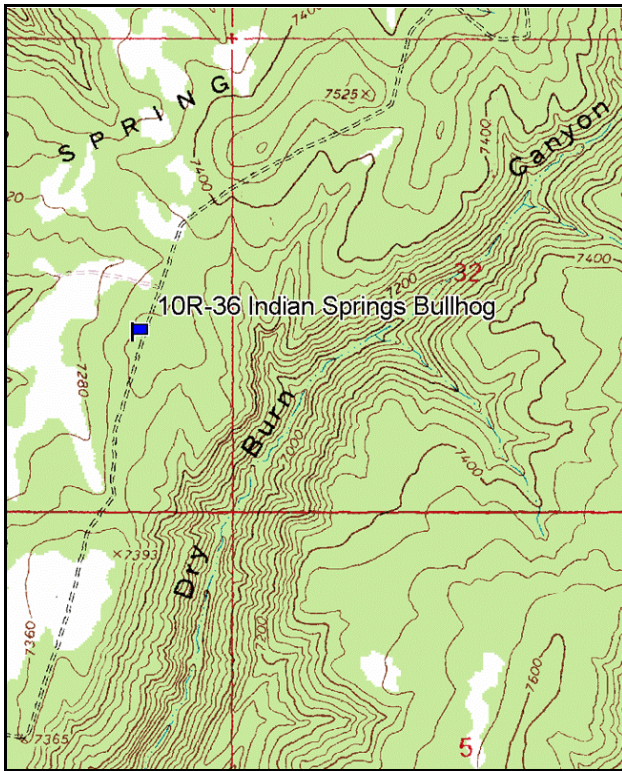
Compass bearing: frequency baseline 0'-100' 2 degrees magnetic 100'-500' 356 degrees magnetic.

Frequency belt placement: line 1(11 ft & 95 ft), line 2(34 ft), line 3(59 ft), line 4(74 ft).

No Rebar

LOCATION DESCRIPTION

From the Seep Ridge Road, about 10 miles north of Pine Spring, turn onto the Bitter Creek Road near McCoy Reservoir. Drive easterly on this road for 10.9 miles to where the road tops out, turn right off the main road. Go 7.65 miles staying on the main road to a fork. Turn left (west) at the fork and drive 0.9 miles to another junction staying right for another 0.4 miles to a fork and a treatment sign. From there go right for 2.2 miles to a junction with a sign reading "Indian Springs Ridge Road". Go right for 3.4 miles to a witness post on the right. The 0' stake with browse tag #156, is 14 paces from the witness post at 272 degrees magnetic.



Map name: Burnt Timber Canyon

Diagrammatic Sketch

Township 13S , Range 25E , Section 31.

UTM (NAD 83) 12T 4389574N 658300E

## DISCUSSION

### Indian Springs Bullhog - Study No. 10R-36

#### Study Information

This study is located within a dense pinyon-juniper forest on Indian Springs Ridge, approximately 2 miles northeast of Bitter Creek (elevation: 7,350 feet, slope: 4%, aspect: west). The study was established to monitor the effects of a bullhog tree mastication treatment designed to reduce the dense pinyon-juniper canopy. The area is in substantial deer summer range. In 2006, 17 elk and 10 deer days use (41 edu/ha and 25 ddu/ha) were estimated.

#### Soil

The soil is in the Moonset-Whetrock series complex. The Moonset series is located on hills, is well drained and moderately permeable, and is formed in slope alluvium and colluvium derived from sandstone and shale. The Whetrock series is found on hills and includes moderately deep, well drained soils that formed in slope alluvium and colluvium over residuum derived from sandstone and shale (USDA-NRCS 2006). The soil texture is a clay loam with a neutral pH (7.0). The soil is very shallow and rocky and the effective rooting depth is 9 inches. Relative bare ground provided 13% cover in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:4. The combined relative cover of vegetation and litter was 64% in 2006. The 2006 soil erosion condition rating was slight. Moderate pedestals, slight flow patterns, and rills 0.5-1 inch deep were noted.

#### Browse

The key browse species include Utah serviceberry, black sagebrush, true mountain mahogany, and antelope bitterbrush. Black sagebrush is located on the eastern edge of the study on the ridge top. Sagebrush density was 1,720 plants/acre in 2006, most of which were only lightly utilized. Only 3% of the population were young and 48% were classified as decadent. Those plants classified as dying made up 23% of the population. The average leader growth was less than 1 inch in 2006. The serviceberry was 860 plants/acre in 2006 and the average height of plants measured was nearly 6 feet. Only 5% of the population were classified as dying, 26% were classified as young, and 70% were classified as mature. Use was light to moderate and vigor was good. Average leader growth was 1.6 inches in 2006. The mahogany density was 280 plants/acre in 2006. The majority of the population was classified as mature, but plants classified as decadent made up 29% of the population. Plants classified as dying made up 14% of the population. Use was moderate and the average mahogany height was about 3 feet. The average leader growth was 1.5 inches in 2006. Antelope bitterbrush density was 340 plants/acre in 2006. Decadent individuals make up 29% of the population, young make up 24%, and plants classified as dying make up 18%. Utilization was light-moderate and plants are less than 2 feet tall on average. The average leader growth in 2006 was 1.5 inches.

The dominant browse species are pinyon pine and Utah juniper. The 2006 point quarter estimate of pinyon density was 608 trees/acre with an average trunk diameter of 3.2 inches. The estimated juniper density was 212 trees/acre with an average diameter of 1.1 inches. The estimated canopy cover for pinyon was 49% and 4% for juniper in 2006. Douglas fir was also sampled on the north end of the study at a density of 80 trees/acre in 2006. Gambel oak also sampled at a density of 780 plants/acre in 2006.

#### Herbaceous Understory

The herbaceous understory is neither diverse nor abundant. Six species of grasses and 14 species of forbs were sampled in 2006 and the combined grass and forb cover was only 7% in 2006. The dominant species, which make up 72% of the total understory cover, include a sedge, rock goldenrod, and desert phlox.

HERBACEOUS TRENDS --  
Management unit 10R, Study no: 36

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron spicatum	11	.13
G	Carex sp.	57	1.18
G	Koeleria cristata	38	.50
G	Oryzopsis hymenoides	2	.01
G	Poa fendleriana	15	.39
G	Poa secunda	9	.05
Total for Annual Grasses		0	0
Total for Perennial Grasses		132	2.27
Total for Grasses		132	2.27
F	Arabis sp.	7	.04
F	Astragalus spatulatus	19	.09
F	Comandra pallida	15	.06
F	Collinsia parviflora (a)	2	.00
F	Cordylanthus sp. (a)	9	.24
F	Eriogonum alatum	11	.15
F	Erigeron pumilus	8	.07
F	Ipomopsis aggregata	1	.00
F	Lesquerella sp.	19	.10
F	Machaeranthera grindelioides	1	.00
F	Penstemon sp.	6	.02
F	Petradoria pumila	41	1.35
F	Phlox austromontana	77	2.28
F	Senecio multilobatus	1	.00
Total for Annual Forbs		11	0.24
Total for Perennial Forbs		206	4.20
Total for Forbs		217	4.44

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

BROWSE TRENDS --

Management unit 10R, Study no: 36

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier utahensis	19	3.38
B	Artemisia nova	39	4.00
B	Cercocarpus montanus	10	1.49
B	Chrysothamnus depressus	21	.35
B	Juniperus osteosperma	9	1.16
B	Leptodactylon pungens	1	.00
B	Pediocactus simpsonii	1	-
B	Pinus edulis	31	13.64
B	Pseudotsuga menziesii	4	.15
B	Purshia tridentata	14	.88
B	Quercus gambelii	6	.98
B	Symphoricarpos oreophilus	2	.15
Total for Browse		157	26.21

CANOPY COVER, LINE INTERCEPT --

Management unit 10R, Study no: 36

Species	Percent Cover
	'06
Amelanchier utahensis	4.91
Artemisia nova	2.75
Cercocarpus montanus	1.10
Chrysothamnus depressus	.93
Juniperus osteosperma	4.13
Pinus edulis	48.75
Pseudotsuga menziesii	.06
Purshia tridentata	.96
Quercus gambelii	1.96
Symphoricarpos oreophilus	.25

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 10R, Study no: 36

Species	Average leader growth (in)
	'06
Amelanchier utahensis	1.6
Artemisia nova	0.6
Cercocarpus montanus	1.5
Purshia tridentata	1.5

POINT-QUARTER TREE DATA --  
Management unit 10R, Study no: 36

Species	Trees per Acre	Average diameter (in)
	'06	'06
Juniperus osteosperma	212	1.1
Pinus edulis	608	3.2

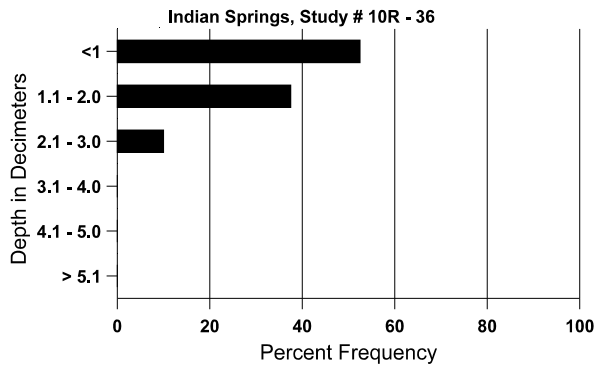
BASIC COVER --  
Management unit 10R, Study no: 36

Cover Type	Average Cover %
	'06
Vegetation	28.15
Rock	11.41
Pavement	14.43
Litter	50.68
Cryptogams	2.67
Bare Ground	16.11

SOIL ANALYSIS DATA --  
Herd Unit 10R, Study # 36, Study Name: Indian Springs

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
8.98	65.2 (11.02)	7.0	27.3	38.4	34.3	6.3	12.6	115.2	1.2

# Stoniness Index



## PELLET GROUP DATA --

Management unit 10R, Study no: 36

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	27	-
Elk	11	17 (41)
Deer	1	10 (25)

## BROWSE CHARACTERISTICS --

Management unit 10R, Study no: 36

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>												
06	<b>860</b>	220	220	600	40	40	21	0	5	-	0	58/50
<i>Artemisia nova</i>												
06	<b>1720</b>	80	60	840	820	1520	3	1	48	23	29	12/19
<i>Cercocarpus montanus</i>												
06	<b>280</b>	-	20	180	80	-	50	14	29	14	14	37/31
<i>Chrysothamnus depressus</i>												
06	<b>1260</b>	-	-	1080	180	20	16	62	14	10	10	4/8
<i>Juniperus osteosperma</i>												
06	<b>180</b>	80	120	60	-	-	0	0	-	-	11	-/-
<i>Leptodactylon pungens</i>												
06	<b>20</b>	-	-	20	-	40	0	0	-	-	0	-/-
<i>Pediocactus simpsonii</i>												
06	<b>40</b>	-	-	40	-	-	0	0	-	-	0	1/2
<i>Pinus edulis</i>												
06	<b>1200</b>	980	780	380	40	-	0	3	3	2	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)
<i>Pseudotsuga menziesii</i>												
06	<b>80</b>	20	80	-	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
06	<b>340</b>	-	80	160	100	-	47	0	29	18	18	16/31
<i>Quercus gambelii</i>												
06	<b>780</b>	420	380	360	40	60	0	0	5	5	5	27/29
<i>Symphoricarpos oreophilus</i>												
06	<b>40</b>	-	-	40	-	-	0	0	-	-	0	11/17

Trend Study 10R-37-06

Study site name: Winter Ridge Dixie 2.

Vegetation type: Mountain Big Sagebrush.

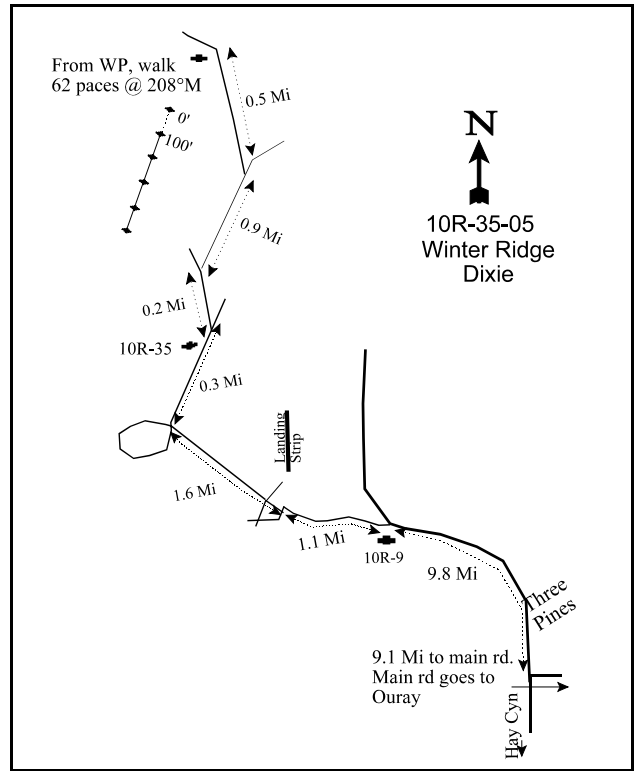
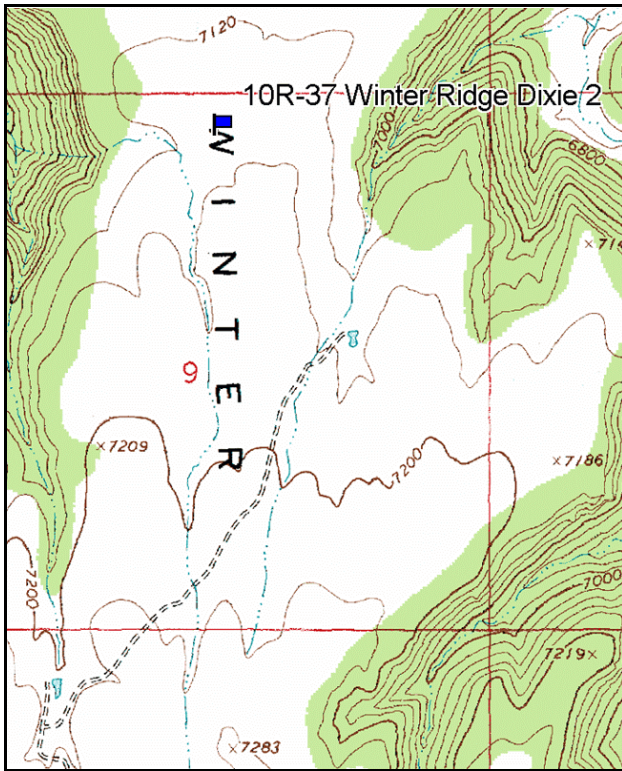
Compass bearing: frequency baseline 194 degrees magnetic.

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

No Rebar

LOCATION DESCRIPTION

From the intersection of the Seep Ridge and Book Cliff Divide road, proceed west along the divide for 9.4 miles to the major Three Pines - Hay Canyon intersection. Drive west along the Winter Ridge Rd for 9.8 miles to a fork. The Winter Ridge Exclosure (10R-9,10,11) is just south. Take the left fork (west) and drive 1.1 miles to a fork. Take the right fork, passing an antenna, and drive 1.6 miles to an intersection. Turn right (north) and drive 0.3 miles to the witness post on the right (west) side of the road. From the witness post, drive 0.2 miles to a fork and stay right for 0.9 miles to another fork and go left for 0.5 miles to another witness post. Walk 62 paces at 208 degrees magnetic to the 0' stake. The 0' stake is marked with browse tag #151.



Map name: Burnt Timber Canyon

Diagrammatic Sketch

Township 15S, Range 21E, Section 9.

UTM (NAD 83) 12T 4376958N 622713E



## DISCUSSION

### Winter Ridge Dixie 2 - Study No. 10R-37

#### Study Information

This study was established on the north end of Winter Ridge (elevation: 7,150 feet, slope: 3%, aspect: west). This study was established to monitor a dixie harrow treatment in mule deer winter range. This study will take place on an area that was cleared for oil and gas work. The treatment was originally planned to be implemented at location 1.3 miles to the south in 2005, but either NEPA or archeological clearance was not given. Twenty or more mustangs were seen 3-5 miles south of the study in 2006. In 2006, the estimated pellet group data were 10 elk, 1 deer, 7 cow, and 15 horse days use/acre (25 edu/ha, 3 ddu/ha, 16 cdu/ha, and 37 hdu/ha). Elk and deer use were from winter and early spring and horse use was from the current summer.

#### Soil

The soil is in the Winterridge-Moonset series complex. The Winterridge series is found on summits of plateaus and consists of very deep, well drained soils that are formed in eolian deposits over slope alluvium derived from shale, sandstone, siltstone, and limestone rocks. Moonset series is located on hills, is well drained and moderately permeable, and is formed in slope alluvium and colluvium derived from sandstone and shale (USDA-NRCS 2006). The effective rooting depth is 10 inches with about 10-15% rock in the profile. The soil texture is a clay loam with a neutral pH (7.3). Relative bare ground cover was 46% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.2. The combined relative cover of vegetation and litter was 48% in 2006. The 2006 soil erosion condition rating was slight. Two to five pedestals per 100 sq. ft., slight flow patterns, and rills less than 0.5 inch deep were noted.

#### Browse

The browse component is dominated by mountain big sagebrush and broom snakeweed. The preferred browse species are fringed sagebrush, mountain big sagebrush, and winterfat. Mountain big sagebrush leaves were very dry and beginning to fall off when sampled in 2006. It provided 11% cover with a density 5,280 plants/acre in 2006. The majority of the population (61%) was mature and decadence was moderately high at 36% of the population. Only 3% of the population were classified as young and plants classified as dying made up 14% of the population. Use was light in 2006. The average browse leader growth in 2006 was less than 1 inch. Winterfat plants were small, 4 inches tall on average, and density was 780 plants/acre in 2006. Only 5% of the population were classified as decadent and 15% were young. Winterfat plants were moderately to heavily hedged in 2006. Fringed sagebrush was sampled in low densities in 2006, 40 plants/acre, and provided little to the browse component.

Dwarf rabbitbrush was sampled at a density of 14,540 plants/acre in 2006, 85% of which were mature. Broom snakeweed is the most abundant species on the study. It only provided 7% cover, but its density was 23,480 plants/acre in 2006.

#### Herbaceous Understory

The herbaceous understory is neither diverse nor abundant. It provided a combined 14% cover in 2006. Eight species of grasses were sampled in 2006, one of which was an annual. Twelve species of forbs were also sampled, all of which were perennials. Grasses provided a total cover of 9% in 2006. The dominant grasses in 2006 were western wheatgrass (4% cover), Sandberg bluegrass (3% cover), and blue grama (2% cover). Forbs only provided 5% cover in 2006, desert phlox provided 4% itself.

The 2006 Desirable Components Index score was poor-fair due to moderate browse cover, high sagebrush decadence, and moderate perennial grass cover.

2006 winter range condition (DC Index) – poor-fair (51) Mid-level potential scale

HERBACEOUS TRENDS --

Management unit 10R, Study no: 37

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Agropyron smithii</i>	248	3.56
G	<i>Agropyron spicatum</i>	7	.21
G	<i>Bouteloua gracilis</i>	33	1.61
G	<i>Bromus tectorum</i> (a)	6	.06
G	<i>Koeleria cristata</i>	22	.69
G	<i>Oryzopsis hymenoides</i>	1	.03
G	<i>Poa fendleriana</i>	21	.31
G	<i>Poa secunda</i>	215	2.71
Total for Annual Grasses		6	0.06
Total for Perennial Grasses		547	9.14
Total for Grasses		553	9.20
F	<i>Agoseris glauca</i>	2	.00
F	<i>Astragalus</i> sp.	1	.00
F	<i>Castilleja</i> sp.	3	.00
F	<i>Erigeron pumilus</i>	12	.06
F	<i>Ipomopsis aggregata</i>	5	.04
F	<i>Lesquerella</i> sp.	2	.00
F	<i>Linum lewisii</i>	4	.01
F	<i>Machaeranthera grindelioides</i>	10	.33
F	<i>Phlox austromontana</i>	176	4.08
F	<i>Phlox longifolia</i>	7	.01
F	<i>Sphaeralcea coccinea</i>	57	.22
F	<i>Townsendia</i> sp.	41	.15
Total for Annual Forbs		0	0
Total for Perennial Forbs		320	4.95
Total for Forbs		320	4.95

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

BROWSE TRENDS --

Management unit 10R, Study no: 37

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia frigida	2	.00
B	Artemisia tridentata vaseyana	91	11.17
B	Ceratoides lanata	22	.19
B	Chrysothamnus depressus	93	4.23
B	Gutierrezia sarothrae	94	6.53
B	Opuntia sp.	1	.03
B	Pediocactus simpsonii	1	-
B	Pinus edulis	2	-
Total for Browse		306	22.18

CANOPY COVER, LINE INTERCEPT --

Management unit 10R, Study no: 37

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	14.03
Ceratoides lanata	.16
Chrysothamnus depressus	3.73
Gutierrezia sarothrae	7.25

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 10R, Study no: 37

Species	Average leader growth (in)
	'06
Artemisia tridentata vaseyana	0.9

BASIC COVER --

Management unit 10R, Study no: 37

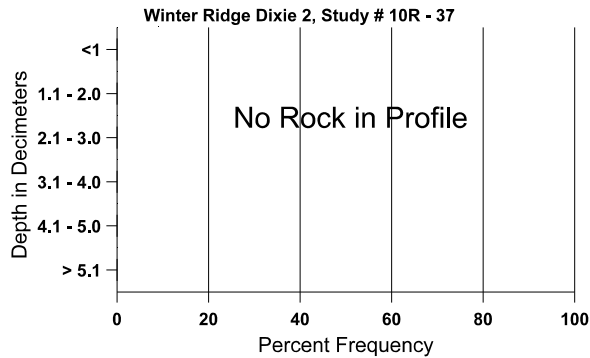
Cover Type	Average Cover %
	'06
Vegetation	30.23
Rock	.95
Pavement	2.42
Litter	22.76
Cryptogams	3.64
Bare Ground	50.78

SOIL ANALYSIS DATA --

Herd Unit 10R, Study # 37, Study Name: Winter Ridge Dixie 2

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	ppm P	ppm K	dS/m
10.31	69 (11.97)	7.3	28.3	44.4	27.3	2.0	10.4	86.4	0.9

Stoniness Index



PELLET GROUP DATA --

Management unit 10R, Study no: 37

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	76	-
Horse	13	15 (37)
Elk	6	10 (25)
Deer	5	1 (3)
Cattle	2	7 (16)

BROWSE CHARACTERISTICS --

Management unit 10R, Study no: 37

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia frigida</i>												
06	<b>40</b>	-	-	40	-	-	0	0	-	-	0	6/7
<i>Artemisia tridentata vaseyana</i>												
06	<b>5280</b>	-	180	3200	1900	820	8	.75	36	14	50	17/24
<i>Ceratoides lanata</i>												
06	<b>780</b>	-	120	620	40	-	15	59	5	-	0	4/5
<i>Chrysothamnus depressus</i>												
06	<b>14540</b>	20	860	12300	1380	1120	16	67	9	2	2	2/6
<i>Gutierrezia sarothrae</i>												
06	<b>23480</b>	80	1600	21800	80	120	0	0	0	.08	.08	5/7

		Age class distribution (plants per acre)					Utilization					
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia sp.												
06	<b>20</b>	-	-	-	20	-	0	0	100	100	100	-/-
Pediocactus simpsonii												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	1/2
Pinus edulis												
06	<b>40</b>	-	40	-	-	-	0	0	-	-	0	-/-

Trend Study 10R-38-06

Study site name: Long Canyon Chain.

Vegetation type: Pinyon/Juniper.

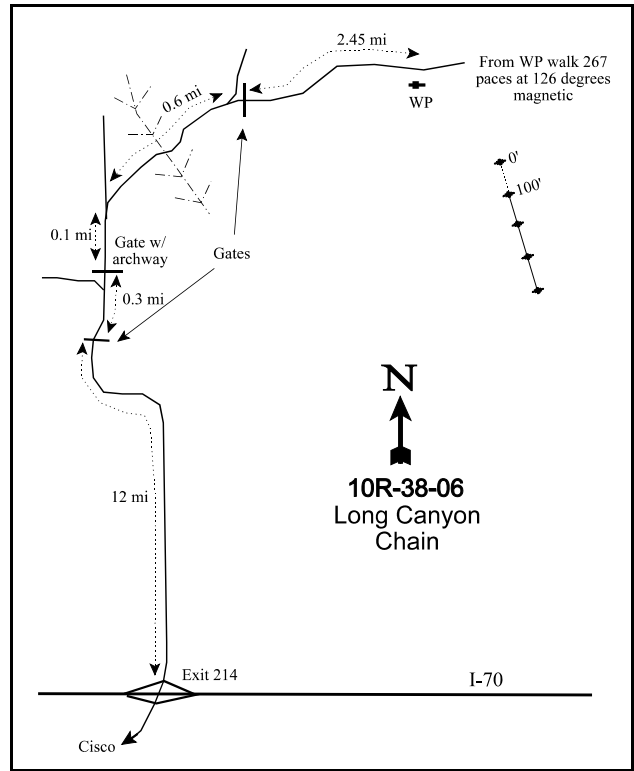
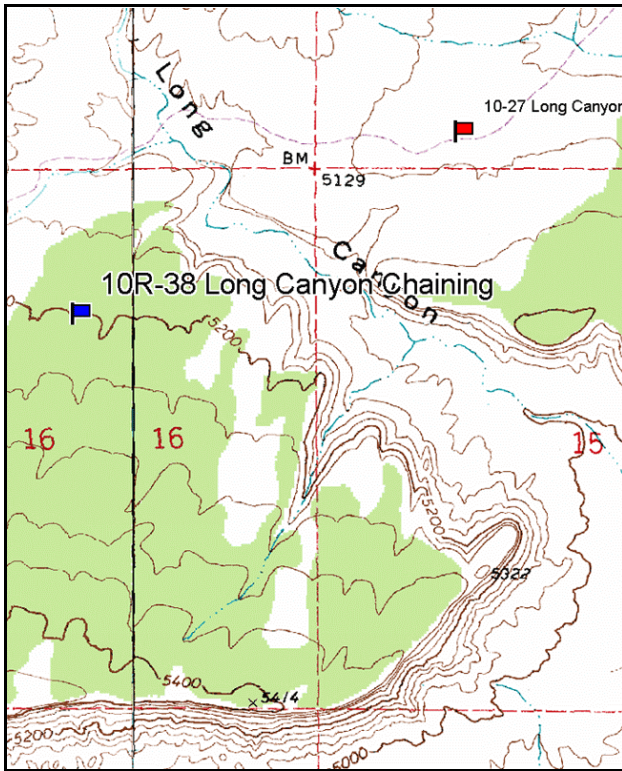
Compass bearing: frequency baseline 164 degrees magnetic.

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

No Rebar

LOCATION DESCRIPTION

From the I-70 take the Cisco exit, Exit 214. From the exit drive north for 12 miles to a gate. Proceed through the gate for 0.3 miles to a fork and another gate. Drive through the gate 0.1 miles to a fork. Turn right and drive 0.6 miles to another fork in the road and gate crossing a wash along the way. Proceed through the gate for 2.45 miles to a witness post on the right. Walk 276 paces (1380 ft) at 126 degrees magnetic to the 0' stake. The 0' stake is marked with browse tag #162.



Map name: Flume Canyon

Diagrammatic Sketch

Township 19S, Range 23E, Section 16.

UTM (NAD 83) 12T 4335462N 640165E

## DISCUSSION

### Long Canyon Chaining - Study No. 10R-38

#### Study Information

This study is located approximately 13 miles north of Cisco in a pinyon-juniper stand (elevation: 5,200 feet, slope: 12%, aspect: north). The study was established in 2006 to sample the effects of a pinyon-juniper chaining planned to take place in the fall of 2006. It is located in winter range on SITLA land south of the Book Cliffs. In 2006, the pellet group estimate data was 1 deer day use/acre (3 ddu/ha).

#### Soil

The soil is a Shalako gravelly sandy loam. The Shalako series consists of shallow, well drained, moderately rapidly permeable soils that formed in residuum and alluvium derived from sandstone. It is found on slopes and benches (USDA-NRCS 2006). The effective rooting depth is 10 inches with about 10-15% rock in the profile. The soil texture is a loam with a slightly alkaline pH (7.5). Relative bare ground cover was 51% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.2. The combined relative cover of vegetation and litter was only 32% in 2006. The 2006 soil erosion condition rating was slight. This was due to flow patterns covering 25% and 50% of the soil surface area.

#### Browse

There was little browse cover in 2006 due to the high Utah juniper cover. No living sagebrush were sampled in 2006, but 1,760 dead plants/acre were sampled. Only broom snakeweed seedlings and dead were sampled as well. West (1994) showed that as pinyon-juniper cover increases, the herbaceous and browse understories decrease. Generally, pinyon-juniper cover of over 15% greatly diminishes the understory cover. Juniper canopy cover was 19% in 2006. The estimated juniper density, measured by the point quarter method, was 214 trees/acre with an average diameter of 10.6 inches in 2006. The juniper showed no utilization from big game.

#### Herbaceous Understory

The herbaceous understory is also diminished because of the high juniper cover. The combined cover of grasses and forbs was 1% in 2006. Two species of grasses, cheatgrass and sixweeks fescue, were sampled in 2006. Five species of forbs, four of which were annuals, were sampled in 2006 as well.

The chaining can only improve the browse and herbaceous understory components of this study if species are seeded.

The 2006 Desirable Components Index score was very poor due to the lack of browse and understory cover.

2006 winter range condition (DC Index) – very poor (0) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 10R, Study no: 38

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Bromus tectorum (a)	13	.08
G	Vulpia octoflora (a)	8	.01
Total for Annual Grasses		21	0.09
Total for Perennial Grasses		0	0

Type	Species	Nested Frequency	Average Cover %
		'06	'06
Total for Grasses		21	0.09
F	Alyssum alyssoides (a)	7	.03
F	Descurainia pinnata (a)	41	.61
F	Eriogonum cernuum (a)	70	.38
F	Lappula occidentalis (a)	27	.09
F	Schoenocrambe linifolia	2	.00
Total for Annual Forbs		145	1.11
Total for Perennial Forbs		2	0.00
Total for Forbs		147	1.12

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

BROWSE TRENDS --

Management unit 10R, Study no: 38

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata wyomingensis	0	-
B	Ephedra viridis	0	-
B	Gutierrezia sarothrae	0	-
B	Juniperus osteosperma	12	7.91
B	Opuntia sp.	3	-
Total for Browse		15	7.91

CANOPY COVER, LINE INTERCEPT --

Management unit 10R, Study no: 38

Species	Percent Cover
	'06
Juniperus osteosperma	19.35

POINT-QUARTER TREE DATA --

Management unit 10R, Study no: 38

Species	Trees per Acre	Average diameter (in)
	'06	'06
Juniperus osteosperma	214	10.6



BASIC COVER --

Management unit 10R, Study no: 38

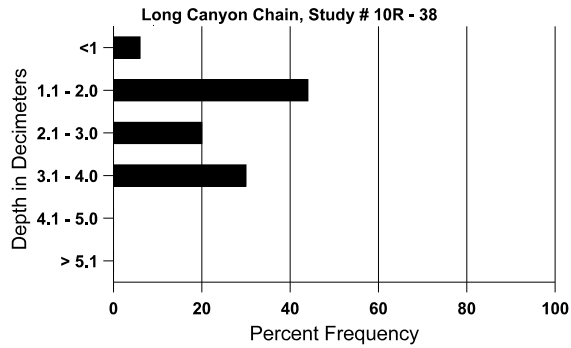
Cover Type	Average Cover % '06
Vegetation	8.62
Rock	3.10
Pavement	3.81
Litter	27.36
Cryptogams	13.46
Bare Ground	58.60

SOIL ANALYSIS DATA --

Herd Unit 10R, Study # 38, Study Name: Long Canyon Chain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
12.28	75 (24.4)	7.5	38.2	36.0	25.8	1.3	16.1	118.4	0.4

### Stoniness Index



PELLET GROUP DATA --

Management unit 10R, Study no: 38

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	64	-
Deer	-	1 (3)

BROWSE CHARACTERISTICS --  
 Management unit 10R, Study no: 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)
<i>Artemisia tridentata wyomingensis</i>												
06	0	-	-	-	-	1760	0	0	-	-	0	-/-
<i>Ephedra viridis</i>												
06	0	-	-	-	-	-	0	0	-	-	0	19/22
<i>Gutierrezia sarothrae</i>												
06	0	40	-	-	-	160	0	0	-	-	0	8/11
<i>Juniperus osteosperma</i>												
06	280	20	40	180	60	40	0	0	21	21	36	-/-
<i>Opuntia sp.</i>												
06	60	-	20	-	40	-	0	0	67	33	67	4/20

Trend Study 11R-9-06

Study site name: East Carbon Bullhog.

Vegetation type: Pinyon/Juniper chain.

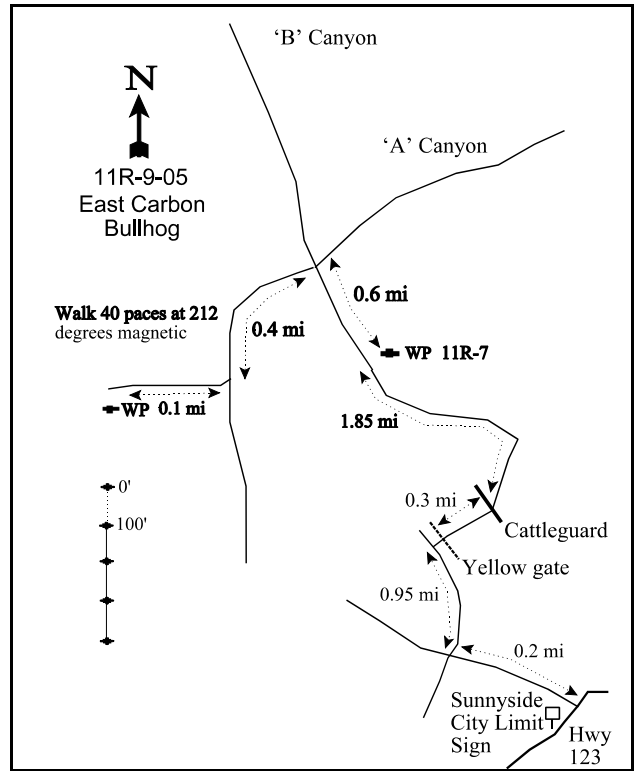
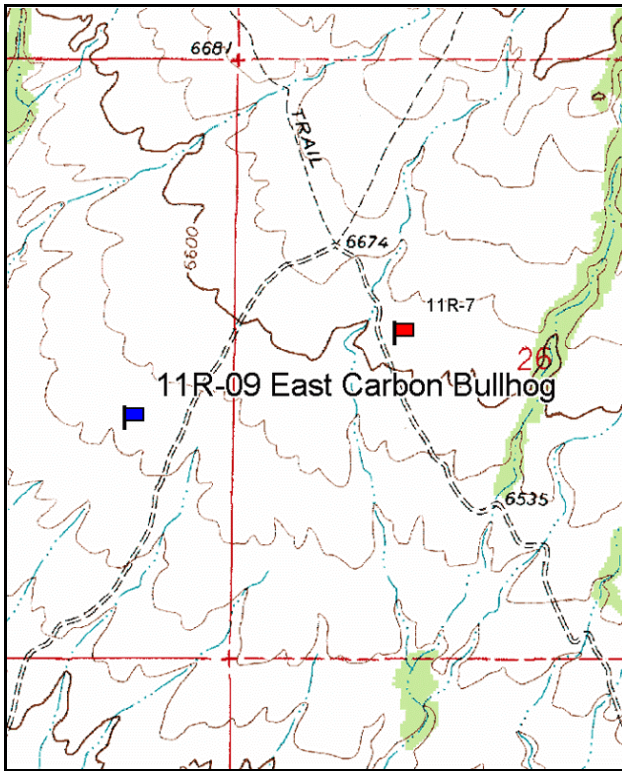
Compass bearing: frequency baseline 180 degrees magnetic.

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

No Rebar

LOCATION DESCRIPTION

From the I-70 take the Cisco exit, Exit 214. From the exit drive north for 12 miles to a gate. Proceed through the gate for 0.3 miles to a fork and another gate. Drive through the gate 0.1 miles to a fork. Turn right and drive 0.6 miles to another fork in the road and gate crossing a wash along the way. Proceed through the gate for 2.45 miles to a witness post on the right. Walk 276 paces (1380 ft) at 126 degrees magnetic to the 0' stake. The 0' stake is marked with browse tag #162.



Map name: Sunnyside

Diagrammatic Sketch

Township 14S, Range 13E, Section 27.

UTM (NAD 83) 12T 4380935N 547915E

## DISCUSSION

### East Carbon Bullhog - Study No. 11R-9

#### Study Information

This study is located 3 miles northwest of East Carbon City in an old chaining (elevation: 6,500 feet, slope: 9%, aspect: south). The pinyon and juniper trees dominate the area and browse and understory species are rare. It was established to monitor the effects of a bullhog pinyon-juniper mastication treatment in this mule deer winter range. The pretreatment data collection was conducted in August 2006. In 2006, the estimated pellet group data were 2 elk and 36 deer days use/acre (5 edu/ha and 89 ddu/ha). Deer and elk use were from winter. A few cow pats were also seen on the study, but not measured in the pellet group measurements.

#### Soil

The soil is a Strych very stony loam. The Strych series soils are very deep, well drained, moderately rapidly permeable that are formed from sandstone shale and conglomerate in alluvium and colluvium. These soils can be found on alluvial fans, fan remnants, toeslopes, terraces, and fan piedmonts (USDA-NRCS 2006). The effective rooting depth is 10 inches with a high percentage of rock in the profile. A calcium carbonate layer was evident on the top of the profile rocks. The soil texture is a sandy clay loam with a slightly alkaline pH (7.8). Relative bare ground cover was 28% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.3. The combined relative cover of vegetation and litter was only 55% in 2006. The 2006 soil erosion condition rating was moderate. This was due to light surface litter movement, moderate surface rock movement, 7-10 pedestals per 100 square feet, flow patterns covering 25% and 50% of the soil surface area, two large active gullies with 10-50% of the gully walls showing active erosion, and a small amount of soil movement.

#### Browse

The browse component is greatly reduced due to the high pinyon-juniper cover. True mountain mahogany and green ephedra are the key browse species. Mountain mahogany cover was 1% with a density of 120 plants/acre in 2006. The majority of that population, 67%, was decadent and 67% were classified as dying. Utilization in 2006 was moderate-heavy. Mahogany average leader growth was 2.2 inches in 2006. Only 140 green ephedra plants/acre were sampled in 2006, all of which were heavily utilized.

The pinyon and juniper trees have played a role in decreasing the understory and browse cover. Tausch and West (1994) showed that as pinyon-juniper cover increases, the herbaceous and browse understories decrease. Generally, pinyon-juniper cover of over 15% greatly diminishes the understory cover. The combined canopy cover of pinyon and juniper was over 17% in 2006. The pinyon density estimates, using the point quarter method, were 116 trees/acre with an average trunk diameter of 4.9 inches in 2006. The juniper density estimates were 232 trees/acre with an average trunk diameter of 3.9 inches. In 2006, most pinyon trees were between 8 and 12 feet in height and most junipers were between 4 and 8 feet.

#### Herbaceous Understory

The herbaceous understory is very sparse. Only three species of grasses and three species of forbs were sampled in 2006. Crested wheatgrass provided the 94% of herbaceous cover at 7%. All other species were rare.

The 2006 Desirable Components Index score was poor due to the lack of browse cover and low understory cover.

2006 winter range condition (DC Index) – poor (18) Low potential scale

HERBACEOUS TRENDS --

Management unit 11R, Study no: 9

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Agropyron cristatum</i>	204	7.39
G	<i>Aristida purpurea</i>	3	.15
G	<i>Oryzopsis hymenoides</i>	1	.15
Total for Annual Grasses		0	0
Total for Perennial Grasses		208	7.70
Total for Grasses		208	7.70
F	<i>Euphorbia</i> sp.	8	.12
F	<i>Penstemon</i> sp.	6	.02
F	<i>Phlox longifolia</i>	1	.00
Total for Annual Forbs		0	0
Total for Perennial Forbs		15	0.14
Total for Forbs		15	0.14

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

BROWSE TRENDS --

Management unit 11R, Study no: 9

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	<i>Cercocarpus montanus</i>	5	1.36
B	<i>Ephedra viridis</i>	2	.38
B	<i>Gutierrezia sarothrae</i>	0	.00
B	<i>Juniperus osteosperma</i>	11	3.26
B	<i>Opuntia</i> sp.	0	-
B	<i>Pinus edulis</i>	10	6.14
Total for Browse		28	11.15

CANOPY COVER, LINE INTERCEPT --

Management unit 11R, Study no: 9

Species	Percent Cover
	'06
<i>Cercocarpus montanus</i>	1.75
<i>Ephedra viridis</i>	.85
<i>Juniperus osteosperma</i>	2.45
<i>Pinus edulis</i>	14.88

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 11R, Study no: 9

Species	Average leader growth (in)
	'06
Cercocarpus montanus	2.2

POINT-QUARTER TREE DATA --  
Management unit 11R, Study no: 9

Species	Trees per Acre	Average diameter (in)
	'06	'06
Juniperus osteosperma	232	3.9
Pinus edulis	116	4.9

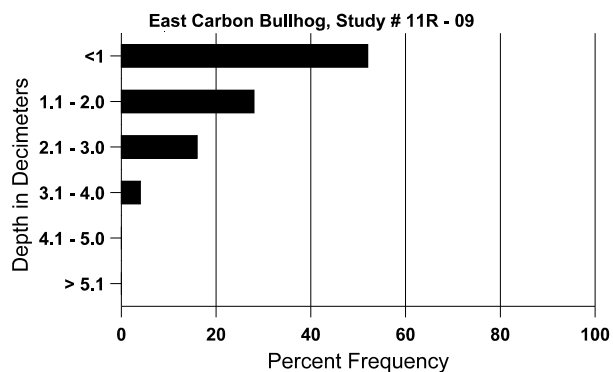
BASIC COVER --  
Management unit 11R, Study no: 9

Cover Type	Average Cover %
	'06
Vegetation	18.98
Rock	13.50
Pavement	4.66
Litter	45.75
Cryptogams	1.08
Bare Ground	31.97

SOIL ANALYSIS DATA --  
Herd Unit 11R, Study # 9, Study Name: East Carbon Bullhog

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
10.41	71.6 (10.79)	7.8	48.2	27.0	24.5	3.5	17.1	83.2	0.6

## Stoniness Index



PELLET GROUP DATA --  
 Management unit 11R, Study no: 9

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	82	-
Elk	-	2 (5)
Deer	22	36 (89)

BROWSE CHARACTERISTICS --  
 Management unit 11R, Study no: 9

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Cercocarpus montanus</i>												
06	<b>120</b>	-	-	40	80	40	67	17	67	67	67	59/59
<i>Ephedra viridis</i>												
06	<b>140</b>	-	-	140	-	-	0	100	-	-	0	39/45
<i>Gutierrezia sarothrae</i>												
06	<b>0</b>	20	-	-	-	-	0	0	-	-	0	2/2
<i>Juniperus osteosperma</i>												
06	<b>240</b>	20	60	180	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	4/9
<i>Pinus edulis</i>												
06	<b>220</b>	20	40	180	-	-	0	0	-	-	0	-/-

Trend Study 14R-12-06

Study site name: Bell Draw Drill.

Vegetation type: Wyoming Big Sagebrush.

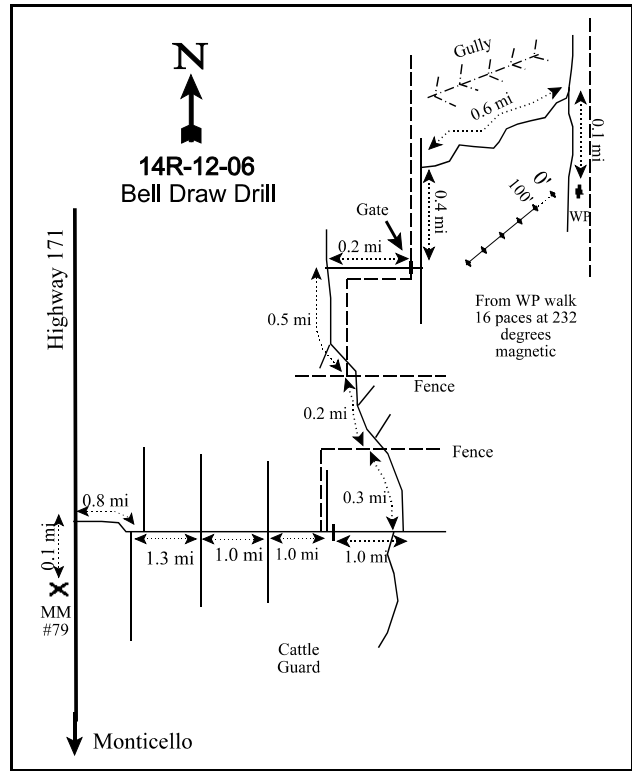
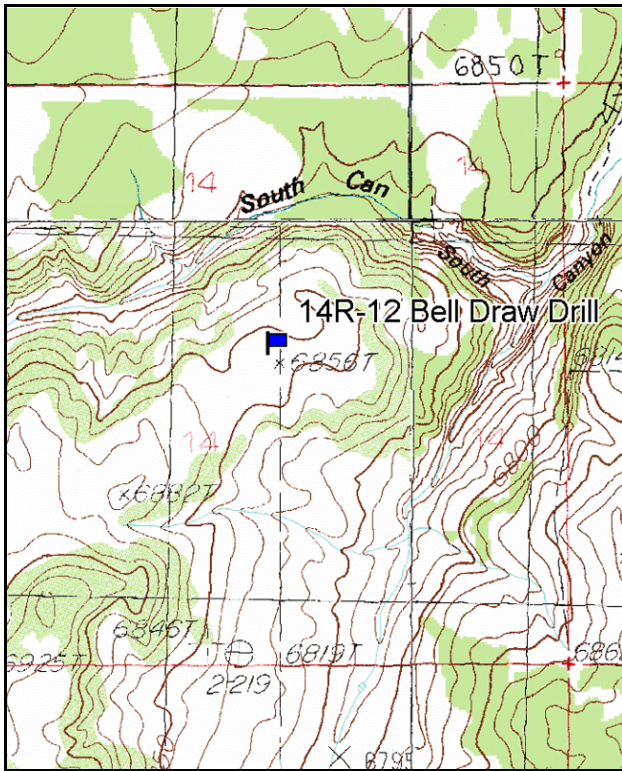
Compass bearing: frequency baseline 224 degrees magnetic.

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

No Rebar

LOCATION DESCRIPTION

From mile marker 79 on highway 191 north of Monticello drive 0.1 miles north and turn right onto a road heading east. Drive 0.8 miles to a junction, stay straight for 1.3 miles to another junction again staying straight for 1.0 mile to another junction again staying straight for another 1.0 mile to a junction and cattle guard. From the cattle guard drive 1.0 mile and turn left on a two-track road heading north. Drive 0.3 miles to a gate. Go through the gate and drive 0.2 miles to a fence staying left through two forks. From the fence drive 0.5 miles to a junction staying right through one fork. At the junction turn right and drive 0.2 miles to a gate. Immediately after the gate turn left (north) and drive 0.4 miles to a road on the right. Turn right and drive 0.6 miles to a fork and turn right, drive 0.1 miles to the witness post on the left. The witness post is right next to a fence post between the fence and the road. Walk 16 paces from the witness post at 232 degrees magnetic to the 0' stake marked with browse tag #166.



Map name: Monticello North

Diagrammatic Sketch

Township 32S , Range 24E , Section 14.

UTM (NAD 83) 12T 4206873N 653205E



## DISCUSSION

### Bell Draw Drill - Study No. 14R-12

#### Study Information

This study is located on private property approximately 10 miles northeast of Monticello (elevation: 6,850 feet, slope: 3%, aspect: west). This study was established to monitor the effects of a drill seeding on a crested wheatgrass field in winter range. The pretreatment data collection was conducted in August 2006. The grasses showed moderate use in 2006. The 2006 pellet group data estimates were 2 elk and 33 cow days use/acre (5 edu/ha and 82 cdu/ha). The elk use was from the previous winter.

#### Soil

The soil is a Northdale loam. The Northdale series is made up of moderately deep, well drained soils formed in eolian deposits and material weathered from sandstone and are found on rolling uplands (USDA-NRCS 2006). The effective rooting depth is 10 inches with no rock in the profile. The soil texture is a loam with a slightly alkaline pH (7.5). Relative bare ground cover was 59% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:1.9. The combined relative cover of vegetation and litter was only 41% in 2006. The 2006 soil erosion condition rating was moderate. This might have been inflated somewhat because the study had received an extremely heavy rain event the previous day. This erosion evidences were heavy surface litter movement, 7-10 pedestals per 100 square feet, flow patterns covering over 50% of the soil surface area, and heavy soil movement.

#### Browse

The browse component is dominated by broom snakeweed, although some Wyoming big sagebrush and antelope bitterbrush were sampled. Sagebrush density was 100 plants/acre in 2006. Bitterbrush was only sampled in the height-crown measurements. Broom snakeweed provided 3% cover at density of 14,420 plants/acre in 2006. Rubber rabbitbrush was sampled at a density of 700 plants/acre in 2006.

#### Herbaceous Understory

The herbaceous understory is dominated by crested wheatgrass. It made up 93% of the herbaceous understory cover and 80% of vegetation cover in 2006. It provided 26% cover and was at a quadrat frequency of 97%. No other grass species and six forb species were sampled in 2006. Lobeleaf groundsel provided the majority of the forb cover and provided nearly 2% cover in 2006. No annual species were sampled in 2006.

The 2006 Desirable Components Index score was fair due to the high perennial grass cover, but was penalized because of the lack of browse cover.

2006 winter range condition (DC Index) – fair (34) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 14R, Study no: 12

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	344	26.04
Total for Annual Grasses		0	0
Total for Perennial Grasses		344	26.04
Total for Grasses		344	26.04
F	Astragalus sp.	21	.05
F	Cryptantha sp.	1	.00

Type	Species	Nested Frequency	Average Cover %
		'06	'06
F	Erigeron sp.	3	.03
F	Euphorbia sp.	40	.18
F	Senecio multilobatus	181	1.69
F	Sphaeralcea coccinea	20	.03
Total for Annual Forbs		0	0
Total for Perennial Forbs		266	2.00
Total for Forbs		266	2.00

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

#### BROWSE TRENDS --

Management unit 14R, Study no: 12

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata wyomingensis	4	.01
B	Chrysothamnus nauseosus hololeucus	27	1.43
B	Gutierrezia sarothrae	90	2.97
B	Opuntia sp.	0	-
B	Purshia tridentata	0	-
Total for Browse		121	4.41

#### CANOPY COVER, LINE INTERCEPT --

Management unit 14R, Study no: 12

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	.08
Chrysothamnus nauseosus hololeucus	.85
Gutierrezia sarothrae	2.73

BASIC COVER --

Management unit 14R, Study no: 12

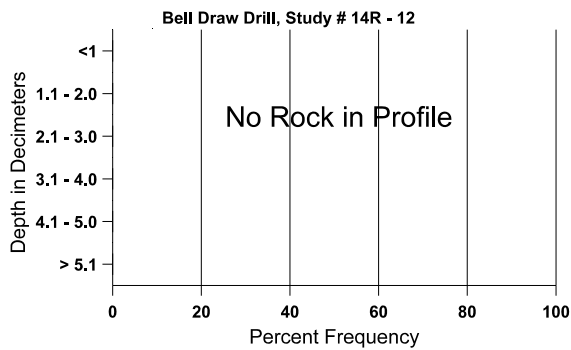
Cover Type	Average Cover %
	'06
Vegetation	30.14
Rock	.08
Pavement	.15
Litter	17.50
Cryptogams	.70
Bare Ground	69.19

SOIL ANALYSIS DATA --

Herd Unit 14R, Study # 12, Study Name: Bell Draw Drill

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
11.5	67.6 (11.34)	7.5	34.2	40.0	25.8	1.1	14.9	134.4	0.5

### Stoniness Index



PELLET GROUP DATA --

Management unit 14R, Study no: 12

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	93	-
Elk	1	2 (5)
Cattle	21	33 (82)

BROWSE CHARACTERISTICS --  
 Management unit 14R, Study no: 12

		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>Artemisia tridentata wyomingensis</i>												
06	<b>100</b>	20	20	60	20	160	20	0	20	-	0	8/13
<i>Chrysothamnus nauseosus hololeucus</i>												
06	<b>700</b>	60	260	440	-	-	14	17	-	-	0	12/13
<i>Gutierrezia sarothrae</i>												
06	<b>14420</b>	12880	5840	8440	140	40	0	.27	1	.55	.55	5/7
<i>Opuntia sp.</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	5/50
<i>Purshia tridentata</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	3/6

Trend Study 14R-13-06

Study site name: Bell Draw Dixie.

Vegetation type: Wyoming Big Sagebrush.

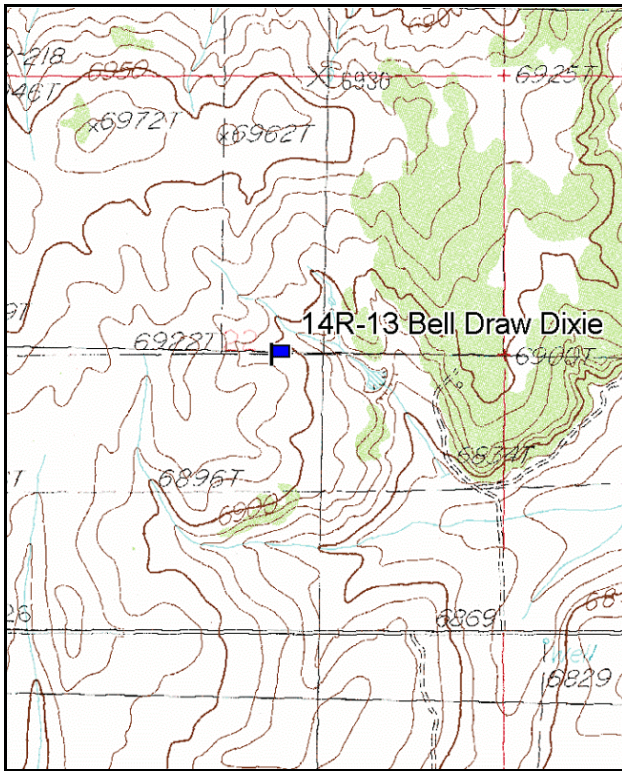
Compass bearing: frequency baseline 251 degrees magnetic.

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

No Rebar

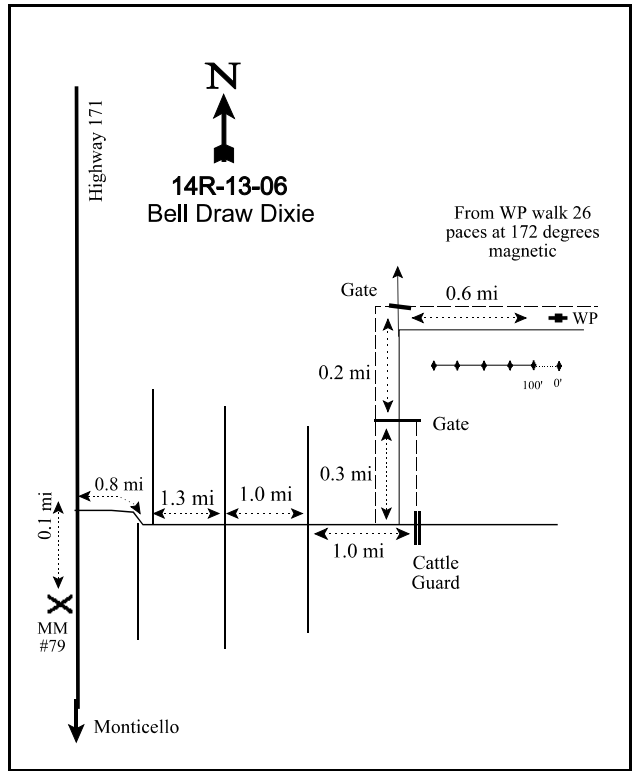
LOCATION DESCRIPTION

From mile marker 79 on highway 191 north of Monticello drive 0.1 miles north and turn right onto a road heading east. Drive 0.8 miles to a junction, stay straight for 1.3 miles to another junction again staying straight for 1.0 mile to another junction again staying straight for another 1.0 mile to a junction. Turn left (north) at this junction and drive 0.3 miles to a gate. Drive 0.2 miles to another gate and turn right on a road just before the gate. Proceed 0.6 miles to a witness post on the left. The witness post is right next to a fence post. The 0' stake is 26 paces from the witness post at 172 degrees magnetic. The 0' stake is marked with browse tag #165.



Map name: Monticello North

Township 32S , Range 24E , Section 22.



Diagrammatic Sketch

UTM (NAD 83) 12T 4205153N 651792E

## DISCUSSION

### Bell Draw Dixie - Study No. 14R-13

#### Study Information

This study is located on private property approximately 8 miles northeast of Monticello (elevation: 6,900 feet, slope: 7%, aspect: northeast). This study was established to monitor the effects of a dixie harrow treatment in winter range in a dense Wyoming big sagebrush community. The pretreatment data collection was conducted in August 2006. The 2006 pellet group data estimates were 1 elk, 3 deer, and 27 cow days use/acre (2 edu/ha, 7 ddu/ha, and 66 cdu/ha).

#### Soil

The soil is a Northdale loam. The Northdale series is made up of moderately deep, well drained soils formed in eolian deposits and material weathered from sandstone and are found on rolling uplands (USDA-NRCS 2006). The effective rooting depth is 12 inches with no rock in the profile. The soil texture is a loam with a neutral pH (7.3). Relative bare ground cover was 58% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:1.9. The combined relative cover of vegetation and litter was only 41% in 2006. The 2006 soil erosion condition rating was moderate. This might have been inflated somewhat because the study had received an extremely heavy rain event just while setting it up. The erosion evidences were moderate surface litter movement, 5-7 pedestals per 100 square feet, flow patterns covering between 25% and 50% of the soil surface area, deep rills 3-6 inches deep, and light soil movement.

#### Browse

The browse component is dominated by Wyoming big sagebrush. Sagebrush cover was 19% with a density of 3,800 plants/acre in 2006. Young individuals made up 31% of the population, decadent made up 23%, and mature made up 46% in 2006. Plants classified as decadent made up only 11% of the population. Seedlings were very abundant in 2006 at 76,220 plants/acre. Use was light. The average browse leader growth was less than 1 inch. Rubber rabbitbrush was sampled at 200 plants/acre and broom snakeweed was sampled at 7,740 plants/acre in 2006.

#### Herbaceous Understory

The herbaceous understory is dominated by crested wheatgrass. It made up 76% of the herbaceous understory cover in 2006. It provided 7% cover and was at a quadrat frequency of 68%. No other grass species and seven forb species were sampled in 2006. Lobeleaf groundsel provided the majority of the forb cover and provided nearly 2% cover in 2006. No annual species were sampled in 2006.

The 2006 Desirable Components Index score was excellent due to high preferred browse cover, good percent young, moderate decadence, and high perennial grass cover.

2006 winter range condition (DC Index) – excellent (69) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 14R, Study no: 13

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	192	6.58
Total for Annual Grasses		0	0
Total for Perennial Grasses		192	6.58

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
Total for Grasses		192	6.58
F	Astragalus convallarius	3	.00
F	Erigeron sp.	13	.04
F	Euphorbia sp.	46	.14
F	Machaeranthera grindelioides	1	.00
F	Penstemon sp.	4	.03
F	Senecio multilobatus	128	1.72
F	Sphaeralcea coccinea	21	.13
Total for Annual Forbs		0	0
Total for Perennial Forbs		216	2.08
Total for Forbs		216	2.08

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

#### BROWSE TRENDS --

Management unit 14R, Study no: 13

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata wyomingensis	71	18.95
B	Chrysothamnus nauseosus hololeucus	10	.53
B	Gutierrezia sarothrae	76	2.18
B	Opuntia sp.	6	1.12
Total for Browse		163	22.79

#### CANOPY COVER, LINE INTERCEPT --

Management unit 14R, Study no: 13

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	23.41
Chrysothamnus nauseosus hololeucus	.43
Gutierrezia sarothrae	8.31
Opuntia sp.	.83

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

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	0.8

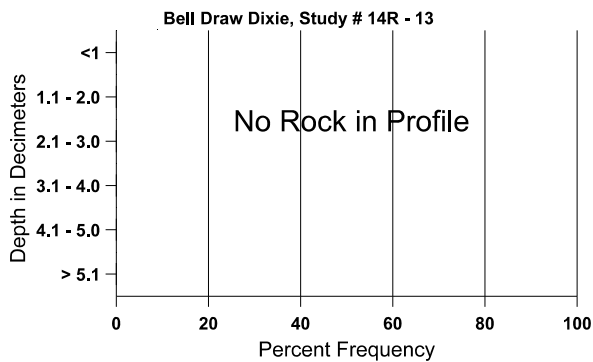
BASIC COVER --  
 Management unit 14R, Study no: 13

Cover Type	Average Cover %
	'06
Vegetation	26.28
Rock	.01
Pavement	.05
Litter	20.48
Cryptogams	.96
Bare Ground	67.24

SOIL ANALYSIS DATA --  
 Herd Unit 14R, Study # 13, Study Name: Bell Draw Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
15.43	68.8 (14.96)	7.3	44.2	36.0	19.8	1.4	21.12	172.8	0.6

### Stoniness Index





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

Type	Quadrat Frequency	Days use per acre (ha)
	'06	
Rabbit	78	-
Elk	3	1 (2)
Deer	1	3 (7)
Cattle	5	27 (66)

BROWSE CHARACTERISTICS --  
 Management unit 14R, 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)
<i>Artemisia tridentata wyomingensis</i>												
06	<b>3800</b>	76220	1180	1760	860	500	0	0	23	11	11	27/40
<i>Chrysothamnus nauseosus hololeucus</i>												
06	<b>200</b>	-	20	40	140	-	10	10	70	60	60	19/21
<i>Gutierrezia sarothrae</i>												
06	<b>7740</b>	3580	2920	4800	20	60	0	0	0	-	0	5/9
<i>Opuntia sp.</i>												
06	<b>120</b>	-	20	80	20	-	0	0	17	-	17	6/30

Trend Study 14R-14-06

Study site name: SITLA Dixie.

Vegetation type: Wyoming Big Sagebrush.

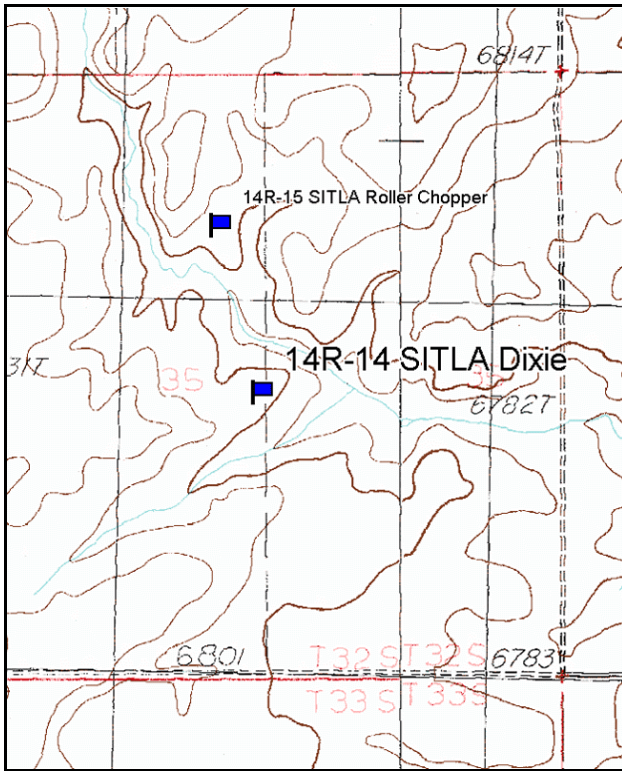
Compass bearing: frequency baseline 253 degrees magnetic.

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

No Rebar

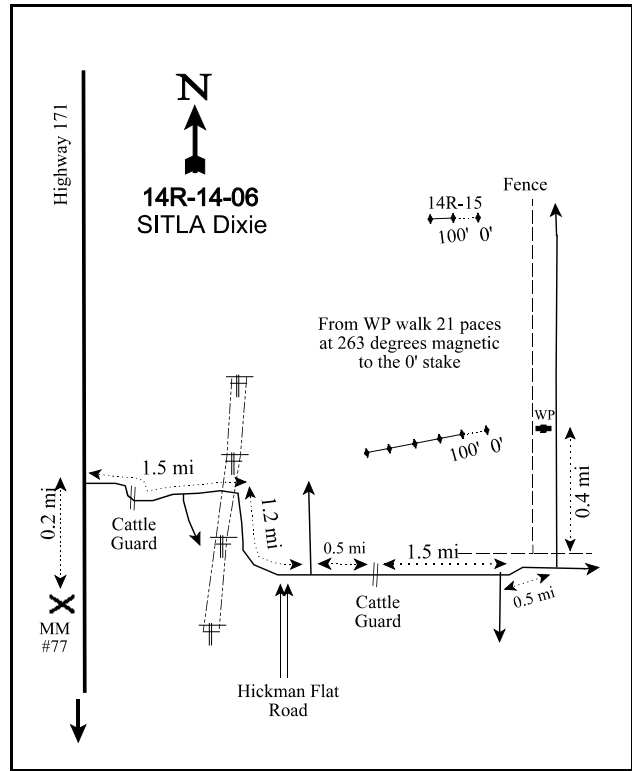
LOCATION DESCRIPTION

From mile marker 77 on highway 191 north of Monticello, drive 0.2 miles north and turn right onto a road heading east (Hickman Flat Road). From there drive for 1.5 miles to some power lines and a southward bend in the road. Go 1.2 miles to a junction staying straight for another 0.5 miles to a cattle guard. From the cattle guard drive 1.5 miles to another junction and continue straight for 0.5 miles. Turn left onto a two-track road and a gate. Proceed 0.4 miles through the gate to a witness post on the left. Walk 21 paces from the witness post at 263 degrees magnetic to the 0' stake marked with browse tag #164.



Map name: Monticello North

Township 32S , Range 24E , Section 35.



Diagrammatic Sketch

UTM (NAD 83) 12S 4201916N 653302E

## DISCUSSION

### SITLA Dixie - Study No. 14R-14

#### Study Information

This study is located in a Wyoming big sagebrush community approximately 7 miles northeast of Monticello on state trust lands (elevation: 6,800 feet, slope: 2%, aspect: south). It was established to monitor a dixie harrow treatment in this winter range. The pretreatment data collection was conducted in August 2006. A small two-track road runs through some of the belts. The 2006 pellet group data estimates were 4 cow days use/acre (9 cdu/ha).

#### Soil

The soil is a Northdale loam. The Northdale series is made up of moderately deep, well drained soils formed in eolian deposits and material weathered from sandstone and are found on rolling uplands (USDA-NRCS 2006). The effective rooting depth is 11 inches with only about 10-20% rock in the profile. The soil texture is a loam with a neutral pH (7.3). Relative bare ground cover was 58% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.2. The combined relative cover of vegetation and litter was only 56% in 2006. The 2006 soil erosion condition rating was slight due to slight surface litter movement, 5-7 pedestals per 100 square feet, flow patterns covering between 2% and 10% of the soil surface area, rills less than 1 inch deep, and light soil movement.

#### Browse

The key browse species is Wyoming big sagebrush, which provided 22% cover and had a density of 5,340 plants/acre in 2006. The majority of the population was mature, decadent individuals made up 22% of the population and 13% of the population were classified as dying. Young plants only made up 2% of the population, but 48,740 seedlings/acre were sampled in 2006. Use is light and vigor is relatively good. Rubber rabbitbrush, low rabbitbrush, broom snakeweed, and prickly pear were also sampled.

#### Herbaceous Understory

The herbaceous understory is not diverse with only four species of grasses, one of which is an annual, and seven species of forbs, three of which were annuals sampled in 2006. Cheatgrass dominates the understory and provided 80% of the herbaceous understory cover in 2006. It was sampled in 82% of the quadrats and provided 6% cover. All other species combined provided about 1% cover.

The 2006 Desirable Components Index score was fair due to high preferred browse cover, but also had a low percentage of young individuals and a high percentage of decadent individuals.

2006 winter range condition (DC Index) – fair (37) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 14R, Study no: 14

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	31	.19
G	Bouteloua gracilis	1	.00
G	Bromus tectorum (a)	274	6.00
G	Sitanion hystrix	6	.30
Total for Annual Grasses		274	6.00
Total for Perennial Grasses		38	0.50

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
Total for Grasses		312	6.50
F	Erigeron sp.	15	.06
F	Lappula occidentalis (a)	16	.22
F	Phlox longifolia	6	.04
F	Salsola iberica (a)	4	.03
F	Sphaeralcea coccinea	118	.56
F	Trifolium sp.	6	.01
F	Unknown forb-annual (a)	3	.01
Total for Annual Forbs		23	0.26
Total for Perennial Forbs		145	0.67
Total for Forbs		168	0.94

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

#### BROWSE TRENDS --

Management unit 14R, Study no: 14

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata wyomingensis	89	22.17
B	Chrysothamnus nauseosus hololeucus	12	.71
B	Chrysothamnus viscidiflorus	4	-
B	Gutierrezia sarothrae	24	.15
B	Opuntia sp.	3	-
Total for Browse		132	23.04

#### CANOPY COVER, LINE INTERCEPT --

Management unit 14R, Study no: 14

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	24.95
Chrysothamnus nauseosus hololeucus	.36
Gutierrezia sarothrae	.16

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 14R, Study no: 14

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	0.9

**BASIC COVER --**

Management unit 14R, Study no: 14

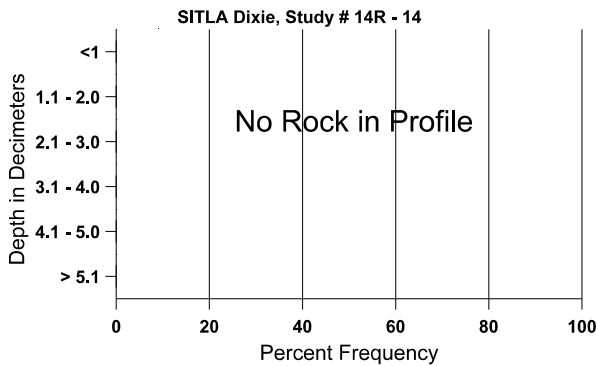
Cover Type	Average Cover %
	'06
Vegetation	27.42
Rock	.66
Pavement	.35
Litter	39.73
Cryptogams	.35
Bare Ground	51.45

**SOIL ANALYSIS DATA --**

Herd Unit 14R, Study # 14, Study Name: SITLA Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
11.18	74.6 (8.58)	7.3	38.2	39.0	22.8	1.5	15.5	214.4	0.6

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 14R, Study no: 14

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	74	-
Elk	4	-
Deer	4	-

Type	Quadrat Frequency
	'06
Cattle	1

Days use per acre (ha)
'06
4 (9)

BROWSE CHARACTERISTICS --  
Management unit 14R, Study no: 14

		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>Artemisia tridentata wyomingensis</i>												
06	<b>5340</b>	48740	100	4040	1200	1580	3	.74	22	13	13	20/28
<i>Chrysothamnus nauseosus hololeucus</i>												
06	<b>420</b>	40	320	80	20	-	0	67	5	5	5	15/19
<i>Chrysothamnus viscidiflorus</i>												
06	<b>80</b>	20	-	40	40	40	0	100	50	25	50	12/12
<i>Gutierrezia sarothrae</i>												
06	<b>940</b>	320	80	860	-	20	0	0	-	-	0	6/9
<i>Opuntia sp.</i>												
06	<b>60</b>	-	20	40	-	-	0	0	-	-	0	7/15

Trend Study 14R-15-06

Study site name: SITLA Roller Chopper.

Vegetation type: Wyoming Big Sagebrush.

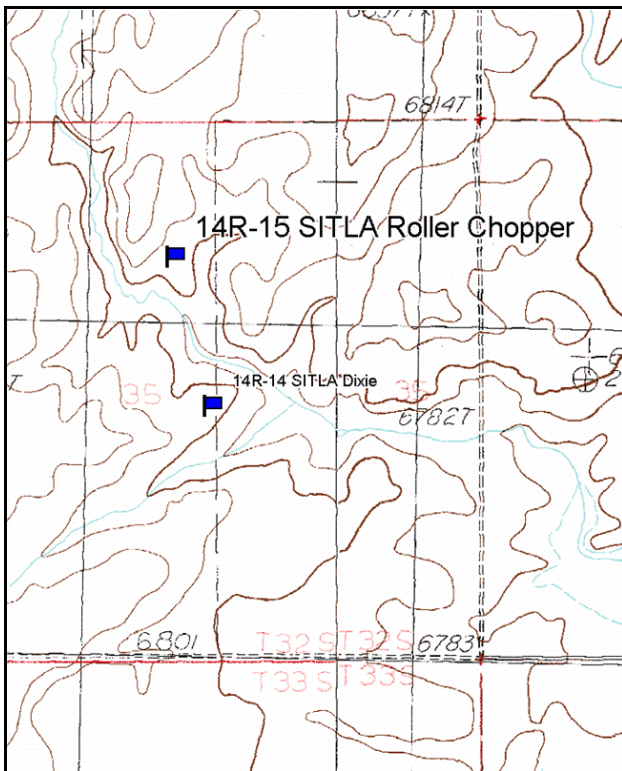
Compass bearing: frequency baseline 271 degrees magnetic.

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

No Rebar

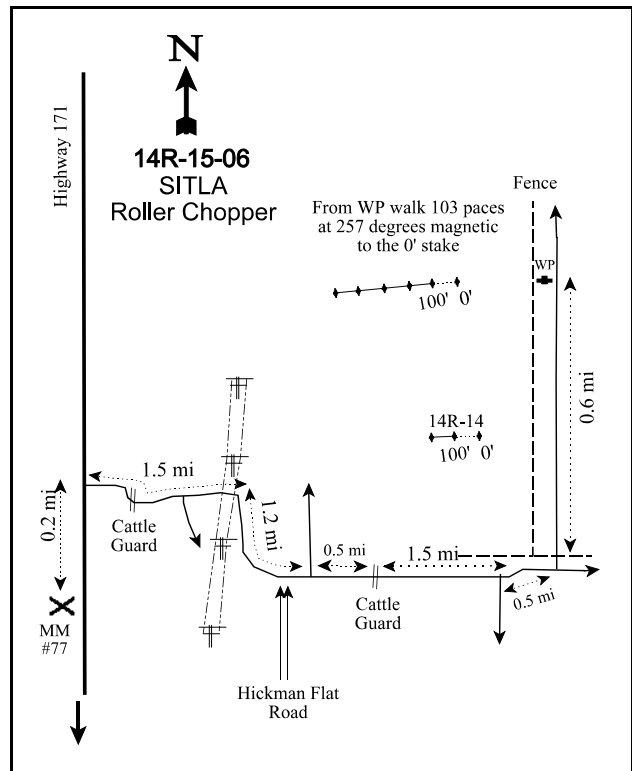
LOCATION DESCRIPTION

From mile marker 77 on highway 191 north of Monticello, drive 0.2 miles north and turn right onto a road heading east (Hickman Flat Road). From there drive for 1.5 miles to some power lines and a southward bend in the road. Go 1.2 miles to a junction staying straight for another 0.5 miles to a cattle guard. From the cattle guard drive 1.5 miles to another junction and continue straight for 0.5 miles. Turn left onto a two-track road and a gate. Drive 0.6 miles to a witness post on the left. Walk 103 paces from the witness post at 257 degrees magnetic to the 0' stake marked with browse tag #163.



Map name: Monticello North

Township 32S , Range 24E , Section 35.



Diagrammatic Sketch

UTM (NAD 83) 12S 4202361N 653183E

## DISCUSSION

### SITLA Roller Chopper - Study No. 14R-15

#### Study Information

This study is located in a Wyoming big sagebrush community approximately 7 miles northeast of Monticello on state trust lands (elevation: 6,800 feet, slope: 4%, aspect: southwest). It was established to monitor a roller chopper treatment in this winter range. The pretreatment data collection was conducted in August 2006. The 2006 pellet group data estimates were 4 deer and 1 cow days use/acre (10 ddu/ha and 2 cdu/ha). A deer carcass was found in 2006.

#### Soil

The soil is a Montvale rocky very fine sandy loam. The Montvale series is made up of shallow or very shallow, well drained soils that are formed from sandstone and are found on gentle slopes (USDA-NRCS 2006). The effective rooting depth is 10 inches with only about 10% rock in the profile. The soil texture is a sandy clay loam with a neutral pH (7.2). Relative bare ground cover was 41% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2. The combined relative cover of vegetation and litter was 50% in 2006. The 2006 soil erosion condition rating was moderate. The erosion evidences were light surface litter movement, slight rock fragment movement, 5-7 pedestals per 100 square feet, flow patterns covering between 25% and 50% of the soil surface area, rills 1.5-3 inches deep, and light soil movement.

#### Browse

The key browse species is Wyoming big sagebrush, which provided 21% cover and had a density of 5,900 plants/acre in 2006. The majority of the population was mature, decadent individuals made up 44% of the population and 23% of the population were classified as dying. Young plants only made up 3% of the population, but 14,000 seedlings/acre were sampled in 2006. Use is light and vigor is moderate. Fringed sagebrush was sampled at a density of 540 plants/acre in 2006, nearly half of which were young. Many (380 plants/acre) of fringed sagebrush seedlings were also sampled in 2006. Rubber rabbitbrush, broom snakeweed, and prickly pear were also sampled.

#### Herbaceous Understory

The herbaceous understory is not diverse with only three species of grasses, one of which is an annual, and ten species of forbs, three of which were annuals sampled in 2006. The combined herbaceous understory cover was less than 2%. Cheatgrass was present, but provided less than one-half of a percent cover and was sampled in 11% of the quadrats. Scarlet globemallow provided the most cover at 1%.

The 2006 Desirable Components Index score was fair due to high preferred browse cover, but also had a low percentage of young individuals and a high percentage of decadent individuals with a poor herbaceous understory.

2006 winter range condition (DC Index) – fair (37) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 14R, Study no: 15

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	13	.06
G	Bouteloua gracilis	1	.00
G	Bromus tectorum (a)	28	.48



T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
	Total for Annual Grasses	28	0.48
	Total for Perennial Grasses	14	0.07
	Total for Grasses	42	0.55
F	Astragalus convallarius	1	.00
F	Astragalus sp.	2	.03
F	Cryptantha sp.	7	.04
F	Erodium cicutarium (a)	1	.00
F	Lappula occidentalis (a)	7	.02
F	Phlox austromontana	7	.02
F	Phlox longifolia	6	.01
F	Senecio multilobatus	20	.07
F	Sphaeralcea coccinea	122	1.23
F	Trifolium sp.	1	.00
	Total for Annual Forbs	8	0.02
	Total for Perennial Forbs	166	1.42
	Total for Forbs	174	1.44

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

#### BROWSE TRENDS --

Management unit 14R, Study no: 15

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia frigida	8	.44
B	Artemisia tridentata wyomingensis	87	21.46
B	Chrysothamnus nauseosus hololeucus	8	.53
B	Gutierrezia sarothrae	40	1.11
B	Opuntia sp.	13	1.01
	Total for Browse	156	24.56

CANOPY COVER, LINE INTERCEPT --  
 Management unit 14R, Study no: 15

Species	Percent Cover '06
Artemisia frigida	.15
Artemisia tridentata wyomingensis	28.18
Chrysothamnus nauseosus hololeucus	.38
Gutierrezia sarothrae	1.31
Opuntia sp.	.18

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 14R, Study no: 15

Species	Average leader growth (in) '06
Artemisia tridentata wyomingensis	0.8

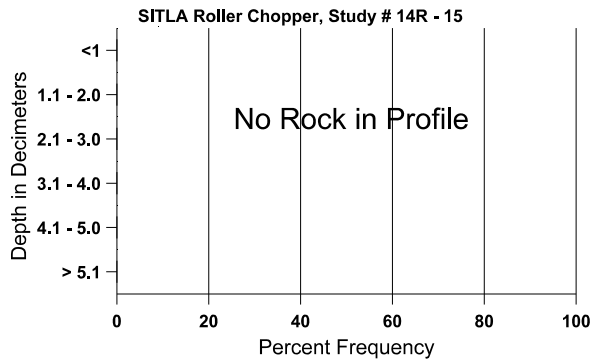
BASIC COVER --  
 Management unit 14R, Study no: 15

Cover Type	Average Cover % '06
Vegetation	24.97
Rock	6.36
Pavement	3.61
Litter	33.52
Cryptogams	.87
Bare Ground	47.93

SOIL ANALYSIS DATA --  
 Herd Unit 14R, Study # 15, Study Name: SITLA Roller Chopper

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
9.61	70.6 (10.47)	7.2	45.2	24.0	30.8	1.3	14.9	134.4	0.5

# Stoniness Index



PELLET GROUP DATA --  
Management unit 14R, Study no: 15

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	75	-
Deer	-	4 (10)
Cattle	-	1 (2)

BROWSE CHARACTERISTICS --  
Management unit 14R, Study no: 15

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia frigida</i>												
06	<b>540</b>	380	260	280	-	-	0	11	-	-	0	8/12
<i>Artemisia tridentata wyomingensis</i>												
06	<b>5900</b>	14000	160	3120	2620	1380	0	0	44	23	23	24/32
<i>Chrysothamnus nauseosus hololeucus</i>												
06	<b>180</b>	-	-	60	120	80	22	11	67	44	44	16/18
<i>Gutierrezia sarothrae</i>												
06	<b>2820</b>	2800	560	2260	-	80	0	0	-	-	0	6/9
<i>Opuntia sp.</i>												
06	<b>480</b>	-	120	360	-	-	0	0	-	-	0	6/16

Trend Study 14R-16-06

Study site name: Harvey John Mesa.

Vegetation type: Mountain Big Sagebrush.

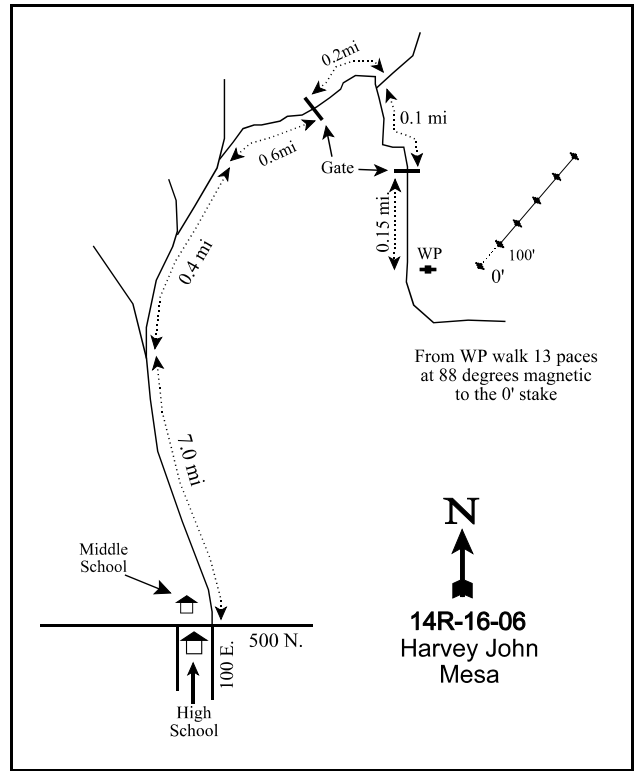
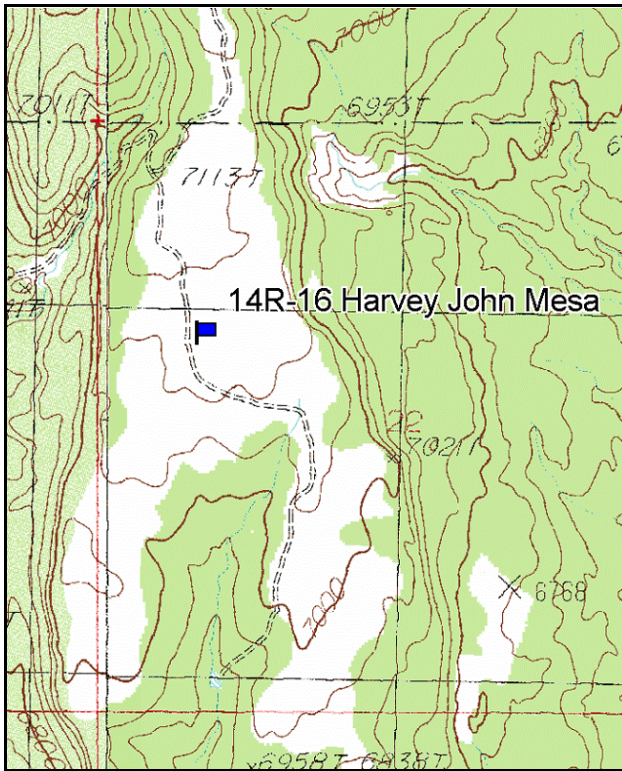
Compass bearing: frequency baseline 60 degrees magnetic.

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

No Rebar

LOCATION DESCRIPTION

From the intersection of 500 N. and 100 E. in Blanding, drive north for 7.0 miles to a fork. Take the right fork staying right through another small fork for 0.4 miles to another fork. Go right for 0.6 miles to a locked gate. Proceed through the gate and go 0.2 miles following the road around as it bends south to another fork. Take the right fork for 0.1 miles to another gate. Drive through the gate for 0.15 miles to a witness post on the left. Walk 13 paces at 88 degrees magnetic to the 0' stake marked with browse tag #179.



Map name: Blanding North

Diagrammatic Sketch

Township 35S, Range 22E, Section 22.

UTM (NAD 83) 12S 4176097N 632384E

## DISCUSSION

### Harvey John Mesa - Study No. 14R-16

#### Study Information

This study is located 7 miles north of Blanding in a mountain big sagebrush community on Harvey John Kratchner Mesa (elevation: 7,100 feet, slope: 3-5%, aspect: southwest). It was established to monitor a dixie harrow sagebrush reduction treatment on private land. The pretreatment data collection was conducted in August 2006. The area has received little grazing pressure since about 1996 with only about 25 head of cattle per year and some horse use. The landowner plans on grazing the area in the spring after the seeded species are established. Deer sign was noted on this summer range in 2006. The 2006 pellet group estimates were 11 elk, 11 deer, and 7 horse days use/acre.

#### Soil

The soil is a Bodot-Strych-Skos association. The Bodot series is made of moderately deep, well drained soils that formed from shale in slope alluvium on hills and ridges. The Strych series soils are very deep, well drained, moderately rapidly permeable that are formed from sandstone shale and conglomerate in alluvium and colluvium. These soils can be found on alluvial fans, fan remnants, toeslopes, terraces, and fan piedmonts. The Skos series is made of very shallow to shallow, well drained, moderately permeable soils that formed in residuum colluvium from interbedded sandstone, siltstone and shale (USDA-NRCS 2006). The effective rooting depth is 11 inches with little rock in the profile. The soil texture is a loam with a neutral pH (7.1). Relative bare ground cover was 48% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2. The combined relative cover of vegetation and litter was 50% in 2006. The 2006 soil erosion condition rating was slight. The erosion evidences were slight surface litter movement, 7-10 pedestals per 100 square feet, flow patterns covering between 25% and 50% of the soil surface area, rills less than 0.5 inches deep, and heavy soil movement.

#### Browse

Mountain big sagebrush is the key browse species. It provided 30% cover in 2006 and had a density of 24,060 plants/acre. Young individuals made up 18% of the population and decadent individuals made up 17%. Plants classified as dying made up 5% of the population. This dense population of sagebrush received light use in 2006. Average sagebrush leader growth was less than 1 inch in 2006. Rubber rabbitbrush, narrowleaf low rabbitbrush, broom snakeweed, and prickly pear were also sampled in 2006.

#### Herbaceous Understory

The understory diversity is relatively low for a mountain big sagebrush community. Four species of grasses, two of which were annuals, and twelve species of forbs, four of which were annuals, were sampled in 2006. Cheatgrass provided 58% of the herbaceous understory cover in 2006. Total forb cover was nearly 11% in 2006. Cheatgrass cover was 6% and was sampled in 76% of the quadrats. Crested wheatgrass and squirreltail bottlebrush both provided about 2% cover. Forbs provided less than 1% cover (3% of the total understory cover).

#### HERBACEOUS TRENDS --

Management unit 14R, Study no: 16

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	81	2.25
G	Bromus tectorum (a)	262	6.33
G	Sitanion hystrix	96	1.97

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Vulpia octoflora</i> (a)	1	.00
Total for Annual Grasses		263	6.33
Total for Perennial Grasses		177	4.23
Total for Grasses		440	10.57
F	<i>Arabis</i> sp.	1	.00
F	<i>Calochortus nuttallii</i>	1	.00
F	<i>Cordylanthus</i> sp. (a)	12	.09
F	<i>Descurainia pinnata</i> (a)	3	.00
F	<i>Erigeron bellidiastrum</i> (a)	6	.04
F	<i>Eriogonum racemosum</i>	3	.03
F	<i>Heterotheca villosa</i>	3	.03
F	<i>Penstemon</i> sp.	16	.11
F	<i>Phlox longifolia</i>	12	.03
F	<i>Polygonum douglasii</i> (a)	4	.00
F	<i>Senecio multilobatus</i>	1	.00
F	<i>Sphaeralcea coccinea</i>	1	.00
Total for Annual Forbs		25	0.14
Total for Perennial Forbs		38	0.22
Total for Forbs		63	0.36

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

#### BROWSE TRENDS --

Management unit 14R, Study no: 16

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	<i>Artemisia tridentata vaseyana</i>	100	30.22
B	<i>Chrysothamnus nauseosus</i>	2	.53
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	7	.09
B	<i>Gutierrezia sarothrae</i>	28	.67
B	<i>Opuntia</i> sp.	2	-
Total for Browse		139	31.52

CANOPY COVER, LINE INTERCEPT --  
 Management unit 14R, Study no: 16

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	40.04
Chrysothamnus nauseosus	.68
Gutierrezia sarothrae	.45

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 14R, Study no: 16

Species	Average leader growth (in)
	'06
Artemisia tridentata vaseyana	0.6

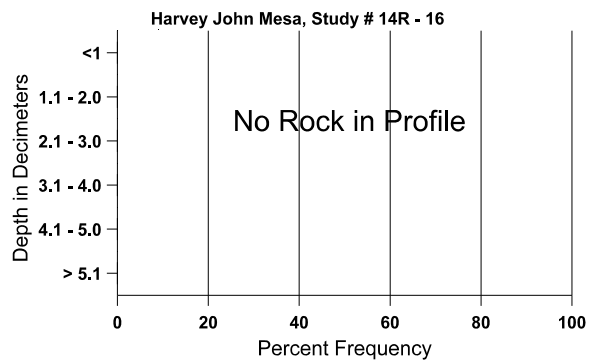
BASIC COVER --  
 Management unit 14R, Study no: 16

Cover Type	Average Cover %
	'06
Vegetation	35.42
Rock	.49
Pavement	.23
Litter	20.50
Cryptogams	.91
Bare Ground	53.70

SOIL ANALYSIS DATA --  
 Herd Unit 14R, Study # 16, Study Name: Harvey John Mesa

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
10.94	64.8 (8.35)	7.1	36.2	44.0	19.8	1.3	22.7	112.0	0.5

## Stoniness Index



PELLET GROUP DATA --  
 Management unit 14R, Study no: 16

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	50	-
Horse	5	7 (17)
Elk	1	11 (28)
Deer	6	11 (28)

BROWSE CHARACTERISTICS --  
 Management unit 14R, 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)
<i>Artemisia tridentata vaseyana</i>												
06	<b>24060</b>	60	4220	15720	4120	1620	.74	19	17	5	6	14/27
<i>Chrysothamnus nauseosus</i>												
06	<b>60</b>	-	-	-	60	20	0	0	100	100	100	45/53
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
06	<b>280</b>	-	-	280	-	-	0	71	-	-	21	6/8
<i>Gutierrezia sarothrae</i>												
06	<b>880</b>	-	20	860	-	-	0	0	-	-	0	7/10
<i>Opuntia sp.</i>												
06	<b>40</b>	-	-	20	20	-	0	0	50	50	50	2/3



Trend Study 14R-17-06

Study site name: Stateline South.

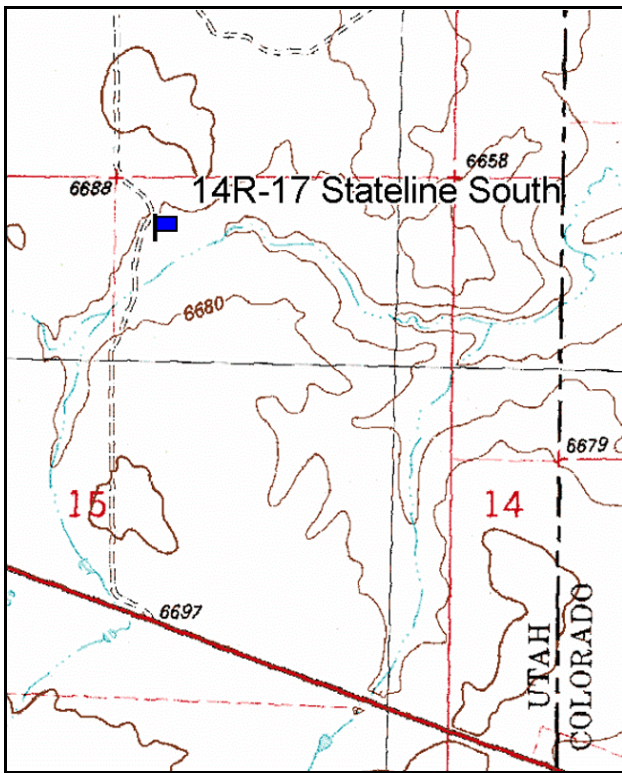
Vegetation type: Black Sagebrush.

Compass bearing: frequency baseline 0' - 300' 80 degrees magnetic, 300' - 500' 37 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5 (95 ft).  
No Rebar

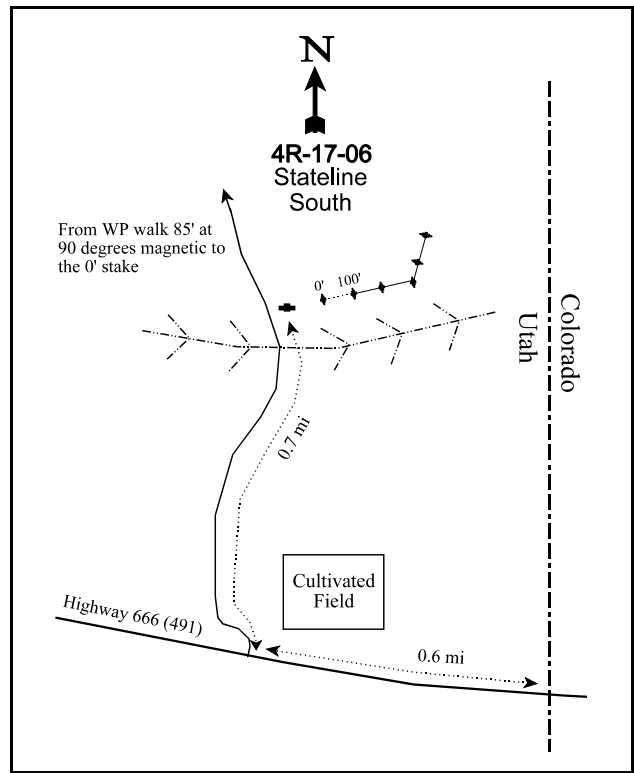
LOCATION DESCRIPTION

On highway 666 (491) drive 0.6 miles west from the Utah/Colorado border to a turnoff on the right (north). Travel north on this road for 0.7 miles to a witness post on the right. Walk 85 feet at 90 degrees magnetic to the 0' stake marked with browse tag #198.



Map name: Northdale

Township 34S, Range 26E, Section 15.



Diagrammatic Sketch

UTM (NAD 83) 12S 4188477N 671360E

## DISCUSSION

### State Line South - Study No. 14R-17

#### Study Information

This study is located 16 miles east of Monticello and just north of Highway 666 (491) near the Colorado state line (elevation: 6,650 feet, slope: 4%, aspect: southwest). It is within a black sagebrush/basin big sagebrush community in mule deer winter range. It was established to monitor a dixie harrow treatment. The pretreatment data collection was conducted in August 2006. Before the treatment, big game use was low. A deer antler was found in 2006. In 2006, the pellet group estimates were 2 deer and 6 cow days use/acre (5 ddu/ha and 14 cdu/ha).

#### Soil

The soil is a Montvale rocky very fine sandy loam. The Montvale series is made up of shallow or very shallow, well drained soils that are formed from sandstone and are found on gentle slopes (USDA-NRCS 2006). The effective rooting depth is 9 inches with little rock in the profile. The area transitions from a deeper to a more shallow soil. The soil texture is a clay loam with a neutral pH (7.3). Relative bare ground cover was 45% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.1. The combined relative cover of vegetation and litter was 47% in 2006. The 2006 soil erosion condition rating was critical. The evidences of were light surface litter movement, 7-10 pedestals per 100 square feet, flow patterns covering more than 50% of the soil surface area, rills less than 1 inch deep, gullies with more than 50% of the walls actively eroding, and heavy soil movement.

#### Browse

The key browse species are black sagebrush and basing big sagebrush. Black sagebrush cover was 13% in 2006. Black sagebrush density was 5,540 plants/acre in 2006, 30% of which were decadent and 2% were young. Plants classified as dying made up 13% of the population. Use was light in 2006. The basin big sagebrush provided 7% cover with a density of 1,200 plants/acre in 2006. Decadent individuals made up 35% of the population and young plants made up 10%. Plants classified as dying made up 10% of the basin big sagebrush population. Use was light in 2006. Average browse leader growth was less than 1 inch in 2006. Fringed sage, rubber rabbitbrush, stickleaf low rabbitbrush, broom snakeweed, and four species of cactus were also sampled in 2006. The stickleaf low rabbitbrush had been heavily utilized by rabbits.

#### Herbaceous Understory

The understory has a low diverse with 8 species of grasses, one of which was an annual, and 12 species of perennial forbs sampled in 2006. The understory abundance is also low with only 5% total cover, 89% of which is grasses. Blue grama and cheatgrass are the dominant species. Cheatgrass provided slightly more than 1% cover in 2006. It was, however, sampled in 63% of the quadrats. Blue grama provided slightly less the 2% cover in 2006. Forbs are sparse.

The 2006 Desirable Components Index score was fair-good due to high preferred browse cover, but also had a low percentage of young individuals and a high percentage of decadent individuals with a poor herbaceous understory.

2006 winter range condition (DC Index) – fair-good (44) Low potential scale

HERBACEOUS TRENDS --

Management unit 14R, Study no: 17

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Bouteloua gracilis</i>	39	1.53
G	<i>Bromus tectorum</i> (a)	182	1.45
G	<i>Koeleria cristata</i>	7	.07
G	<i>Oryzopsis hymenoides</i>	1	.00
G	<i>Poa</i> sp.	65	.68
G	<i>Poa fendleriana</i>	34	.55
G	<i>Poa secunda</i>	3	.03
G	<i>Sitanion hystrix</i>	12	.08
Total for Annual Grasses		182	1.45
Total for Perennial Grasses		161	2.97
Total for Grasses		343	4.42
F	<i>Astragalus</i> sp.	8	.05
F	<i>Cirsium</i> sp.	1	.00
F	<i>Cryptantha</i> sp.	2	.01
F	<i>Erigeron eatonii</i>	12	.02
F	<i>Eriogonum racemosum</i>	3	.00
F	<i>Eriogonum umbellatum</i>	9	.18
F	<i>Oenothera</i> sp.	2	.01
F	<i>Penstemon caespitosus</i>	3	.03
F	<i>Penstemon</i> sp.	10	.02
F	<i>Phlox hoodii</i>	22	.15
F	<i>Phlox longifolia</i>	3	.00
F	<i>Sphaeralcea coccinea</i>	22	.07
Total for Annual Forbs		0	0
Total for Perennial Forbs		97	0.56
Total for Forbs		97	0.56

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

BROWSE TRENDS --

Management unit 14R, Study no: 17

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia frigida	9	.04
B	Artemisia nova	86	13.14
B	Artemisia tridentata tridentata	29	6.67
B	Chrysothamnus nauseosus	12	2.37
B	Chrysothamnus viscidiflorus viscidiflorus	26	1.12
B	Coryphantha sp.	2	.00
B	Echinocereus triglochidatus	0	-
B	Gutierrezia sarothrae	18	.36
B	Opuntia sp.	3	.03
B	Pediocactus simpsonii	1	-
B	Pinus edulis	0	.03
Total for Browse		186	23.78

CANOPY COVER, LINE INTERCEPT --

Management unit 14R, Study no: 17

Species	Percent Cover
	'06
Artemisia frigida	.11
Artemisia nova	16.60
Artemisia tridentata tridentata	5.84
Chrysothamnus nauseosus	3.23
Chrysothamnus viscidiflorus viscidiflorus	1.46
Gutierrezia sarothrae	.06
Opuntia sp.	.08

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 14R, Study no: 17

Species	Average leader growth (in)
	'06
Artemisia tridentata tridentata	0.6

BASIC COVER --

Management unit 14R, Study no: 17

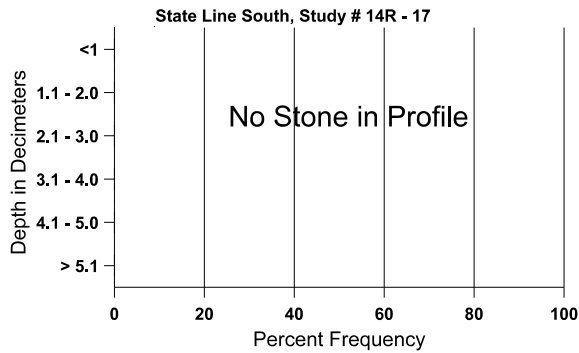
Cover Type	Average Cover % '06
Vegetation	28.25
Rock	3.01
Pavement	2.19
Litter	26.42
Cryptogams	3.57
Bare Ground	52.07

SOIL ANALYSIS DATA --

Herd Unit 14R, Study # 17, Study Name: State Line South

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
8.55	-	7.3	39.2	33.00	27.8	2.11	15.0	156.8	0.5

### Stoniness Index



PELLET GROUP DATA --

Management unit 14R, Study no: 17

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	70	-
Deer	5	2 (5)
Cattle	-	6 (14)

BROWSE CHARACTERISTICS --  
Management unit 14R, Study no: 17

		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>Artemisia frigida</i>												
06	<b>320</b>	-	-	320	-	-	31	6	-	-	0	6/9
<i>Artemisia nova</i>												
06	<b>5540</b>	140	100	3800	1640	1120	2	0	30	13	17	11/22
<i>Artemisia tridentata tridentata</i>												
06	<b>1200</b>	40	120	660	420	300	0	0	35	10	12	30/44
<i>Chrysothamnus nauseosus</i>												
06	<b>380</b>	-	-	300	80	20	0	0	21	-	0	23/30
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>1300</b>	-	60	920	320	60	38	58	25	5	17	5/11
<i>Coryphantha sp.</i>												
06	<b>40</b>	-	20	20	-	-	0	0	-	-	0	5/12
<i>Echinocereus triglochidatus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	5/12
<i>Gutierrezia sarothrae</i>												
06	<b>580</b>	60	60	520	-	-	0	0	-	-	0	7/11
<i>Opuntia sp.</i>												
06	<b>80</b>	-	40	40	-	-	0	0	-	-	0	4/10
<i>Pediocactus simpsonii</i>												
06	<b>40</b>	-	-	40	-	-	0	0	-	-	0	2/3
<i>Pinus edulis</i>												
06	<b>0</b>	20	-	-	-	-	0	0	-	-	0	-/-

Trend Study 14R-18-06

Study site name: Stateline Dixie North.

Vegetation type: Wyoming Big Sagebrush.

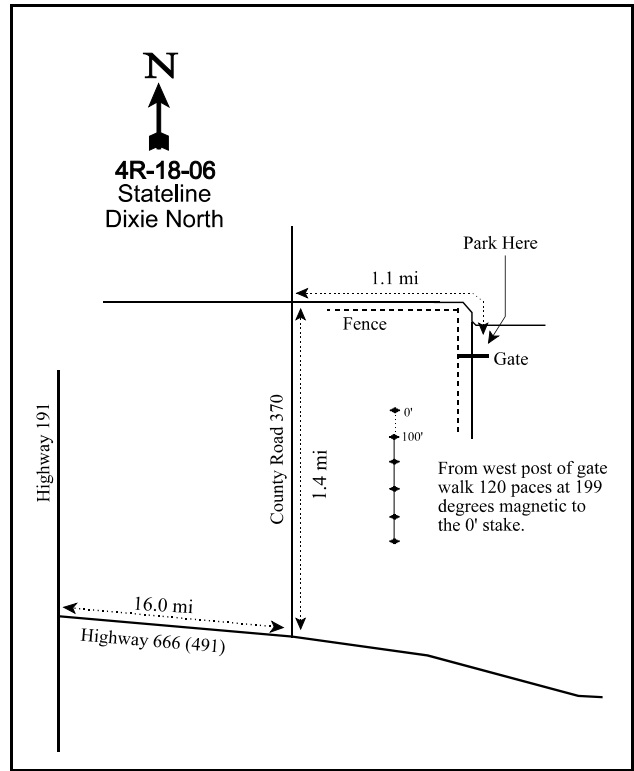
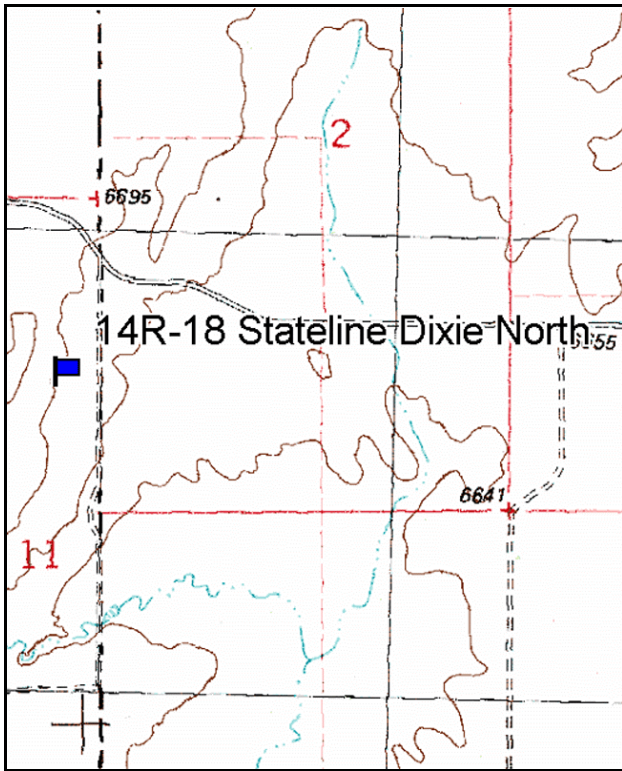
Compass bearing: frequency baseline 171 degrees magnetic.

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

No Rebar

LOCATION DESCRIPTION

From highway 191 turn east onto highway 666 (491). Proceed 16.0 miles to County Road 370. Turn left (north) and drive 1.4 miles to an intersection. Turn right at the intersection and drive 1.1 miles to a road going south. Turn and park by the gate. Walk from the west post (cedar post) of the gate 120 paces at 199 degrees magnetic to the 0' stake marked with browse tag #100.



Map name: Northdale

Diagrammatic Sketch

Township 34S, Range 26E, Section 11.

UTM (NAD 83) 12S 4189852N 672205E

## DISCUSSION

### State Line North - Study No. 14R-18

#### Study Information

This study is located 16 miles east of Monticello and just north of Highway 666 (491) near the Colorado state line (elevation: 6,650 feet, slope: 4%, aspect: east). It is within a Wyoming big sagebrush community in mule deer winter range. It was established to monitor a dixie harrow treatment. The pretreatment data collection was conducted in August 2006. Before the treatment, big game use was low. In 2006, the pellet group estimates were 3 deer and 2 cow days use/acre (8 ddu/ha and 5 cdu/ha).

#### Soil

The soil is a Northdale loam. The Northdale series is made up of moderately deep, well drained soils formed in eolian deposits and material weathered from sandstone and are found on rolling uplands (USDA-NRCS 2006). The effective rooting depth is 13 inches with little rock in the profile. The soil texture is a loam with a mildly alkaline pH (7.4). Relative bare ground cover was 47% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2. The combined relative cover of vegetation and litter was 50% in 2006. The 2006 soil erosion condition rating was slight due to moderate surface litter movement, 5-7 pedestals per 100 square feet, flow patterns covering between 10% and 25% of the soil surface area, rills between 0.5 and 1 inch deep, and moderate soil movement.

#### Browse

Wyoming big sagebrush is the key browse species. It provided 21% cover in 2006 and had a density of 5,160 plants/acre. Thirty-five percent of the population were decadent and 2% were young. Plants classified as dying made up 14% of the population. Use was light and vigor was relatively average. The average leader growth in 2006 was less than 1 inch. Rubber rabbitbrush, stickleaf low rabbitbrush, broom snakeweed, and prickly pear cactus were also sampled. The stickleaf low rabbitbrush had been heavily utilized by rabbits.

#### Herbaceous Understory

Seven species of grasses, one of which was cheatgrass, and three species of perennial forbs were sampled in 2006. A bluegrass species provided nearly 7% cover, 96% of the herbaceous understory cover, in 2006. Cheatgrass was sampled, but in only 8% of the quadrats.

The 2006 Desirable Components Index score was good due to high preferred browse cover and moderate perennial grass cover.

2006 winter range condition (DC Index) – good (49) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 14R, Study no: 18

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	1	.01
G	Bromus tectorum (a)	14	.04
G	Koeleria cristata	-	.00
G	Poa sp.	209	6.65
G	Poa fendleriana	5	.04
G	Poa secunda	8	.01
G	Sitanion hystrix	9	.07



T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
	Total for Annual Grasses	14	0.03
	Total for Perennial Grasses	232	6.78
	Total for Grasses	246	6.82
F	Cryptantha sp.	3	.00
F	Erigeron eatonii	3	.00
F	Sphaeralcea coccinea	37	.10
	Total for Annual Forbs	0	0
	Total for Perennial Forbs	43	0.11
	Total for Forbs	43	0.11

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

#### BROWSE TRENDS --

Management unit 14R, Study no: 18

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata wyomingensis	86	20.71
B	Chrysothamnus nauseosus	0	-
B	Chrysothamnus viscidiflorus viscidiflorus	23	.40
B	Gutierrezia sarothrae	2	-
B	Opuntia sp.	15	.84
	Total for Browse	126	21.96

#### CANOPY COVER, LINE INTERCEPT --

Management unit 14R, Study no: 18

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	23.00
Chrysothamnus viscidiflorus viscidiflorus	.68
Opuntia sp.	.06

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 14R, Study no: 18

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	0.8

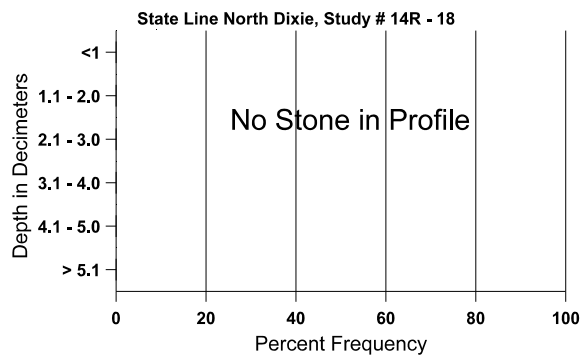
BASIC COVER --  
Management unit 14R, Study no: 18

Cover Type	Average Cover %
	'06
Vegetation	27.95
Rock	.69
Pavement	.08
Litter	30.41
Cryptogams	2.84
Bare Ground	54.20

SOIL ANALYSIS DATA --  
Herd Unit 14R, Study # 18, Study Name: State Line North

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
12.5	72.8 (15.1)	7.4	38.2	38.0	23.8	1.0	13.8	70.4	0.4

### Stoniness Index



PELLET GROUP DATA --  
Management unit 14R, Study no: 18

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	94	-
Deer	-	3 (8)
Cattle	2	2 (5)

BROWSE CHARACTERISTICS --  
 Management unit 14R, Study no: 18

		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>Artemisia tridentata wyomingensis</i>												
06	<b>5160</b>	120	100	3260	1800	1240	9	0	35	14	16	29/36
<i>Chrysothamnus nauseosus</i>												
06	<b>0</b>	-	-	-	-	40	0	0	-	-	0	33/36
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>1400</b>	20	80	1260	60	-	20	59	4	3	3	3/7
<i>Gutierrezia sarothrae</i>												
06	<b>40</b>	20	-	40	-	-	0	0	-	-	0	5/9
<i>Opuntia sp.</i>												
06	<b>320</b>	-	-	300	20	20	19	0	6	-	0	5/18

Trend Study 16R-21-06

Study site name: Stump Flat.

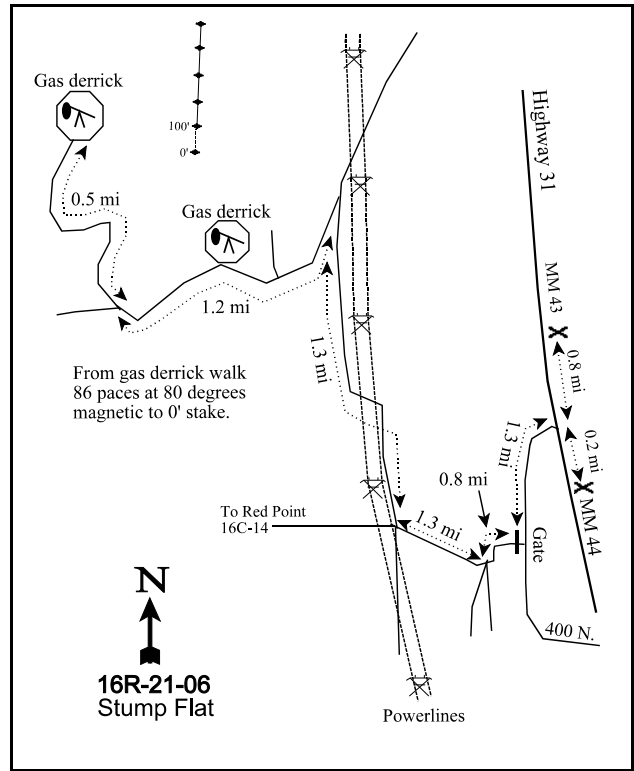
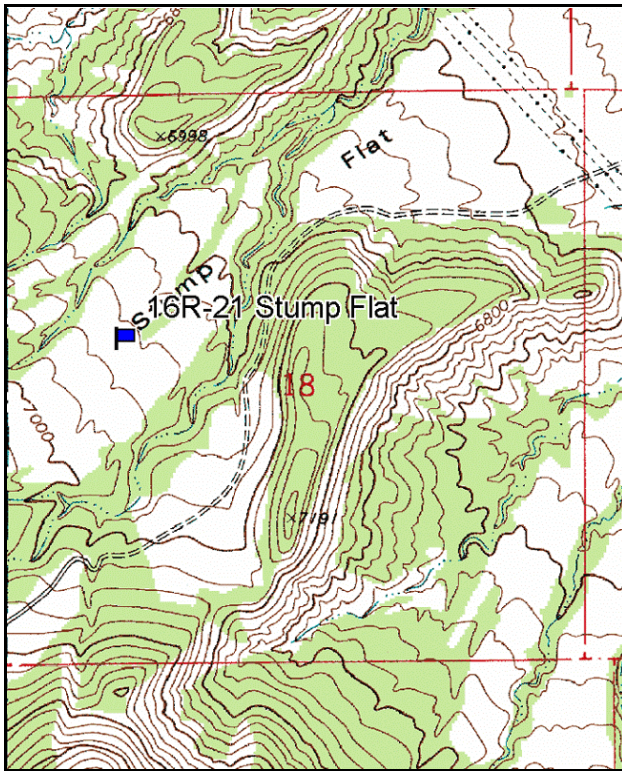
Vegetation type: Black Sagebrush.

Compass bearing: frequency baseline 11 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5 (95 ft).  
No Rebar

LOCATION DESCRIPTION

From highway 31 heading south from mile marker 43 drive 0.8 miles to a road on the right, or heading north drive 0.2 miles from mile marker 44. Turn here and drive 1.3 miles to a road on the right (west) and a gate. Go through the gate and drive 0.8 miles to a fork and stay right. Drive 1.3 miles to a fork and some powerlines. Go right following the powerlines for 1.3 miles to another fork. Turn left here and drive 1.2 miles to a fork passing a road and gas derrick on the right side of the road. At the fork turn right and drive 0.5 miles to a gas derrick. From the gas derrick walk 86 paces at 80 degrees magnetic to the 0' stake marked with browse tag #153.



Map name: Red Point

Diagrammatic Sketch

Township 17S , Range 8E , Section 18.

UTM (NAD 83) 12S 4354996N 493633E

## DISCUSSION

### Stump Flat - Study No. 16R-21

#### Study Information

This study is located in an old chaining treatment 6 miles west of Huntington (elevation: 6,900 feet, slope: 8%, aspect: northeast). The flat was being reinvaded by pinyon and juniper, it was to be roller chopped the fall of 2006. The pretreatment data collection was conducted in June 2006. The area receives substantial winter use by big game. In 2006, pellet group data estimates were 94 elk, 9 deer, and 10 cow days use/acre (231 edu/ha, 23 ddu/ha, and 25 cdu/ha). The majority of the pellets were from winter.

#### Soil

The soil texture is a loam with a neutral pH (7.3). The effective rooting depth is 11 inches with many large rocks in the profile. Relative bare ground cover was 27% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:3.1. The combined relative cover of vegetation and litter was 66% in 2006. The 2006 soil erosion condition rating was slight due to light surface litter movement, less than 2 pedestals per 100 square feet, flow patterns covering less than 2% of the soil surface area, gullies with 2 to 5% of the walls actively eroding, and moderate soil movement.

#### Browse

The browse composition is diverse, but not abundant. Black sagebrush, utah serviceberry, true mountain mahogany, cliff ros, green ephedra, and antelope bitterbrush were the preferred browse species in 2006. Black sagebrush density was only 120 plants/acre, but 2,080 seedlings/acre were sampled so there is much potential for increases in black sagebrush. The other species were sampled at less than 100 plants/acre.

Pinyon and juniper are relatively young and are reinvading. Pinyon density measured using the point quarter method was 64 trees/acre in 2006 with an average trunk diameter of 5.0 inches. The juniper density estimates were 41 trees/acre in 2006 with an average trunk diameter of 4.4 inches. The majority of pinyon and juniper trees were 4-8 feet tall.

#### Herbaceous Understory

Six species of perennial grasses and 14 species of forbs, one of which was an annual, were sampled in 2006. Crested wheatgrass provided the most cover (17%) of all understory species. It provided 85% of all herbaceous understory cover and 97% of grass cover. Perennial forbs provided 3% cover in 2006.

The 2006 Desirable Components Index score was fair due to high perennial grass cover and moderate perennial forb cover, but was penalized because of the low browse cover.

2006 winter range condition (DC Index) – fair (38) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 16R, Study no: 21

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	333	17.18
G	Agropyron intermedium	7	.19
G	Elymus junceus	2	.15
G	Elymus salina	3	.15
G	Oryzopsis hymenoides	2	.00

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Sitanion hystrix</i>	-	.00
Total for Annual Grasses		0	0
Total for Perennial Grasses		347	17.68
Total for Grasses		347	17.68
F	<i>Arabis</i> sp.	1	.00
F	<i>Astragalus convallarius</i>	11	.25
F	<i>Cryptantha</i> sp.	18	.31
F	<i>Eriogonum umbellatum</i>	4	.03
F	<i>Hedysarum boreale</i>	4	.09
F	<i>Ipomopsis aggregata</i>	1	.00
F	<i>Lappula occidentalis</i> (a)	12	.02
F	<i>Lesquerella</i> sp.	7	.01
F	<i>Machaeranthera grindelioides</i>	5	.18
F	<i>Medicago sativa</i>	31	.55
F	<i>Penstemon</i> sp.	14	.37
F	<i>Schoenocrambe linifolia</i>	6	.07
F	<i>Senecio multilobatus</i>	8	.06
F	<i>Stanleya pinnata</i>	40	.98
Total for Annual Forbs		12	0.02
Total for Perennial Forbs		150	2.95
Total for Forbs		162	2.98

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

BROWSE TRENDS --

Management unit 16R, Study no: 21

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier utahensis	0	-
B	Artemisia nova	4	.48
B	Ceratoides lanata	0	-
B	Cercocarpus montanus	3	.67
B	Chrysothamnus nauseosus	0	-
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Cowania mexicana stansburiana	0	-
B	Ephedra viridis	1	.00
B	Gutierrezia sarothrae	0	-
B	Juniperus osteosperma	2	1.00
B	Opuntia sp.	1	-
B	Pinus edulis	6	6.40
B	Purshia tridentata	0	-
Total for Browse		17	8.56

CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 21

Species	Percent Cover
	'06
Artemisia nova	.25
Cercocarpus montanus	1.58
Pinus edulis	7.09

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 16R, Study no: 21

Species	Average leader growth (in)
	'06
Cercocarpus montanus	6.6

POINT-QUARTER TREE DATA --  
Management unit 16R, Study no: 21

Species	Trees per Acre
	'06
Juniperus osteosperma	41
Pinus edulis	64

Average diameter (in)
'06
4.4
5.0

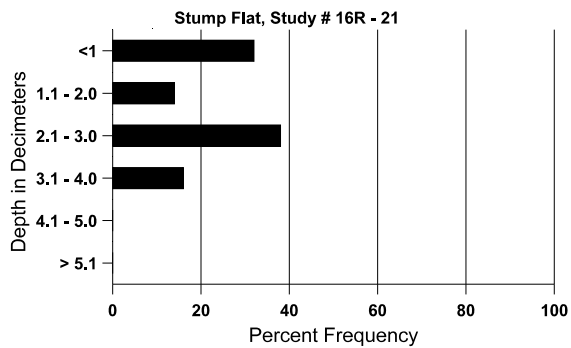
BASIC COVER --  
Management unit 16R, Study no: 21

Cover Type	Average Cover %
	'06
Vegetation	27.17
Rock	4.67
Pavement	2.02
Litter	47.02
Cryptogams	1.21
Bare Ground	30.35

SOIL ANALYSIS DATA --  
Herd Unit 16R, Study # 21, Study Name: Stump Flat

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
28.2	72 (13.62)	7.3	40.2	33.0	26.8	3.6	14.3	96.0	0.7

### Stoniness Index





PELLET GROUP DATA --

Management unit 16R, Study no: 21

Type	Quadrat Frequency	Days use per acre (ha)
	'06	
Rabbit	49	-
Elk	38	94 (231)
Deer	3	9 (23)
Cattle	3	10 (25)

BROWSE CHARACTERISTICS --

Management unit 16R, Study no: 21

		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>Amelanchier utahensis</i>												
06	0	-	-	-	-	-	0	0	-	-	0	32/30
<i>Artemisia nova</i>												
06	120	2080	80	40	-	-	17	0	-	-	0	13/28
<i>Ceratoides lanata</i>												
06	0	-	-	-	-	-	0	0	-	-	0	21/16
<i>Cercocarpus montanus</i>												
06	60	20	-	60	-	-	0	33	-	-	0	64/64
<i>Chrysothamnus nauseosus</i>												
06	0	-	-	-	-	-	0	0	-	-	0	34/39
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	0	-	-	-	-	-	0	0	-	-	0	10/13
<i>Cowania mexicana stansburiana</i>												
06	0	-	-	-	-	-	0	0	-	-	0	39/41
<i>Ephedra viridis</i>												
06	20	-	20	-	-	-	0	0	-	-	0	33/60
<i>Gutierrezia sarothrae</i>												
06	0	-	-	-	-	-	0	0	-	-	0	9/11
<i>Juniperus osteosperma</i>												
06	40	-	40	-	-	80	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
06	20	-	-	20	-	-	0	0	-	-	0	-/-
<i>Pinus edulis</i>												
06	120	-	20	100	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
06	0	-	-	-	-	-	0	0	-	-	0	25/48

Trend Study 16R-22-06

Study site name: Levan Spray & Drill.

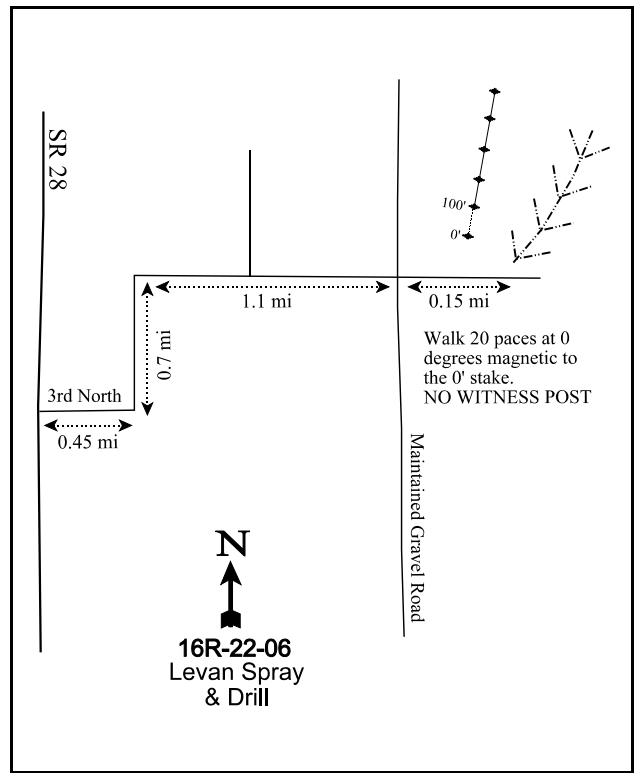
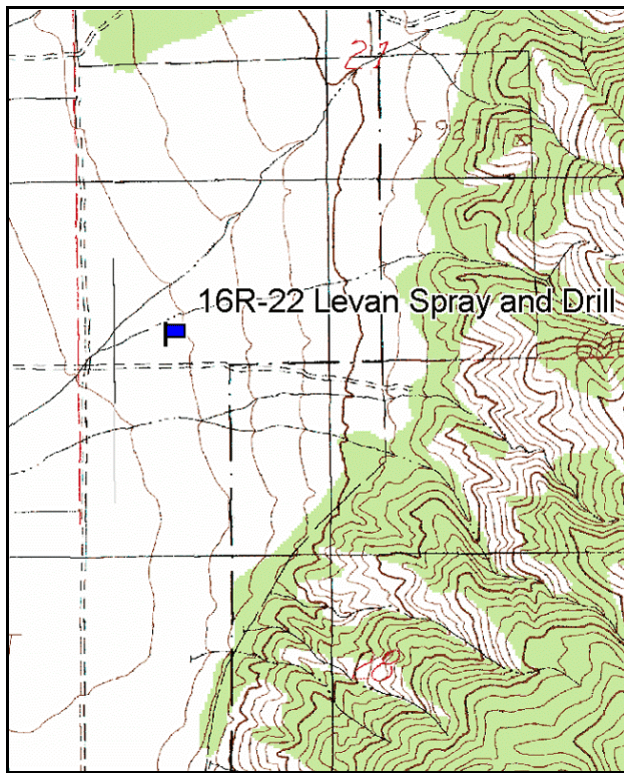
Vegetation type: Perennial Grass & Forb.

Compass bearing: frequency baseline 16 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5 (95 ft).  
No Rebar

LOCATION DESCRIPTION

From highway SR 28 turn east onto 3<sup>rd</sup> north in Levan. On 3<sup>rd</sup> north drive 0.45 miles and turn north on 5<sup>th</sup> east (may not be a street sign) and drive 0.7 miles then turn east. Drive 1.1 miles passing a road on the left to a well maintained gravel road. Cross this street and drive 0.15 miles and park. No witness post was put in. From here walk 20 paces at 0 degrees magnetic to the 0' stake marked with browse tag #200.



Map name: Levan

Diagrammatic Sketch

Township 14S, Range 1E, Section 21.

UTM (NAD 83) 12S 4380754N 428499E

## DISCUSSION

### Levan Spray and Drill - Study No. 16R-22

#### Study Information

This study is located within the South Nebo WMA approximately 2 miles northeast of Levan (elevation: 5,500 feet, slope: 5%, aspect: west). The area is dominated by crested wheatgrass, weeds, and scattered mountain big sagebrush. It appears to have been farm land at one time. This study was established to monitor a weed control treatment on this mule deer winter range. The proposed treatment was to spray invading jointed goatgrass and field bindweed with herbicide and drill seed with desired species. The pretreatment data collection was conducted in August 2006. Recent big game use appeared to very light in 2006. The 2006 pellet group estimates were 55 cow days use/acre (136 cdu/ha). All of the cattle use appeared to have been from spring.

#### Soil

The soil is a mix of Rofiss gravelly loam and possibly Wales loam. The Rofiss series has very deep, well drained, moderately slowly permeable soils formed in alluvium derived from shale and are found on alluvial fans. The Wales series is similar, but is derived from sandstone, shale, limestone, and igneous rocks and are found on alluvial fans, plains, and flood plains (USDA-NRCS 2006). The effective rooting depth is 8 inches with scattered rock in the profile. The soil texture is a clay with a neutral pH (7.2). Relative bare ground cover was only 5% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:5.6. The combined relative cover of vegetation and litter was 92% in 2006. The 2006 soil erosion condition rating was stable due to the high vegetation and litter cover.

#### Browse

A mountain big sagebrush population is located to the north and east of the study, but only scattered browse were within the study area at the time of the study establishment in 2006. Broom snakeweed was the only shrub measured in the browse density measurements. Its density was 940 plants/acre in 2006. Other species sampled in the height and crown measurements include: mountain big sagebrush, white rubber rabbitbrush, and forage kochia.

#### Herbaceous Understory

Although five grass species and nine forb species were sampled in 2006, jointed goatgrass and field bindweed were the dominant species. The herbaceous understory composition is very weedy. Jointed goatgrass cover was 15%, which made up 82% of the grass cover and 45% of the herbaceous understory cover. Field bindweed cover was 14%, which made up 98% of the forb cover and 43% of the understory cover. Goatgrass quadrat frequency was 99% and bindweed quadrat frequency was 92%. Both jointed goatgrass and field bindweed are classified as noxious weeds in the state of Utah. Crested wheatgrass was the only other species which provided a substantial contribution to the understory in 2006; it provided 2% cover. The herbicide and drill treatment can only improve the vegetation composition at this study.

The 2006 Desirable Components Index score was very poor due to the lack of browse cover, low perennial forb cover, low perennial grass cover, and the presence of two noxious weeds.

2006 winter range condition (DC Index) – very poor (38) Mid-level potential scale

HERBACEOUS TRENDS --

Management unit 16R, Study no: 22

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Aegilops cylindrica</i> (a)	394	14.76
G	<i>Agropyron cristatum</i>	65	2.38
G	<i>Bromus japonicus</i> (a)	55	.61
G	<i>Bromus tectorum</i> (a)	32	.26
G	<i>Poa secunda</i>	-	.00
Total for Annual Grasses		481	15.63
Total for Perennial Grasses		65	2.39
Total for Grasses		546	18.03
F	<i>Alyssum alyssoides</i> (a)	7	.01
F	<i>Astragalus</i> sp.	3	.03
F	<i>Convolvulus arvensis</i>	319	13.85
F	<i>Helianthus annuus</i> (a)	1	.00
F	<i>Lactuca serriola</i>	2	.01
F	<i>Lithospermum ruderales</i>	5	.15
F	<i>Phlox longifolia</i>	12	.08
F	<i>Sphaeralcea coccinea</i>	1	.00
F	<i>Tragopogon dubius</i>	4	.01
Total for Annual Forbs		8	0.01
Total for Perennial Forbs		346	14.14
Total for Forbs		354	14.16

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

BROWSE TRENDS --

Management unit 16R, Study no: 22

T y p e	Species	Average Cover %
		'06
B	<i>Artemisia tridentata vaseyana</i>	-
B	<i>Chrysothamnus nauseosus albicaulis</i>	-
B	<i>Gutierrezia sarothrae</i>	.40
B	<i>Kochia prostrata</i>	-
Total for Browse		0.40

CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 22

Species	Percent Cover
	'06
Gutierrezia sarothrae	.36

BASIC COVER --

Management unit 16R, Study no: 22

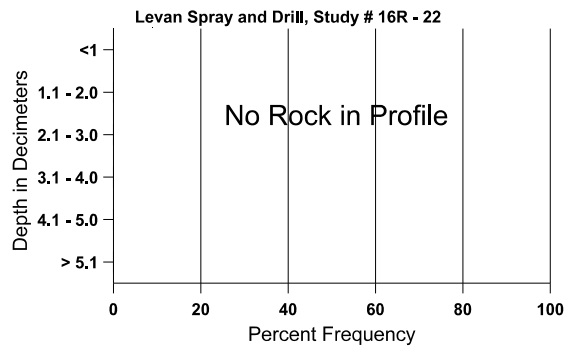
Cover Type	Average Cover %
	'06
Vegetation	34.87
Rock	.93
Pavement	2.27
Litter	68.88
Bare Ground	5.35

SOIL ANALYSIS DATA --

Herd Unit 16R, Study # 22, Study Name: Levan Spray and Drill

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	ppm P	ppm K	dS/m
7.75	-	7.2	56.0	18.1	25.9	2.6	14.7	352.0	0.8

### Stoniness Index



PELLET GROUP DATA --

Management unit 16R, Study no: 22

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	25	-
Cattle	13	55 (136)

BROWSE CHARACTERISTICS --  
 Management unit 16R, Study no: 22

		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>Artemisia tridentata vaseyana</i>												
06	0	-	-	-	-	-	0	0	-	-	0	28/61
<i>Chrysothamnus nauseosus albicaulis</i>												
06	0	-	-	-	-	-	0	0	-	-	0	21/25
<i>Gutierrezia sarothrae</i>												
06	940	-	20	300	620	60	0	0	66	55	55	9/10
<i>Kochia prostrata</i>												
06	0	-	-	-	-	-	0	0	-	-	0	13/33

Trend Study 16R-23-06

Study site name: North Spring.

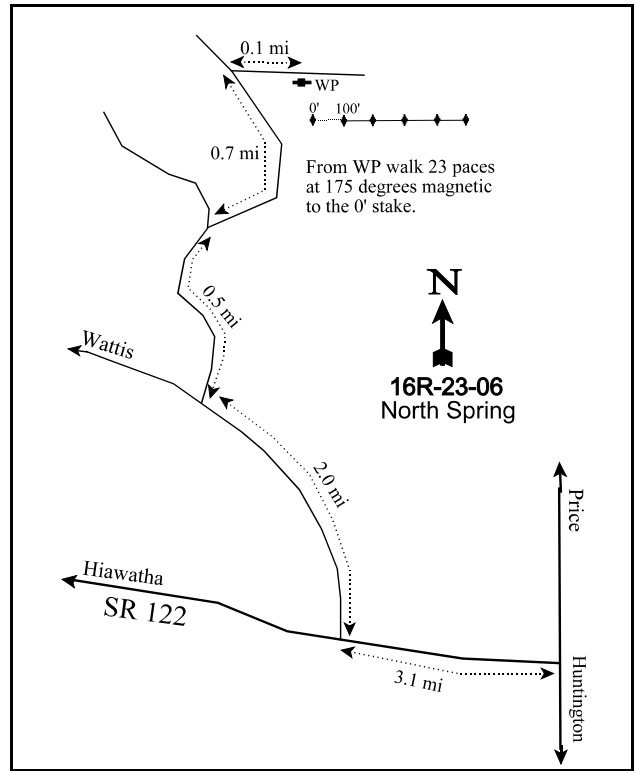
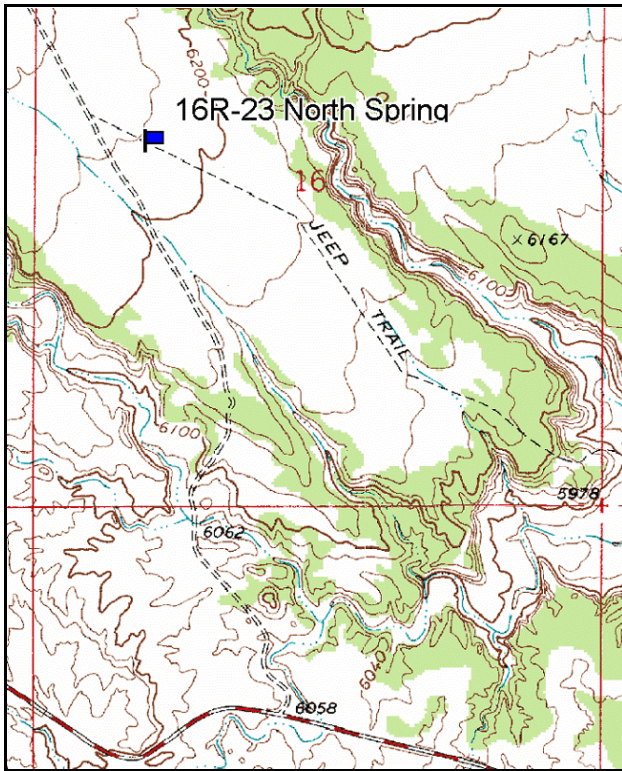
Vegetation type: Wyoming Big Sage.

Compass bearing: frequency baseline 116 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5 (95 ft).  
No Rebar, Line 4 is 83' long to avoid a gully.

LOCATION DESCRIPTION

From the turn off from SR 10 onto SR 122 from Price or Huntington, drive 3.1 miles to a road on the right. Turn here and drive 2.0 miles to another right. Turn here and drive 0.5 miles to a fork and stay right for another 0.7 miles to a road on the right heading southeast. Turn right and go 0.1 miles to a witness post on the right. From the witness post walk 23 paces at 175 degrees magnetic to the 0' stake marked with browse tag #175.



Map name: Pinnacle Peak

Diagrammatic Sketch

Township 15S, Range 9E, Section 16.

UTM (NAD 83) 12S 4374741N 506474E

## DISCUSSION

### North Spring - Study No. 16R-23

#### Study Information

This study is located in a Wyoming big sagebrush community approximately 7 miles southwest of Price (elevation: 6,200 feet, slope: 1%, aspect: south). It was established to monitor the effects of either a Lawson aerator or dixie harrow treatment planned to be implemented in the fall of 2006. The pretreatment data collection was conducted in August 2006. This area is heavily used by the oil and gas industry and a gas derrick is located directly northeast of the study. The area also receives substantial big game use during the winter. The 2006 pellet group estimates were 5 elk and 121 deer days use/acre (13 edu/ha and 299 ddu/ha).

#### Soil

The soil is in the Hernandez series, which is made of very deep, well drained soils formed on alluvial fans and valley fills from alluvium and eolian sediments (USDA-NRCS 2006). The effective rooting depth is 12 inches with little rock in the profile. The soil texture is a loam with a mildly alkaline pH (7.5). Relative bare ground cover was 50% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.1. The combined relative cover of vegetation and litter was 46% in 2006. The 2006 soil erosion condition rating was slight due to minor surface litter movement, 7 to 10 pedestals per 100 square feet, flow patterns covering between 10% and 25% of the soil surface, rills between 0.5 and 1 inch deep, and moderate soil movement.

#### Browse

The key browse species is Wyoming big sagebrush. It provided 9% cover in 2006, with a density of 3,700 plants/acre. Although the population had few young (6% of the population) and very high decadence (70% of the population), 41,260 seedlings/acre were sampled in 2006. This potential for growth could aid in successful restoring this area with the coming treatment. Sagebrush plants classified as dying made up 59% of the population. Average leader growth was 1 inch in 2006. Use was moderate-heavy in 2006. Shadscale was also sampled at a density of 140 plants/acre in 2006. Other sampled shrubs include: Winterfat, narrowleaf low rabbitbrush, broom snakeweed, prickly pear cactus, and yucca.

#### Herbaceous Understory

The herbaceous understory is moderately diverse with 8 grass and 19 forb species. Grasses dominated the understory in 2006; perennial grass cover was nearly 10% (82% of the understory cover). Squirreltail bottlebrush, blue grama, and Indian ricegrass were all abundant. Two annual grasses, cheatgrass and sixweeks fescue, were sampled, but were not abundant. Forbs only provided 2% cover, most of which was from perennial species.

Whether a dixie harrow or aerator treatment, the decadent and dying sagebrush individuals will be removed from the area and will allow some of the young and seedlings (as well as the seeded species) to establish.

The 2006 Desirable Components Index score was fair due to moderate browse cover and moderate perennial grass cover, but was penalized because of the high browse decadence.

2006 winter range condition (DC Index) – fair (33) Low potential scale



HERBACEOUS TRENDS --

Management unit 16R, Study no: 23

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Bouteloua gracilis</i>	66	3.93
G	<i>Bromus tectorum</i> (a)	13	.10
G	<i>Oryzopsis hymenoides</i>	80	1.13
G	<i>Poa secunda</i>	2	.03
G	<i>Sitanion hystrix</i>	179	4.62
G	<i>Stipa comata</i>	5	.01
G	<i>Stipa thurberiana</i>	1	.03
G	<i>Vulpia octoflora</i> (a)	13	.09
Total for Annual Grasses		26	0.20
Total for Perennial Grasses		333	9.76
Total for Grasses		359	9.96
F	<i>Alyssum alyssoides</i> (a)	2	.01
F	<i>Chaenactis douglasii</i>	1	.00
F	<i>Crepis acuminata</i>	1	.03
F	<i>Cryptantha</i> sp.	10	.07
F	<i>Descurainia pinnata</i> (a)	24	.12
F	<i>Eriogonum cernuum</i> (a)	44	.20
F	<i>Halogeton glomeratus</i> (a)	10	.07
F	<i>Lappula occidentalis</i> (a)	4	.03
F	<i>Leucelene ericoides</i>	10	.18
F	<i>Lepidium montanum</i>	23	.41
F	<i>Lupinus</i> sp.	1	.03
F	<i>Machaeranthera grindelioides</i>	21	.59
F	<i>Plantago patagonica</i> (a)	6	.01
F	<i>Ranunculus testiculatus</i> (a)	3	.00
F	<i>Salsola iberica</i> (a)	18	.09
F	<i>Schoenocrambe linifolia</i>	15	.03
F	<i>Sisymbrium altissimum</i> (a)	7	.02
F	<i>Sphaeralcea coccinea</i>	3	.01
Total for Annual Forbs		118	0.57
Total for Perennial Forbs		85	1.36
Total for Forbs		203	1.94

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

BROWSE TRENDS --

Management unit 16R, Study no: 23

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata wyomingensis	81	9.32
B	Atriplex confertifolia	5	.41
B	Ceratoides lanata	1	.00
B	Chrysothamnus viscidiflorus stenophyllus	20	.98
B	Gutierrezia sarothrae	27	.60
B	Opuntia sp.	73	6.02
B	Yucca sp.	0	-
Total for Browse		207	17.36

CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 23

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	10.86
Atriplex confertifolia	.75
Chrysothamnus viscidiflorus stenophyllus	.60
Gutierrezia sarothrae	.71
Opuntia sp.	4.96

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 16R, Study no: 23

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	1.0

BASIC COVER --

Management unit 16R, Study no: 23

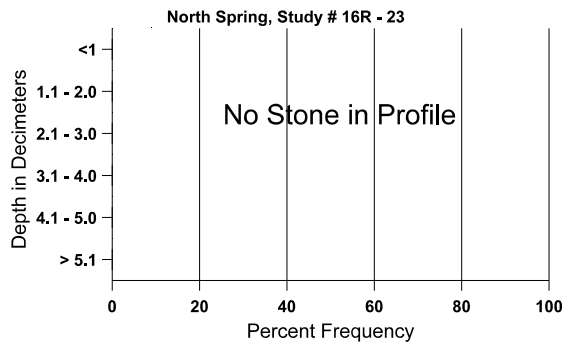
Cover Type	Average Cover % '06
Vegetation	24.47
Rock	.04
Pavement	.07
Litter	29.24
Cryptogams	4.09
Bare Ground	57.20

SOIL ANALYSIS DATA --

Herd Unit 16R, Study # 23, Study Name: North Spring

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
11.65	66.4 (13.07)	7.5	41.2	33.0	25.8	3.3	12.1	118.4	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 16R, Study no: 23

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	33	-
Elk	22	5 (13)
Deer	32	121 (299)

BROWSE CHARACTERISTICS --  
 Management unit 16R, Study no: 23

		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>Artemisia tridentata wyomingensis</i>												
06	<b>3700</b>	41260	220	880	2600	2380	29	46	70	59	59	18/26
<i>Atriplex confertifolia</i>												
06	<b>140</b>	20	80	60	-	-	14	14	-	-	0	16/30
<i>Ceratoides lanata</i>												
06	<b>20</b>	-	-	20	-	-	0	100	-	-	0	15/12
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
06	<b>640</b>	100	160	440	40	-	0	25	6	6	6	9/17
<i>Gutierrezia sarothrae</i>												
06	<b>980</b>	520	420	560	-	20	0	0	-	-	0	11/13
<i>Opuntia sp.</i>												
06	<b>4840</b>	20	60	4720	60	40	0	0	1	.82	.82	3/12
<i>Yucca sp.</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	17/27

Trend Study 16R-24-06

Study site name: 12 Mile Dixie.

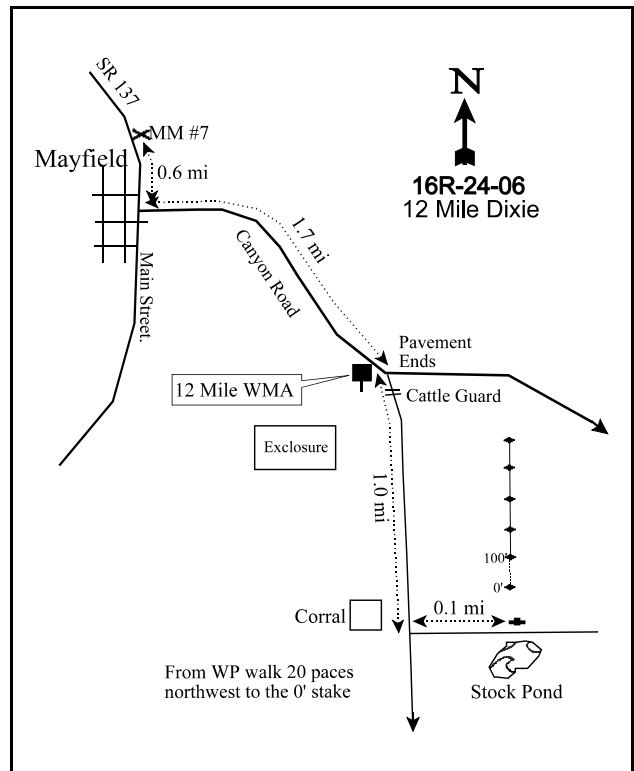
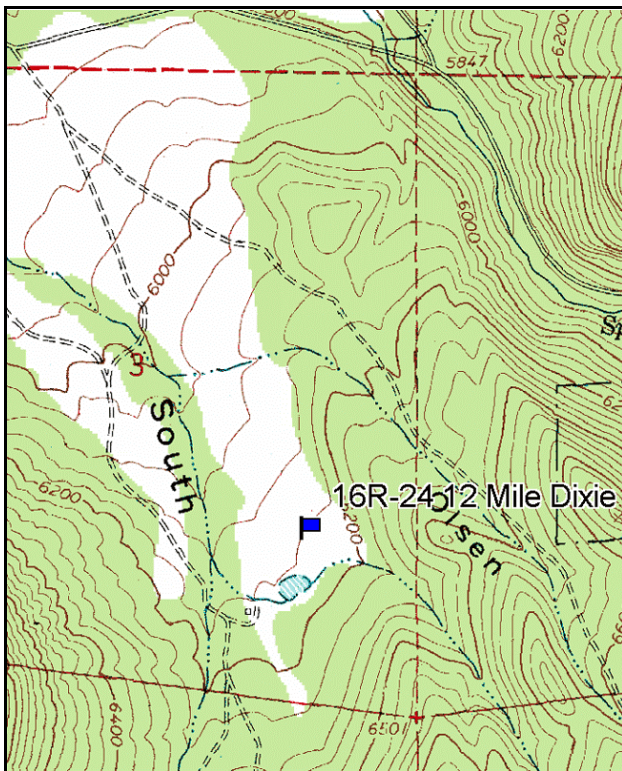
Vegetation type: Annual Forbes.

Compass bearing: frequency baseline 333 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5 (95 ft).  
No Rebar.

LOCATION DESCRIPTION

Drive south on SR 137 toward Mayfield. From mile marker #7 drive 0.6 miles and turn left (east) onto Canyon Road. Drive on this paved road for 1.7 miles to a fork and the end of the pavement and beginning of the dirt road with a sign showing “12 Mile WMA”. From the dirt road, cross a cattle guard and drive 1.0 mile passing a road on the right to a corral on the right and road on the left (east). Turn here and drive 0.1 miles to a half high witness post on the left. From here walk 20 paces northwest to the 0' stake marked with browse tag #199.



Map name: Mayfield

Diagrammatic Sketch

Township 20S, Range 2E, Section 3.

UTM (NAD 83) 12S 4327496N 442056E

## DISCUSSION

### 12 Mile Dixie - Study No. 16R-24

#### Study Information

This study is located approximately 2.5 miles southeast of Mayfield within the Southwest Manti WMA-Mayfield Unit (elevation: 6,200 feet, slope: 3%, aspect: west). It is in a small valley, surrounded by pinyon-juniper forests and scattered sagebrush. This winter range area is very poorly vegetated and dominated by annuals and weeds. Sporadic vehicle tracks were evident across the transect in 2006. The study was established to monitor the effects of dixie harrow and seeding treatment. The pretreatment data collection was conducted in August 2006. Despite the poor quality of the vegetation, there is moderate big game use. A stock pond is located 300 feet to the south. The 2006 pellet group estimates were 20 deer and 11 cow days use/acre (50 ddu/ha and 27 cdu/ha).

#### Soil

The soil is a Toehead silt loam. The Toehead series is very deep, well drained, and moderately slowly permeable and are formed from limestone, quartzite, sandstone and shale in alluvium. This series can be found on alluvial fans and stream terraces (USDA-NRCS 2006). The effective rooting depth is 9 inches with about 5% rock in the profile. The soil texture is a sandy clay loam with a mildly alkaline pH (7.6). Relative bare ground cover was 37% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.4. The combined relative cover of vegetation and litter was 54% in 2006. The 2006 soil erosion condition rating was slight due to slight surface litter movement, minor surface rock movement, minor pedestalling, flow patterns covering between 2% and 10% of the soil surface, and slight soil movement.

#### Browse

The browse component is lacking. Only 20 broom snakeweed plants/acre were sampled in the density measurements and rubber rabbitbrush was sampled in the height/crown measurements. The dixie harrow and seeding treatment will greatly improve the browse component.

#### Herbaceous Understory

The understory was dominated by weeds, both annual and perennial, in 2006. There was very little of worth in the understory. Two noxious weeds, jointed goatgrass and field bindweed, were sampled in 2006. The five dominant species, which make up 95% of the herbaceous understory cover, are cheatgrass, little barley, field bindweed, storksbill, and burr buttercup. Cheatgrass provided 10% cover (31% of the understory cover) and field bindweed provided 11% cover (34% of the understory cover) in 2006. The treatment should also be advantageous to improving the understory as well as the browse component.

The 2006 Desirable Components Index score was very poor due to the lack of browse cover, low perennial forb cover, low perennial grass cover, and the presence of two noxious weeds.

2006 winter range condition (DC Index) – very poor (-8) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 16R, Study no: 24

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Aegilops cylindrica</i> (a)	53	.95
G	<i>Bromus tectorum</i> (a)	189	10.09
G	<i>Hordeum pusillum</i>	27	1.58

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Poa bulbosa	47	.67
Total for Annual Grasses		242	11.04
Total for Perennial Grasses		74	2.26
Total for Grasses		316	13.30
F	Alyssum alyssoides (a)	3	.01
F	Convolvulus arvensis	302	11.05
F	Collinsia parviflora (a)	3	.03
F	Cryptantha sp.	3	.00
F	Descurainia pinnata (a)	2	.01
F	Erodium cicutarium (a)	211	5.26
F	Medicago sativa	1	.03
F	Ranunculus testiculatus (a)	309	2.42
F	Sisymbrium altissimum (a)	-	.00
F	Tragopogon dubius	3	.01
F	Veronica biloba (a)	5	.01
Total for Annual Forbs		533	7.76
Total for Perennial Forbs		309	11.09
Total for Forbs		842	18.86

BROWSE TRENDS--

Management unit 16R, Study no: 24

Species	Strip Frequency	Average Cover %
	'06	'06
Chrysothamnus nauseosus	0	-
Chrysothamnus nauseosus hololeucus	0	-
Gutierrezia sarothrae	1	-
Total for Browse	1	-

CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 24

Species	Percent Cover
	'06
Gutierrezia sarothrae	.40

BASIC COVER --

Management unit 16R, Study no: 24

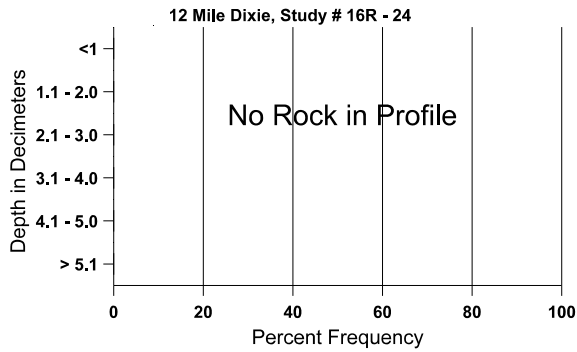
Cover Type	Average Cover %
	'06
Vegetation	35.77
Rock	1.02
Pavement	7.66
Litter	24.57
Cryptogams	.38
Bare Ground	41.93

SOIL ANALYSIS DATA --

Herd Unit 16R, Study # 24, Study Name: 12 Mile Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
9.31	-	7.6	48.7	17.4	33.8	2.5	17.2	224.0	0.7

### Stoniness Index



PELLET GROUP DATA --

Management unit 16R, Study no: 24

Type	Quadrat Frequency	Days use per acre (ha)
	'06	
Rabbit	38	-
Deer	8	20 (30)
Cattle	7	11 (27)



BROWSE CHARACTERISTICS --  
 Management unit 16R, Study no: 24

		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 nauseosus												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	39/65
Chrysothamnus nauseosus hololeucus												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	30/44
Gutierrezia sarothrae												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-

Trend Study 16R-25-06

Study site name: Black Dragon Bullhog.

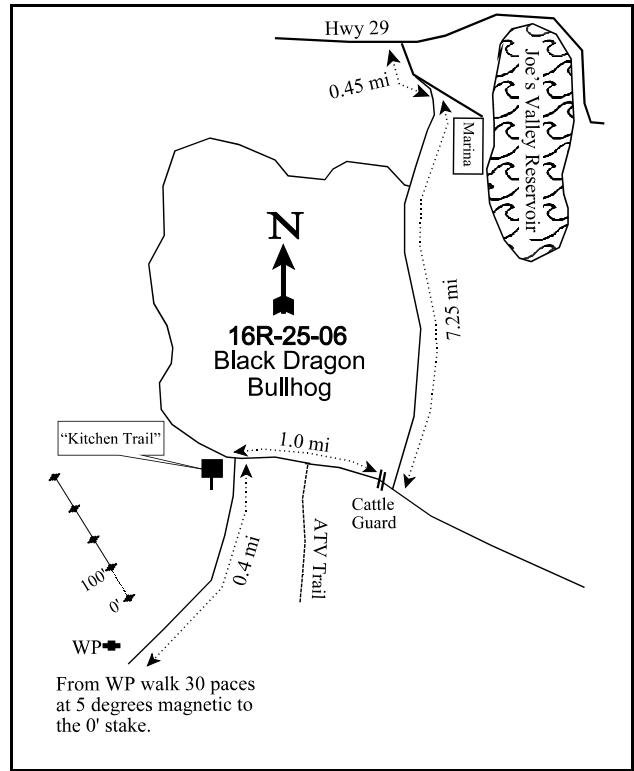
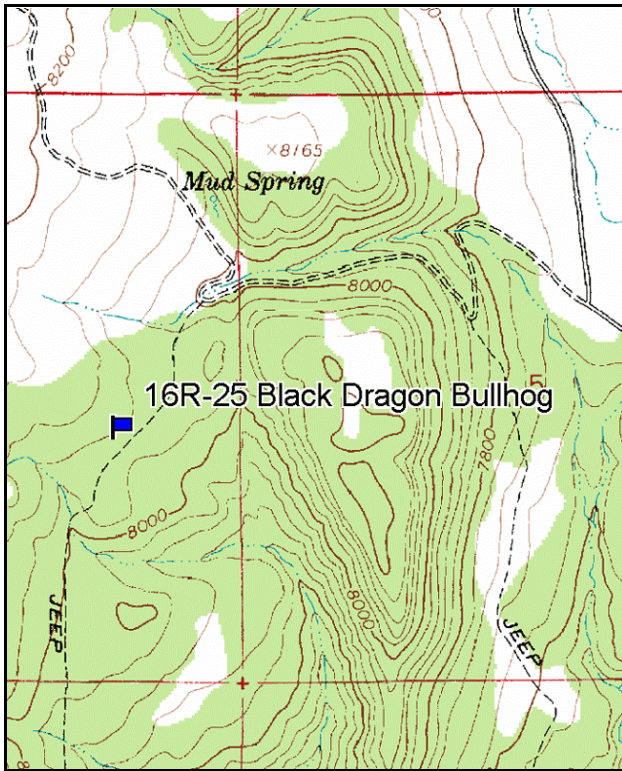
Vegetation type: Pinyon/Juniper/Mtn Brush.

Compass bearing: frequency baseline 270 degrees magnetic.

Frequency belt placement: line 1(11 ft & 95 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft).  
No Rebar.

LOCATION DESCRIPTION

Drive west on SR 29 to the west side of Joe’s Valley Reservoir. Turn south onto the road that leads to the marina and drive 0.45 miles to a fork and go right. Drive for 7.25 miles to a junction. Turn right and drive 1.0 mile crossing a cattle guard and passing an ATV trail. Turn left onto the road with a sign reading “Kitchen Trail”. Drive for 0.4 miles to a witness post on the right. Walk 30 paces at 5 degrees magnetic to the 0' stake marked with browse tag #194.



Map name: Ferron Canyon

Diagrammatic Sketch

Township 19S, Range 6E, Section 6.

UTM (NAD 83) 12S 4338569N 475366E

## DISCUSSION

### Black Dragon Bullhog - Study No. 16R-25

#### Study Information

This study is located approximately 14 miles west of Castle Dale in mountain brush/pinyon-juniper community (elevation: 8,050 feet, slope: 8-15%, aspect: southeast). It was established to monitor a pinyon-juniper bullhog mastication treatment within transitional/summer range. The pretreatment data collection was conducted in August 2006. The 2006 pellet group estimates were 2 elk, 3 deer, and 1 cow days use/acre (5 edu/ha, 7 ddu/ha, and 2 cdu/ha).

#### Soil

The soil texture is a clay loam with a mildly alkaline pH (7.5). The effective rooting depth is 11 inches with approximately 5% rock in the profile. Relative bare ground cover was 23% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.2. The combined relative cover of vegetation and litter was 55% in 2006. The 2006 soil erosion condition rating was slight due to slight surface litter movement, less than 2 pedestals per 100 square feet, flow patterns covering between 2% and 10% of the soil surface area, a few rills on the soil surface, and light soil movement.

#### Browse

The preferred browse species are Utah serviceberry, mountain big sagebrush, and true mountain mahogany. The mountain mahogany is the dominant browse species. It provided 11% cover with a density of 1,520 plants/acre in 2006. Young individuals made up 39% of the population and decadent individuals made up only 8%. Plants classified as dying made up 4%. A large density of seedlings, 1,500 plants/acre, were also sampled. The average leader growth for mahogany was 3.2 inches in 2006. Sagebrush density was 600 plants/acre in 2006 and provided 1% cover. Young made up 10% of the population and decadent individuals made up 20%. The average leader growth of sagebrush was 1.1 inch in 2006. Serviceberry provided 3% cover and had a density of 680 plants/acre. Plants classified as decadent and young each made up 38% of the population. The average leader growth of serviceberry was 2.2 inches in 2006. A large suite of browse were also sampled in 2006.

The purpose of the bullhog treatment was to reduce pinyon and western juniper cover. In 2006, the canopy cover of pinyon pine was 4% and that of western juniper was nearly 2%. Pinyon density, based on the point quarter method, was 276 trees/acre in 2006 with an average trunk diameter of 2.2 inches. Most pinyon trees were between 1 and 4 feet tall. Juniper density was 30 trees/acre in 2006 with an average trunk diameter of 2.4 inches. Most junipers were also between 1 and 4 feet tall.

#### Herbaceous Understory

The understory is diverse with 8 species of grasses and 22 species of forbs in 2006. No annuals were sampled. Grasses provided 11% cover in 2006. Intermediate wheatgrass, great basin wildrye, Salina wildrye, and Indian ricegrass were the dominant grass species. These species made up 95% of the grass cover. Forbs provided a combined cover of nearly 7% in 2006. All species of forbs provided less than 1% cover each, except wing eriogonum, which provided 2% cover.

#### HERBACEOUS TRENDS --

Management unit 16R, Study no: 25

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron intermedium	54	1.43
G	Bromus inermis	12	.18

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Carex sp.	8	.11
G	Elymus cinereus	20	2.53
G	Elymus salina	83	3.62
G	Oryzopsis hymenoides	73	2.59
G	Stipa comata	3	.18
G	Stipa lettermani	6	.03
Total for Annual Grasses		0	0
Total for Perennial Grasses		259	10.71
Total for Grasses		259	10.71
F	Arabis sp.	8	.02
F	Astragalus sp.	1	.03
F	Astragalus utahensis	12	.05
F	Caulanthus crassicaulis	10	.04
F	Castilleja linariaefolia	3	.18
F	Chaenactis douglasii	7	.02
F	Comandra pallida	12	.08
F	Eriogonum alatum	76	2.06
F	Erigeron sp.	9	.09
F	Hymenopappus filifolius	10	.48
F	Hymenoxys richardsonii	11	.39
F	Ipomopsis aggregata	6	.01
F	Lesquerella sp.	4	.01
F	Machaeranthera grindelioides	40	.85
F	Penstemon caespitosus	57	.86
F	Penstemon sp.	17	.49
F	Penstemon pachyphyllus	23	.54
F	Phlox austromontana	22	.46
F	Phlox hoodii	2	.03
F	Schoenocrambe linifolia	12	.02
F	Senecio multilobatus	6	.04
F	Taraxacum officinale	1	.00
Total for Annual Forbs		0	0
Total for Perennial Forbs		349	6.83
Total for Forbs		349	6.83

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

BROWSE TRENDS --

Management unit 16R, Study no: 25

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier utahensis	26	2.98
B	Artemisia nova	0	-
B	Artemisia tridentata vaseyana	16	.81
B	Cercocarpus montanus	45	11.32
B	Ceanothus velutinus	0	-
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus stenophyllus	1	.01
B	Eriogonum corymbosum	1	.00
B	Gutierrezia sarothrae	59	1.35
B	Juniperus scopulorum	2	.53
B	Mahonia repens	21	.64
B	Pinus edulis	10	2.62
B	Symphoricarpos oreophilus	3	.15
B	Tetradymia canescens	6	.03
Total for Browse			20.47

CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 25

Species	Percent Cover
	'06
Amelanchier utahensis	1.75
Artemisia tridentata vaseyana	1.14
Cercocarpus montanus	17.39
Eriogonum corymbosum	.06
Gutierrezia sarothrae	.93
Juniperus scopulorum	1.76
Mahonia repens	.28
Pinus edulis	4.33
Symphoricarpos oreophilus	.03

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 16R, Study no: 25

Species	Average leader growth (in)
	'06
Amelanchier utahensis	2.2
Artemisia tridentata vaseyana	1.1
Cercocarpus montanus	3.2

POINT-QUARTER TREE DATA --  
Management unit 16R, Study no: 25

Species	Trees per Acre	Average diameter (in)
	'06	'06
Juniperus scopulorum	30	2.4
Pinus edulis	276	2.2

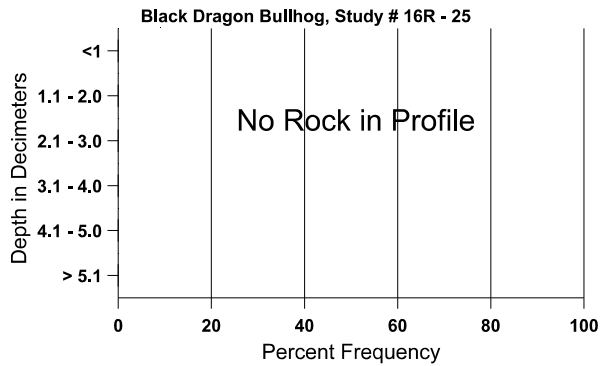
BASIC COVER --  
Management unit 16R, Study no: 25

Cover Type	Average Cover %
	'06
Vegetation	34.62
Rock	7.14
Pavement	20.70
Litter	33.59
Cryptogams	.36
Bare Ground	29.17

SOIL ANALYSIS DATA --  
Herd Unit 16R, Study # 25, Study Name: Black Dragon Bullhog

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
11.34	-	7.5	41.2	30.0	28.8	2.3	12.7	137.6	0.6

# Stoniness Index



## PELLET GROUP DATA --

Management unit 16R, Study no: 25

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	26	-
Elk	4	2 (5)
Deer	1	3 (7)
Cattle	1	1 (2)

## BROWSE CHARACTERISTICS --

Management unit 16R, Study no: 25

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>												
06	<b>680</b>	20	260	160	260	60	9	3	38	26	29	53/53
<i>Artemisia nova</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	10/21
<i>Artemisia tridentata vaseyana</i>												
06	<b>600</b>	20	60	420	120	100	3	0	20	13	13	14/21
<i>Cercocarpus montanus</i>												
06	<b>1520</b>	1500	600	800	120	-	12	0	8	4	4	51/52
<i>Ceanothus velutinus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	14/46
<i>Chrysothamnus nauseosus albicaulis</i>												
06	<b>20</b>	-	20	-	-	-	0	0	-	-	0	39/40
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
06	<b>20</b>	60	-	20	-	-	0	0	-	-	0	5/8
<i>Eriogonum corymbosum</i>												
06	<b>40</b>	-	-	40	-	-	0	0	-	-	0	7/10

		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>Gutierrezia sarothrae</i>												
06	<b>3560</b>	40	440	3000	120	-	0	0	3	1	1	6/7
<i>Juniperus scopulorum</i>												
06	<b>40</b>	20	-	40	-	-	0	0	-	-	0	-/-
<i>Mahonia repens</i>												
06	<b>3980</b>	40	480	3500	-	-	0	0	-	-	0	3/4
<i>Pinus edulis</i>												
06	<b>220</b>	60	160	60	-	-	0	0	-	-	0	-/-
<i>Symphoricarpos oreophilus</i>												
06	<b>120</b>	20	20	100	-	-	0	0	-	-	0	7/12
<i>Tetradymia canescens</i>												
06	<b>160</b>	-	60	20	80	-	13	0	50	38	38	9/16



Trend Study 17R-21-06

Study site name: Blacktail Chaining.

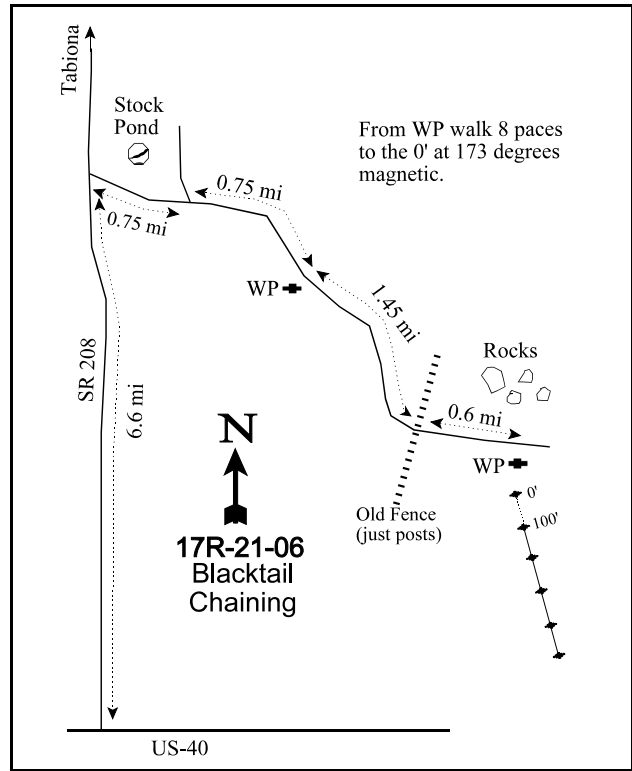
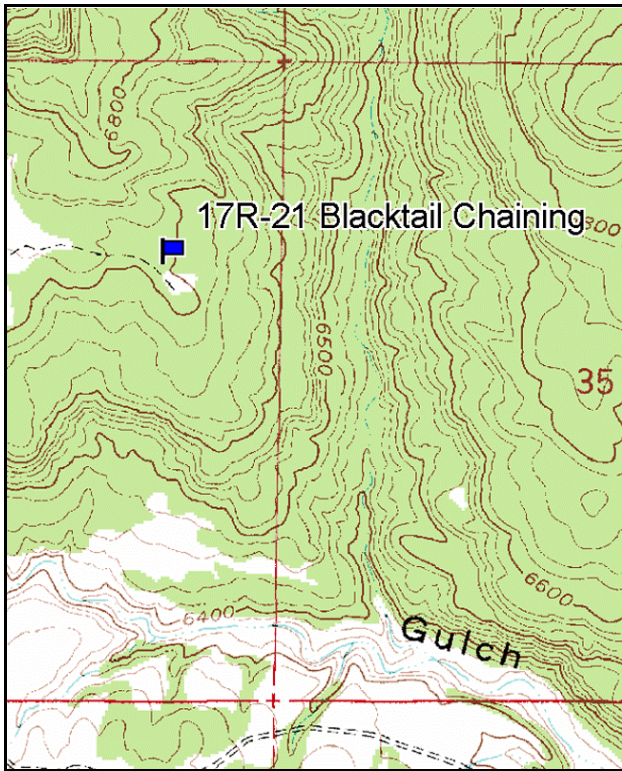
Vegetation type: Pinyon/Juniper.

Compass bearing: frequency baseline 43 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5 (95 ft).  
No Rebar.

LOCATION DESCRIPTION

From US 40 drive north on SR 208 for 6.6 miles to a road on the right. Turn here and drive 0.75 miles to a junction. Stay straight on this road following it around a bend for 0.75 miles to a witness post on the right. From there drive 1.45 miles to and old fence (just posts remain) following the road as it curves back to the east. Proceed 0.6 miles to a witness post on the right and a rock pile on the left. From the witness post walk 8 paces at 173 degrees magnetic to the 0' stake marked with browse tag #148.



Map name: Tabiona

Diagrammatic Sketch

Township 6S, Range 11E, Section 25.

UTM (NAD 83) 12S 4457303N 529257E

## DISCUSSION

### Blacktail Chaining - Study No. 17R-21

#### Study Information

This study is located approximately 10 miles northeast of Fruitland in the Tabby Mountain WMA (elevation: 6,700 feet, slope: 3%, aspect: southeast). It was established to monitor the effects of a pinyon-juniper chaining treatment in mule deer winter range. The pretreatment data collection was conducted in July 2006. The 2006 pellet group estimates were 43 elk and 52 deer days use/acre (106 edu/ha and 129 ddu/ha).

#### Soil

The soil texture is a sandy loam with a neutral pH (6.9). The effective rooting depth is 11 inches with little rock in the profile. Relative bare ground cover was 37% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.7. The combined relative cover of vegetation and litter was 55% in 2006. The 2006 soil erosion condition rating was stable due to sufficient cryptogamic crust and litter cover.

#### Browse

The key browse species is Wyoming big sagebrush, which provided 1% cover in 2006. The majority of the sagebrush previous to the treatment was located in clearing in the pinyon and juniper. The vigor of the sagebrush in this patch was very poor. Of the 340 sagebrush plants/acre sampled, 76% were decadent and 65% were classified as dying. Only 6% of the population were young, but 2,140 seedlings/acre were sampled. Use on sagebrush was light to moderate. Other preferred browse sampled in lower densities include: black sagebrush, true mountain mahogany, and antelope bitterbrush. Granite prickly phlox and prickly pear cactus were also sampled.

The dominant vegetation type is pinyon pine and Utah juniper. In 2006, pinyon canopy cover was 14% and that of juniper was 8%. Tausch and West (1994) showed that as pinyon-juniper cover increases, the herbaceous and browse understories decrease. Generally, pinyon-juniper cover of over 15% greatly diminishes the understory cover. The pinyon density, from the point quarter method, was 56 trees/acre in 2006 with an average trunk diameter of 6.3 inches. Juniper density was estimated at 37 trees/acre with an average trunk diameter of 24 inches.

#### Herbaceous Understory

The understory diversity was low in 2006 with 9 species of grasses and 7 species of forbs. Slightly more than 4% cover was provided by grasses and forbs combined. Grasses were difficult to identify due to heavy use in 2006. Perennial grasses provided 3.5% cover and annuals provided nearly 1%. Needle-and-thread grass was dominant at nearly 2% cover. Cheatgrass was also present, but scattered. Forbs provided much less than 1% cover, most of which were annuals.

The 2006 Desirable Components Index score was very poor due to low browse cover, low perennial forb cover, and low perennial grass cover.

2006 winter range condition (DC Index) – very poor (8) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 17R, Study no: 21

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron smithii	97	.69

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Bouteloua gracilis</i>	16	.07
G	<i>Bromus tectorum</i> (a)	27	.07
G	<i>Carex</i> sp.	17	.03
G	<i>Oryzopsis hymenoides</i>	57	.79
G	<i>Poa secunda</i>	26	.10
G	<i>Stipa comata</i>	88	1.53
G	<i>Stipa lettermani</i>	19	.24
G	<i>Vulpia octoflora</i> (a)	121	.64
Total for Annual Grasses		148	0.70
Total for Perennial Grasses		320	3.46
Total for Grasses		468	4.17
F	<i>Cryptantha</i> sp.	2	.01
F	<i>Descurainia pinnata</i> (a)	3	.01
F	<i>Draba</i> sp. (a)	3	.00
F	<i>Ipomopsis aggregata</i>	2	.00
F	<i>Lappula occidentalis</i> (a)	62	.21
F	<i>Penstemon</i> sp.	1	.00
F	<i>Polygonum douglasii</i> (a)	20	.04
Total for Annual Forbs		88	0.27
Total for Perennial Forbs		5	0.02
Total for Forbs		93	0.29

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 21

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	<i>Artemisia nova</i>	0	-
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	13	1.14
B	<i>Cercocarpus montanus</i>	0	-
B	<i>Juniperus osteosperma</i>	2	.56
B	<i>Leptodactylon pungens</i>	0	.00
B	<i>Opuntia</i> sp.	34	1.70
B	<i>Pinus edulis</i>	6	2.40
B	<i>Purshia tridentata</i>	0	-
Total for Browse		55	5.82

CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 21

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	1.16
Juniperus osteosperma	7.50
Opuntia sp.	1.79
Pinus edulis	13.64

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17R, Study no: 21

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	1.6

POINT-QUARTER TREE DATA --

Management unit 17R, Study no: 21

Species	Trees per Acre	Average diameter (in)
	'06	'06
Juniperus osteosperma	37	24
Pinus edulis	56	6.3

BASIC COVER --

Management unit 17R, Study no: 21

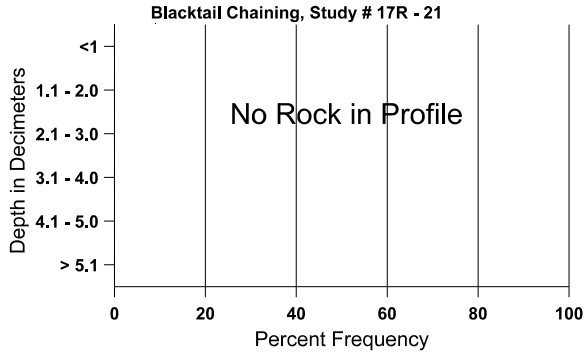
Cover Type	Average Cover %
	'06
Vegetation	10.14
Rock	1.12
Litter	50.79
Cryptogams	5.64
Bare Ground	40.21

SOIL ANALYSIS DATA --

Herd Unit 17R, Study # 21, Study Name: Blacktail Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
11.34	63 (9.53)	6.9	71.3	14.4	14.3	4.5	20.7	131.2	0.9

# Stoniness Index



## PELLET GROUP DATA --

Management unit 17R, Study no: 21

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	69	-
Elk	23	43 (106)
Deer	20	52 (129)

## BROWSE CHARACTERISTICS --

Management unit 17R, Study no: 21

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
06	0	-	-	-	-	-	0	0	-	-	0	11/30
<i>Artemisia tridentata wyomingensis</i>												
06	340	2140	20	60	260	440	29	0	76	65	65	15/28
<i>Cercocarpus montanus</i>												
06	0	-	-	-	-	20	0	0	-	-	0	64/55
<i>Juniperus osteosperma</i>												
06	40	-	-	20	20	40	0	0	50	-	0	-/-
<i>Leptodactylon pungens</i>												
06	0	-	-	-	-	-	0	0	-	-	0	2/6
<i>Opuntia sp.</i>												
06	1800	-	-	1500	300	180	0	0	17	8	9	6/20
<i>Pinus edulis</i>												
06	120	20	40	80	-	20	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
06	0	-	-	-	-	-	0	0	-	-	0	12/54

Trend Study 17R-22-06

Study site name: Allen Smith Reseeding

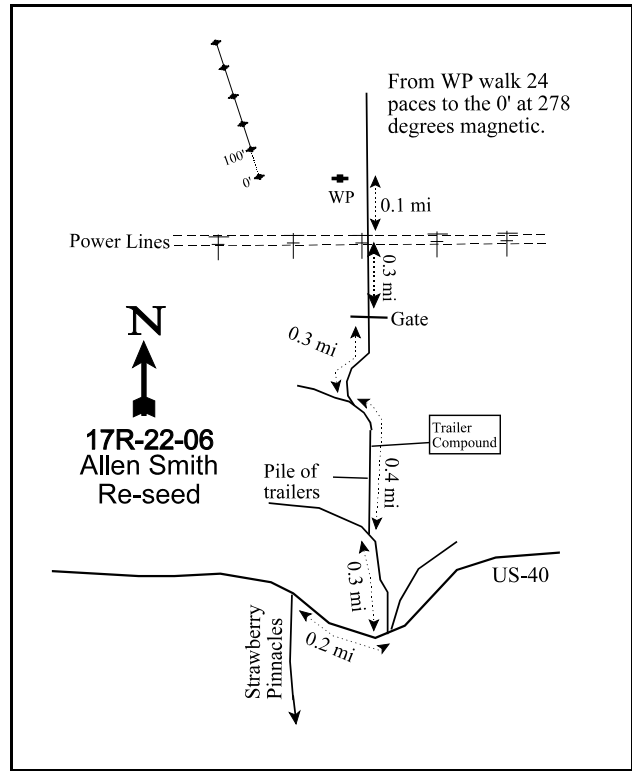
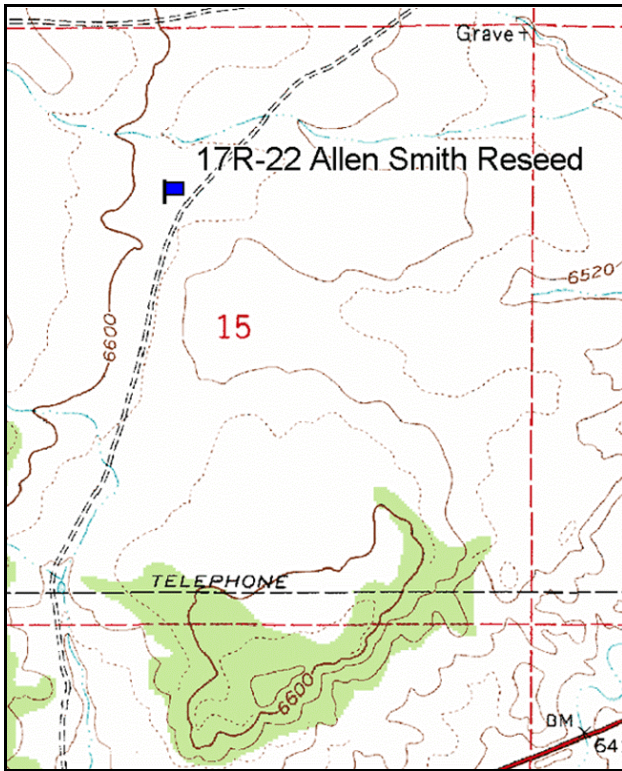
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 356 degrees magnetic.

Frequency belt placement: line 1(11 ft & 95 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft).  
No Rebar.

LOCATION DESCRIPTION

Driving east on US-40 drive to the farthest west turn off to the Strawberry Pinnacles. From there drive east 0.2 miles to a road on the left (north) side of the road. Turn here and drive north for 0.3 miles to a fork that leads to a pile of trailers. Stay to the right and drive 0.4 miles passing a trailer compound and coming to another fork. Stay to the right and drive 0.3 miles to a gate. Go through the gate and drive 0.5 miles to power lines crossing the road. From there drive 0.1 miles to a witness post on the left. From the witness post walk 24 paces at 278 degrees to the 0' stake marked with browse tag #147.



Map name: Fruitland

Diagrammatic Sketch

Township 3S, Range 8W, Section 15.

UTM (NAD 83) 12T 4452480N 519024E

## DISCUSSION

### Allen Smith Reseeding - Study No. 17R-22

#### Study Information

This study is located approximately 3.5 miles east of Fruitland on privately owned land (elevation: 6,600 feet, slope: 2%, aspect: southeast). It is located in a Wyoming big sagebrush community that had been seeded with perennial grasses for grazing forage in the past. The study was established to monitor the effects of a treatment which involved a spray with herbicide to decrease crested wheatgrass and an interseeding of other species. The pretreatment data collection was conducted in July 2006. The area is heavily utilized by big game in winter. Cattle also utilize the area. The 2006 pellet group data estimates were 62 elk, 7 deer, and 21 cow days use/acre (152 edu/ha, 17 ddu/ha, and 52 cdu/ha).

#### Soil

The soil texture is a sandy clay loam with a mildly alkaline pH (7.5). The effective rooting depth is 10 inches with approximately 45% (average) rock in the profile. Relative bare ground cover was 33% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.4. The combined relative cover of vegetation and litter was 64% in 2006. The 2006 soil erosion condition rating was stable due to sufficient vegetation and litter cover.

#### Browse

The key browse species was Wyoming big sagebrush at one time, but nearly the whole population was dead in 2006. Patches black greasewood grow in the depressions, none are sampled in the study area. In 2006, living sagebrush were only sampled in the height/crown measurements, but 2,320 dead sagebrush plants/acre were sampled. It is likely that the dense crested wheatgrass is preventing the establishment of sagebrush seedlings for recruitment. Other species sampled in either low densities or in the height/crown measurements in 2006 include: Winterfat, slender buckwheat, broom snakeweed, and prickly pear cactus.

#### Herbaceous Understory

The understory is made up 8 species of grass and 16 forb species, but is dominated by crested wheatgrass. Crested wheatgrass cover was 21%, 92% of grass cover and 82% of understory cover. It was sampled in 99% of the quadrats in 2006. Russian wildrye provided 1% cover, all other grasses provided less than 1% combined. Forbs provided 3% cover in 2006. Alfalfa was the only species which provided more than 1% cover.

The 2006 Desirable Components Index score was fair due to the high perennial grass cover, although the lack of browse cover prevented it from being higher.

2006 winter range condition (DC Index) – fair (34) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 17R, Study no: 22

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	403	20.61
G	Agropyron intermedium	21	.13
G	Agropyron spicatum	4	.03
G	Bromus tectorum (a)	3	.03
G	Carex sp.	14	.10

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Elymus junceus</i>	34	1.31
G	<i>Oryzopsis hymenoides</i>	37	.21
G	<i>Poa secunda</i>	1	.00
Total for Annual Grasses		3	0.03
Total for Perennial Grasses		514	22.41
Total for Grasses		517	22.45
F	<i>Arabis</i> sp.	1	.00
F	<i>Cryptantha</i> sp.	2	.00
F	<i>Descurainia pinnata</i> (a)	24	.08
F	<i>Draba</i> sp. (a)	2	.00
F	<i>Eriogonum cernuum</i> (a)	5	.01
F	<i>Lappula occidentalis</i> (a)	1	.00
F	<i>Leucelene ericoides</i>	3	.00
F	<i>Machaeranthera canescens</i>	35	.37
F	<i>Melilotus officinalis</i>	2	.00
F	<i>Medicago sativa</i>	42	1.39
F	<i>Phlox austromontana</i>	3	.03
F	<i>Salsola iberica</i> (a)	141	.46
F	<i>Schoenocrambe linifolia</i>	4	.01
F	<i>Senecio multilobatus</i>	3	.00
F	<i>Sphaeralcea coccinea</i>	24	.30
F	<i>Trifolium</i> sp.	6	.01
Total for Annual Forbs		173	0.57
Total for Perennial Forbs		125	2.16
Total for Forbs		298	2.73

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



BROWSE TRENDS --

Management unit 17R, Study no: 22

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata wyomingensis	0	-
B	Ceratoides lanata	0	-
B	Eriogonum microthecum	0	-
B	Gutierrezia sarothrae	5	.03
B	Opuntia sp.	9	.15
Total for Browse		14	0.18

CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 22

Species	Percent Cover
	'06
Opuntia sp.	.10

BASIC COVER --

Management unit 17R, Study no: 22

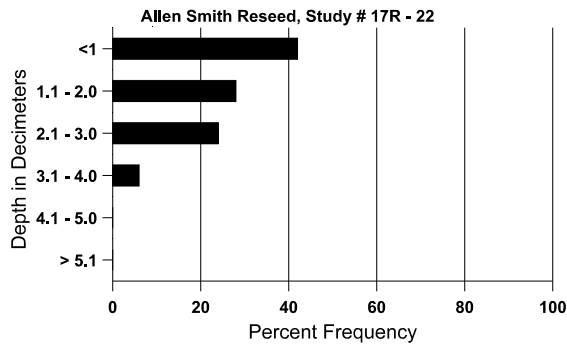
Cover Type	Average Cover %
	'06
Vegetation	25.70
Rock	.77
Pavement	1.70
Litter	52.02
Cryptogams	.13
Bare Ground	39.75

SOIL ANALYSIS DATA --

Herd Unit 17R, Study # 22, Study Name: Allen Smith Reseed

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
10.12	68.4 (10.47)	7.5	49.6	27.2	23.3	1.9	12.1	160.0	0.7

# Stoniness Index



## PELLET GROUP DATA --

Management unit 17R, Study no: 22

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	25	-
Grouse	1	-
Elk	42	62 (152)
Deer	13	7 (17)
Cattle	9	21 (52)

## BROWSE CHARACTERISTICS --

Management unit 17R, Study no: 22

		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>Artemisia tridentata wyomingensis</i>												
06	0	-	-	-	-	2320	0	0	-	-	0	7/8
<i>Ceratoides lanata</i>												
06	0	-	-	-	-	-	0	0	-	-	0	14/23
<i>Eriogonum microthecum</i>												
06	0	-	-	-	-	-	0	0	-	-	0	11/15
<i>Gutierrezia sarothrae</i>												
06	140	-	-	140	-	-	0	0	-	-	0	5/11
<i>Opuntia sp.</i>												
06	180	-	20	100	60	-	0	0	33	22	22	4/16

Trend Study 17R-23-06

Study site name: Rabbit Gulch Interseed.

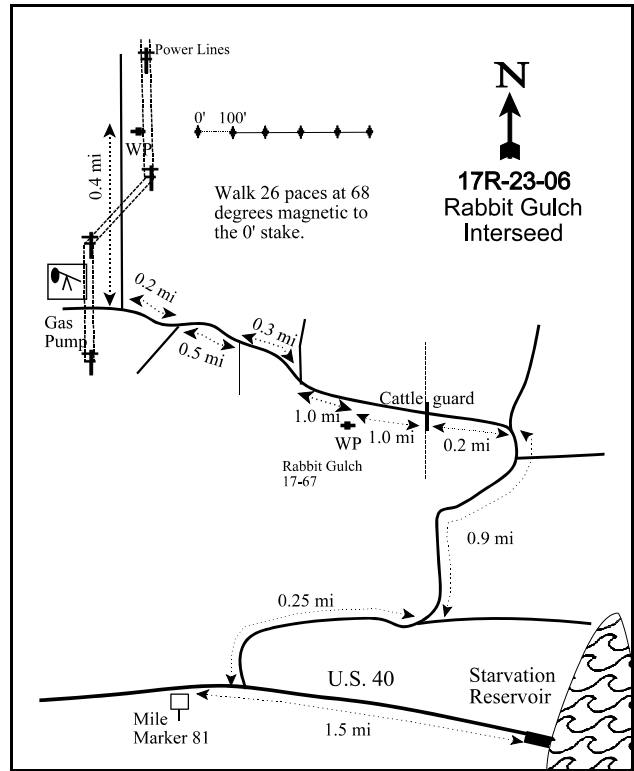
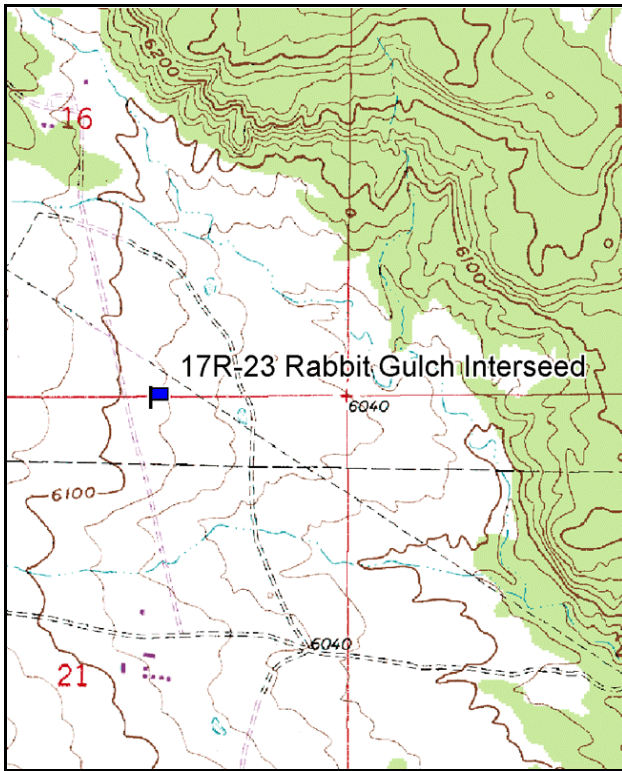
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 71 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5 (95 ft).  
No Rebar.

LOCATION DESCRIPTION

From the Starvation Bridge on U.S. 40 travel west 1.5 miles to a turnoff on the north side of the road. Follow this road 0.25 miles to a fork. Continue left 0.9 miles and staying left. Continue 0.2 miles to a cattleguard and fence. After the cattleguard proceed 1.0 mile to a witness post on the left side of the road. From the witness post drive 0.1 miles to a fork and stay left for 0.4 miles to another intersection again staying left. Continue 0.3 miles to an intersection staying right for 0.5 miles to a fork continuing right for 0.2 miles to another intersection. From here turn right (north) and drive 0.4 miles to a witness post on the right. From the witness post walk 26 paces at 68 degrees magnetic to the 0' stake marked with browse tag #145.



Map name: Rabbit Gulch

Diagrammatic Sketch

Township 3S, Range 6W, Section 21.

UTM (NAD 83) 12T 4451389N 536969E

## DISCUSSION

### Rabbit Gulch Interseeding - Study No. 17R-23

#### Study Information

This study is located approximately 9 miles northwest of Duchesne in the Tabby Mountain WMA (elevation: 6,100 feet, slope: 1%, aspect: south). It was established to monitor the effects of an interseeding project into a decadent population of Wyoming big sagebrush. The pretreatment data collection was conducted in July 2006. The area is critical deer winter range. The 2006 pellet group estimates were 21 elk, 22 deer, and 12 cow days use/acre (53 edu/ha, 55 ddu/ha, and 30 cdu/ha).

#### Soil

The soil texture is a sandy loam with a mildly alkaline pH (7.7). The effective rooting depth is 9 inches with little rock in the profile. Relative bare ground cover was 47% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.5. The combined relative cover of vegetation and litter was 46% in 2006. The 2006 soil erosion condition rating was slight due to slight surface litter movement, 5 to 7 pedestals per 100 square feet, flow patterns covering less than 2% of the soil surface area, infrequent rills on the soil surface, gullies with between 10% and 50% of the walls actively eroding, and light soil movement.

#### Browse

The dominant browse component is dying and dead Wyoming big sagebrush. In 2006, 220 living sagebrush plants/acre were sampled, 91% of which were classified as decadent and 82% were classified as dying. A large density of dead plants, 2,500 plants/acre, were also sampled. Fortunately, there were also 1,120 seedlings/acre sampled. Use was light to moderate on the surviving plants. Shadscale was also sampled in 2006 at 420 plants/acre. Nineteen percent of the population was classified as young and the same was classified as decadent. Approximately 10% of the shadscale had been heavily utilized, the rest were lightly used. Winterfat was also sampled at 260 plants/acre. Broom snakweed and prickly pear cactus were also sampled. The interseeding treatment should be instrumental in revegetating this decadent population.

#### Herbaceous Understory

The understory is composed of 7 grass and 11 forb species. Grasses provided nearly 14% cover in 2006 and forbs provided 1% cover. Indian ricegrass and needle-and-thread grass were the dominant understory species. Indian ricegrass provided 9% cover, 62% of the understory cover and 67% of grass cover. Needle-and-thread provided 4% cover in 2006, 28% of the understory cover and 30% of grass cover. Cheatgrass was present in 2006, but was sampled in only 2% of the quadrats and provided very little cover.

The 2006 Desirable Components Index score was fair due to good perennial grass cover, although the lack of browse cover prevented it from being higher.

2006 winter range condition (DC Index) – fair (29) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 17R, Study no: 23

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Bromus tectorum (a)	2	.01
G	Oryzopsis hymenoides	244	9.10
G	Poa fendleriana	1	.03

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Poa secunda</i>	5	.04
G	<i>Sitanion hystrix</i>	4	.04
G	<i>Stipa comata</i>	124	4.09
G	<i>Vulpia octoflora</i> (a)	35	.18
Total for Annual Grasses		37	0.19
Total for Perennial Grasses		378	13.31
Total for Grasses		415	13.51
F	<i>Descurainia pinnata</i> (a)	14	.08
F	<i>Draba</i> sp. (a)	2	.00
F	<i>Eriogonum cernuum</i> (a)	15	.08
F	<i>Halogeton glomeratus</i> (a)	56	.45
F	<i>Lappula occidentalis</i> (a)	31	.08
F	<i>Leucelene ericoides</i>	6	.06
F	<i>Machaeranthera canescens</i>	4	.01
F	<i>Plantago patagonica</i> (a)	6	.03
F	<i>Salsola iberica</i> (a)	1	.00
F	<i>Schoenocrambe linifolia</i>	4	.01
F	<i>Sphaeralcea coccinea</i>	35	.24
Total for Annual Forbs		125	0.75
Total for Perennial Forbs		49	0.32
Total for Forbs		174	1.07

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 23

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	10	.98
B	<i>Atriplex confertifolia</i>	16	.55
B	<i>Ceratoides lanata</i>	7	.19
B	<i>Gutierrezia sarothrae</i>	20	.63
B	<i>Opuntia</i> sp.	37	1.26
Total for Browse		90	3.63

CANOPY COVER, LINE INTERCEPT --  
 Management unit 17R, Study no: 23

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	.83
Atriplex confertifolia	1.46
Ceratoides lanata	.13
Gutierrezia sarothrae	.13
Opuntia sp.	1.78

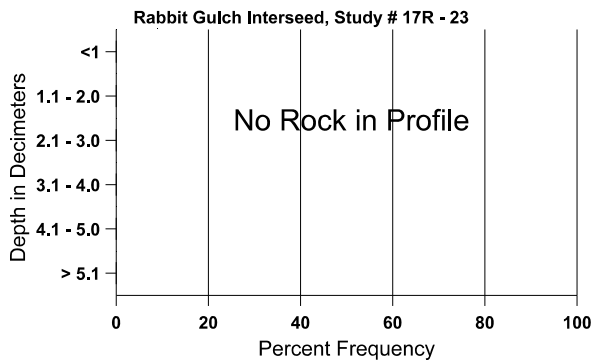
BASIC COVER --  
 Management unit 17R, Study no: 23

Cover Type	Average Cover %
	'06
Vegetation	19.73
Pavement	.02
Litter	33.06
Cryptogams	8.35
Bare Ground	53.54

SOIL ANALYSIS DATA --  
 Herd Unit 17R, Study # 23, Study Name: Rabbit Gulch Interseeding

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
8.9	69.2 (8.43)	7.7	64.7	18.8	16.4	0.7	7.4	176.0	0.4

### Stoniness Index



PELLET GROUP DATA --

Management unit 17R, Study no: 23

Type	Quadrat Frequency	Days use per acre (ha)
	'06	
Rabbit	58	-
Elk	13	21 (53)
Deer	26	22 (55)
Cattle	3	12 (30)

BROWSE CHARACTERISTICS --

Management unit 17R, Study no: 23

		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>Artemisia tridentata wyomingensis</i>												
06	<b>220</b>	1120	-	20	200	2500	27	9	91	82	82	15/22
<i>Atriplex confertifolia</i>												
06	<b>420</b>	740	80	260	80	-	0	10	19	5	10	12/24
<i>Ceratoides lanata</i>												
06	<b>260</b>	160	160	100	-	-	8	8	-	-	23	4/9
<i>Gutierrezia sarothrae</i>												
06	<b>520</b>	20	40	440	40	-	19	4	8	8	96	5/10
<i>Opuntia sp.</i>												
06	<b>1220</b>	-	20	1040	160	180	0	0	13	5	7	5/17

Trend Study 17R-24-06

Study site name: East Santaquin Chaining.

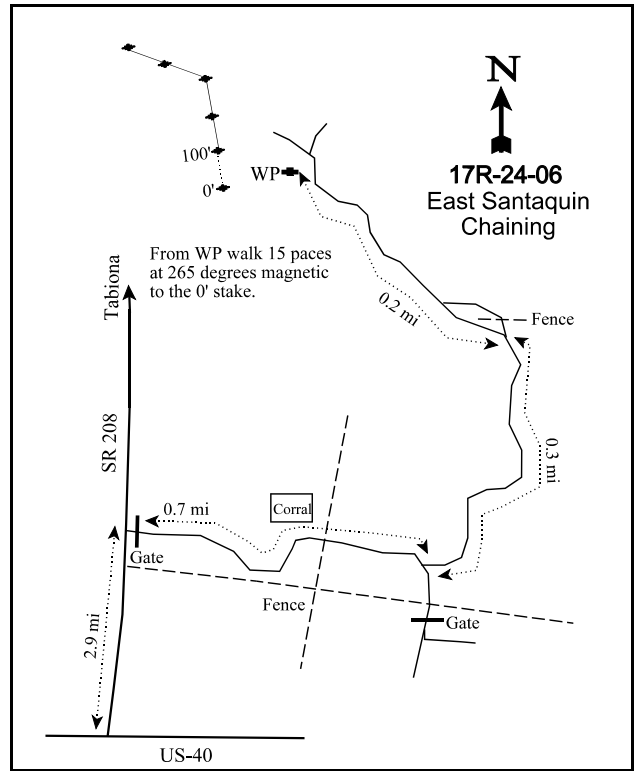
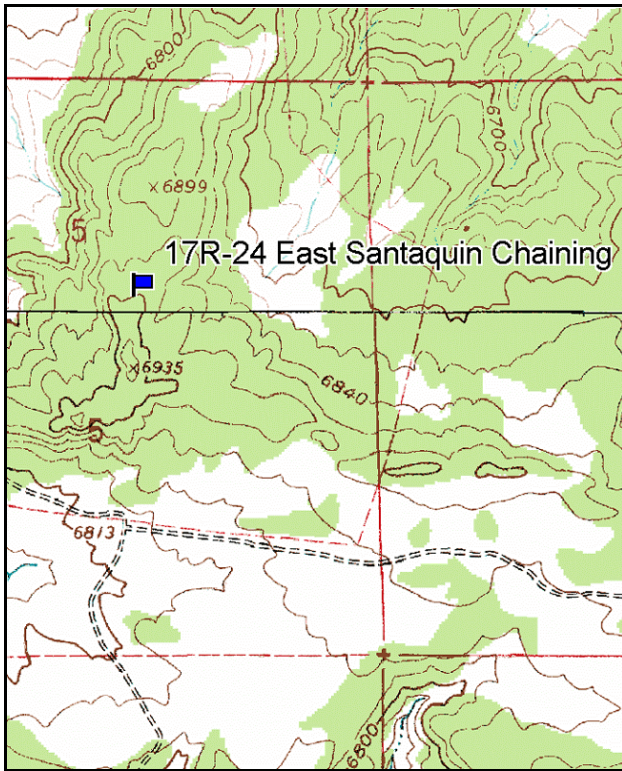
Vegetation type: Pinyon/Juniper.

Compass bearing: frequency baseline 0'-300' 358 degrees magnetic 300'-500' 331 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5 (95 ft).  
No Rebar.

LOCATION DESCRIPTION

From US-40 drive north on SR 208 2.9 miles to a gated road on the right. Turn here and proceed through the gate for 0.7 miles to a fork. Turn left and follow the road for 0.3 road to a fence then veer left and drive 0.2 miles to a witness post on the left. Walk 15 paces at 265 degrees magnetic to the 0' stake marked with browse tag #146.



Map name: Tabiona

Diagrammatic Sketch

Township 7S, Range 11E, Section 5.

UTM (NAD 83) 12T 4455581N 525694E



## DISCUSSION

### East Santaquin Chaining - Study No. 17R-24

#### Study Information

This study is located approximately 8 miles northeast of Fruitland in the Tabby Mountain WMA (elevation: 6,700 feet, slope: 3%, aspect: southeast). It was established to monitor the effects of a pinyon-juniper chaining treatment in mule deer winter range. The pretreatment data collection was conducted in July 2006. The 2006 pellet group estimates were 48 elk and 42 deer days use/acre (119 edu/ha and 104 ddu/ha).

#### Soil

The soil texture is a sandy loam with a neutral pH (7.0). The effective rooting depth is 11 inches with little rock in the profile above 11 inches, below is a rock layer. Relative bare ground cover was 32% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.7. The combined relative cover of vegetation and litter was 63% in 2006. The 2006 soil erosion condition rating was slight due to moderate surface litter movement, 2 to 5 pedestals per 100 square feet, flow patterns covering less 25% to 50% of the soil surface area, and heavy soil movement.

#### Browse

The browse species are very sparse. Antelope bitterbrush was the only preferred browse species sampled in density measurements in 2006, although only 80 plants/acre. Utah serviceberry, Wyoming big sagebrush, and true mountain mahogany were sampled in the height/crown measurements. Brittle pricklypear was the dominant shrub with a density of 6,260 plants/acre in 2006.

The dominant vegetation type is pinyon-juniper. In 2006, pinyon canopy cover was 22% and that of juniper was 8%. Tausch and West (1994) showed that as pinyon-juniper cover increases, the herbaceous and browse understories decrease. Generally, pinyon-juniper cover of over 15% greatly diminishes the understory cover. The pinyon density, from the point quarter method, was 46 trees/acre in 2006 with an average trunk diameter of 17 inches. Juniper density was estimated at 44 trees/acre with an average trunk diameter of 21.8 inches. Most trees, of both species, were greater than 12 feet tall.

#### Herbaceous Understory

The herbaceous understory is composed of 7 grass species and 11 forb species. The understory provided 5% cover in 2006, 73% of which was provided by perennial grasses. Indian ricegrass was the dominant understory species in 2006; it provided 2% cover, 40% of the understory cover and 48% of grass cover. Cheatgrass was also sampled in 25% of the quadrats and provided less than 1% cover. More than half of the forbs sampled in 2006 were annuals.

The 2006 Desirable Components Index score was very poor-poor due to the lack of browse cover and low perennial grass and forb cover.

2006 winter range condition (DC Index) – very poor-poor (10) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 17R, Study no: 24

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron smithii	94	.32
G	Bromus tectorum (a)	76	.58
G	Carex sp.	91	.42

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Oryzopsis hymenoides</i>	95	2.08
G	<i>Poa secunda</i>	37	.44
G	<i>Sitanion hystrix</i>	1	.00
G	<i>Stipa comata</i>	29	.50
Total for Annual Grasses		76	0.58
Total for Perennial Grasses		347	3.78
Total for Grasses		423	4.37
F	<i>Arabis</i> sp.	-	.00
F	<i>Cryptantha</i> sp.	2	.00
F	<i>Descurainia pinnata</i> (a)	1	.00
F	<i>Draba</i> sp. (a)	1	.00
F	<i>Gayophytum ramosissimum</i> (a)	2	.00
F	<i>Gilia</i> sp. (a)	2	.00
F	<i>Ipomopsis aggregata</i>	42	.15
F	<i>Lappula occidentalis</i> (a)	28	.09
F	<i>Penstemon</i> sp.	1	.00
F	<i>Polygonum douglasii</i> (a)	32	.07
F	<i>Senecio multilobatus</i>	24	.46
Total for Annual Forbs		66	0.18
Total for Perennial Forbs		69	0.62
Total for Forbs		135	0.81

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

BROWSE TRENDS --

Management unit 17R, Study no: 24

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier utahensis	0	-
B	Artemisia tridentata wyomingensis	0	-
B	Cercocarpus montanus	0	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	.01
B	Juniperus osteosperma	3	1.25
B	Leptodactylon pungens	2	-
B	Opuntia fragilis	56	2.03
B	Opuntia sp.	9	.56
B	Pinus edulis	2	.71
B	Purshia tridentata	4	1.04
Total for Browse		77	5.61

CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 24

Species	Percent Cover
	'06
Chrysothamnus viscidiflorus viscidiflorus	.05
Juniperus osteosperma	8.46
Opuntia fragilis	2.06
Opuntia sp.	.58
Pinus edulis	21.53
Purshia tridentata	1.31

POINT-QUARTER TREE DATA --

Management unit 17R, Study no: 24

Species	Trees per Acre	Average diameter (in)
	'06	
Juniperus osteosperma	44	21.8
Pinus edulis	46	17.0

**BASIC COVER --**

Management unit 17R, Study no: 24

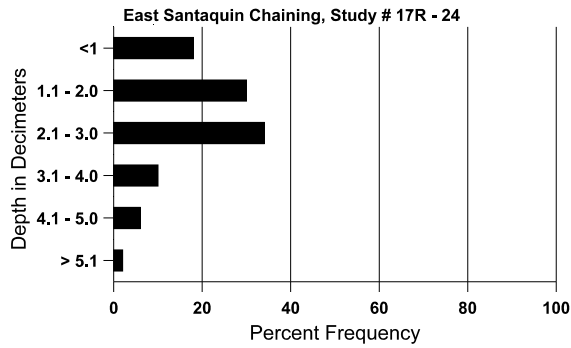
Cover Type	Average Cover % '06
Vegetation	10.18
Rock	2.45
Pavement	.01
Litter	58.43
Cryptogams	2.16
Bare Ground	34.68

**SOIL ANALYSIS DATA --**

Herd Unit 17R, Study # 24, Study Name: East Santaquin Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
11.02	60.8 (10.63)	7.0	72.7	14.4	12.8	1.3	9.4	83.2	0.4

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 17R, Study no: 24

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	70	-
Elk	22	48 (119)
Deer	27	42 (104)

BROWSE CHARACTERISTICS --  
 Management unit 17R, Study no: 24

		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>Amelanchier utahensis</i>												
06	0	-	-	-	-	-	0	0	-	-	0	19/40
<i>Artemisia tridentata wyomingensis</i>												
06	0	-	-	-	-	-	0	0	-	-	0	14/21
<i>Cercocarpus montanus</i>												
06	0	-	-	-	-	-	0	0	-	-	0	23/41
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	20	40	-	20	-	-	0	0	-	-	0	11/20
<i>Juniperus osteosperma</i>												
06	60	-	-	60	-	-	0	0	-	-	0	-/-
<i>Leptodactylon pungens</i>												
06	40	-	-	40	-	-	100	0	-	-	0	4/7
<i>Opuntia fragilis</i>												
06	6260	20	1700	4300	260	20	0	0	4	.63	2	2/10
<i>Opuntia sp.</i>												
06	440	-	-	340	100	-	0	0	23	-	23	4/19
<i>Pinus edulis</i>												
06	40	20	-	40	-	60	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
06	80	-	-	80	-	-	25	50	-	-	0	15/63

Trend Study 17R-25-06

Study site name: Trout Creek Dixie.

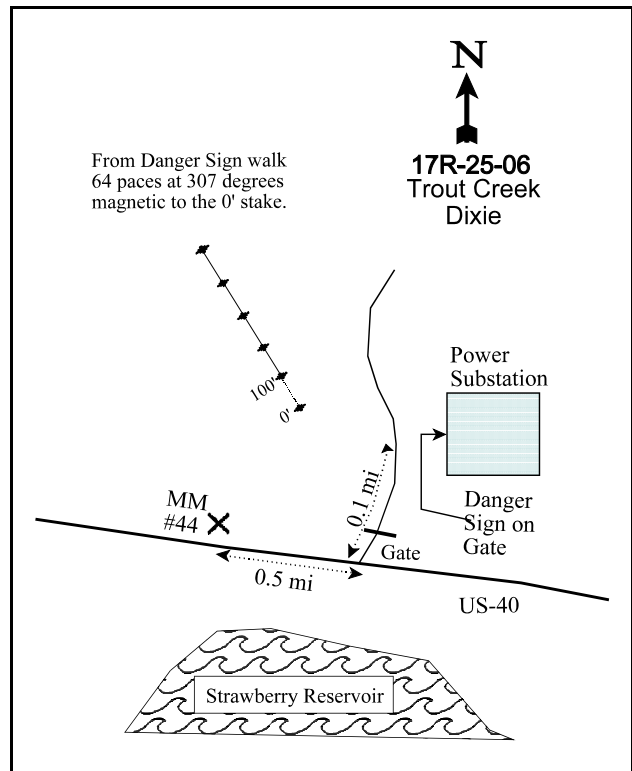
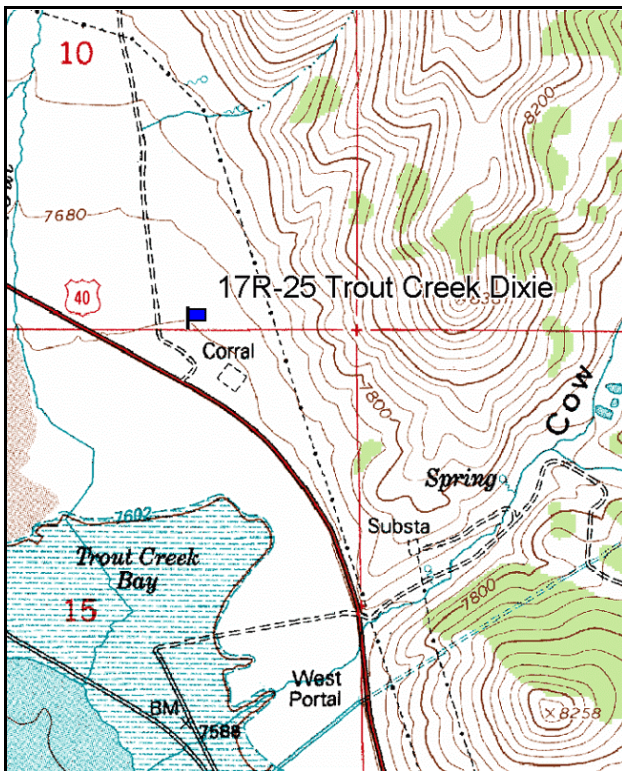
Vegetation type: Mountain Big Sagebrush.

Compass bearing: frequency baseline 313 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5 (95 ft).  
No Rebar.

LOCATION DESCRIPTION

Drive east on US-40 around Strawberry Reservoir to mile marker 44. From there drive 0.5 miles to a road with a gate on the left (north). Turn here and proceed 0.1 miles through the gate to a power substation. From the “danger” sign on the substation gate walk 64 paces at 307 degrees magnetic to the 0' stake marked with browse tag #161.



Map name: Strawberry Reservoir NE

Diagrammatic Sketch

Township 3S , Range 11W , Section 15 .

UTM (NAD 83) 12T 4452940N 490656E

## DISCUSSION

### Trout Creek Dixie - Study No. 17R-25

#### Study Information

This study is located on US Forest Service managed land north of Strawberry Reservoir, north of Highway 40 (elevation: 7,650 feet, slope: 3%, aspect: south). It was established to monitor the effects of a dixie harrow treatment in a dense a mountain big sagebrush community. This area is summer range for mule deer and is near sage grouse habitat. The pretreatment data collection was conducted in August 2006. The 2006 pellet groups estimates were 1 deer day use/acre (3 ddu/ha).

#### Soil

The soil texture is a sandy clay loam with a slightly acidic pH (6.1). The effective rooting depth is 10 inches with little rock in the profile. Relative bare ground cover was 14% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:3.9. The combined relative cover of vegetation and litter was 86% in 2006. The 2006 soil erosion condition rating was stable due to the high vegetation cover.

#### Browse

Mountain big sagebrush is the key browse species. It provided 35% cover in 2006, 96% of the browse cover. Sagebrush density was 7,500 plants/acre, 29% of which were classified as decadent and 1% as young. A large density of seedlings, 3,260 plants/acre, were also sampled in 2006. Plants classified as dying made up 11% of the population. Use was light. Stickileaf low rabbitbrush and whorled buckwheat were also sampled in 2006.

#### Herbaceous Understory

The understory is composed of 9 grass and 6 forb species. The grasses, all of which are perennial, provided 20% cover in 2006. The forbs provided nearly 5% cover in 2006. The dominant species in 2006 included thickspike wheatgrass, prairie junegrass, Kentucky bluegrass, needle-and-thread grass, Letterman needlegrass, and silvery lupine. Pale agoseris and siverly lupine are used by sage grouse (Klebenow and Gray 1968; Martin 1970; Peterson 1970; Wallestad 1975; Barnett and Crawford 1994; Drut et al. 1994).

The vegetation community should show some resilience to the disturbance of the treatment and allow little invasion of weeds.

#### HERBACEOUS TRENDS --

Management unit 17R, Study no: 25

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron dasystachyum	235	1.98
G	Carex sp.	16	.18
G	Koeleria cristata	175	5.32
G	Melica bulbosa	-	.00
G	Poa fendleriana	4	.18
G	Poa pratensis	52	1.30
G	Poa secunda	33	.83
G	Stipa comata	119	4.28
G	Stipa lettermani	209	5.98
Total for Annual Grasses		0	0

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
Total for Perennial Grasses		843	20.10
Total for Grasses		843	20.10
F	Agoseris glauca	2	.00
F	Chaenactis douglasii	1	.00
F	Hackelia patens	6	.04
F	Lupinus argenteus	166	4.78
F	Penstemon sp.	2	.00
F	Polygonum douglasii (a)	14	.03
Total for Annual Forbs		14	0.03
Total for Perennial Forbs		177	4.83
Total for Forbs		191	4.86

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 25

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata vaseyana	99	34.90
B	Chrysothamnus viscidiflorus viscidiflorus	2	.03
B	Eriogonum heracleoides	19	1.50
Total for Browse		120	36.44

#### CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 25

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	46.09
Eriogonum heracleoides	1.68

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17R, Study no: 25

Species	Average leader growth (in)
	'06
Artemisia tridentata vaseyana	1.8



BASIC COVER --

Management unit 17R, Study no: 25

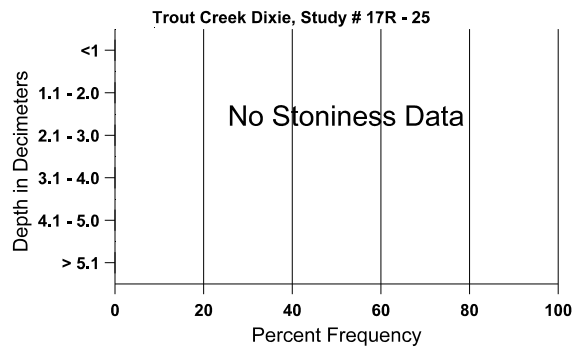
Cover Type	Average Cover % '06
Vegetation	55.04
Rock	.21
Pavement	.33
Litter	47.61
Cryptogams	.13
Bare Ground	16.87

SOIL ANALYSIS DATA --

Herd Unit 17R, Study # 25, Study Name: Trout Creek Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
10	58.6 (10.31)	6.1	50.7	21.4	27.8	3.9	60.5	224.0	0.4

### Stoniness Index



PELLET GROUP DATA --

Management unit 17R, Study no: 25

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	3	-
Grouse	3	-
Deer	2	1 (3)

BROWSE CHARACTERISTICS --  
 Management unit 17R, Study no: 25

		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>Artemisia tridentata vaseyana</i>												
06	<b>7500</b>	3260	60	5240	2200	580	0	0	29	11	11	23/30
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>40</b>	-	-	40	-	-	0	0	-	-	0	10/7
<i>Eriogonum heracleoides</i>												
06	<b>1100</b>	-	40	1060	-	-	0	2	-	-	0	3/14

Trend Study 18R-4-06

Study site name: Big Hollow Bullhog.

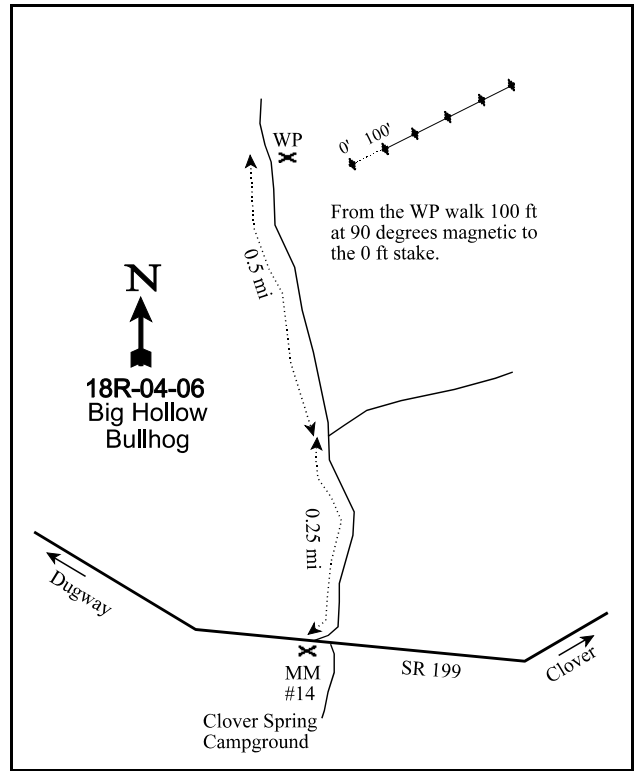
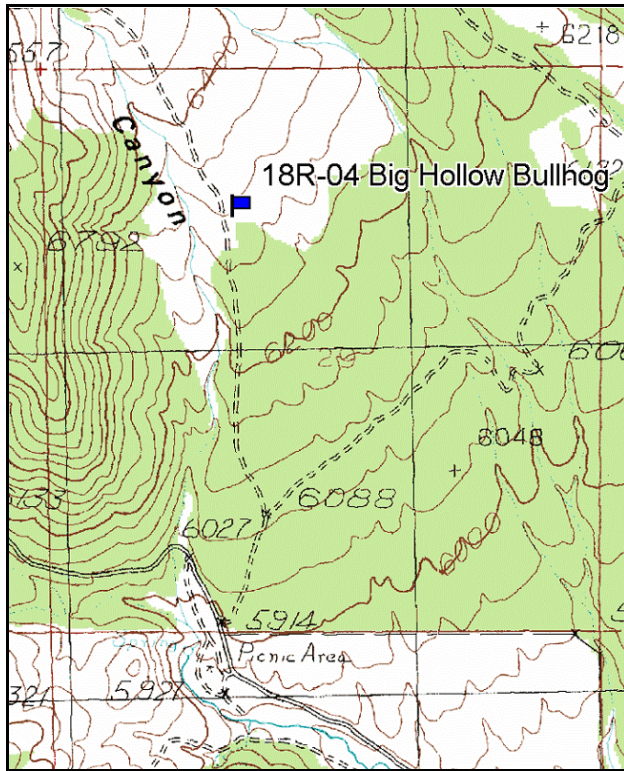
Vegetation type: Utah Juniper.

Compass bearing: frequency baseline 26 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5 (95 ft).  
No Rebar.

LOCATION DESCRIPTION

On SR-199 drive west from Clover. Turn north at mile marker #14 on the road across the street from the road that goes to Clover Spring Campground. From the turnoff drive 0.25 miles to a fork, stay left and drive 0.5 miles to a witness post on the right. Walk 100 feet at 90 degrees magnetic to the 0 foot stake marked with browse tag #155.



Map name: Johnson Pass

Diagrammatic Sketch

Township 5S, Range 6W, Section 29.

UTM (NAD 83) 12T 4468585N 368429E

## DISCUSSION

### Big Hollow Bullhog - Study No. 18R-4

#### Study Information

This study is located approximately 6 miles west of Clover and north of SR 199 (elevation: 6,300 feet, slope: 2-6%, aspect: east). It was established to monitor the effects of a pinyon-juniper bullhog mastication treatment in mule deer winter/spring range. The pretreatment data collection was conducted in June 2006. The 2006 pellet group estimates were 7 deer days use/acre (17 ddu/ha).

#### Soil

The soil is in the Lodar-Lundy-Rock outcrop association. The Lodar series is shallow, well or excessively drained, moderately permeable soils found on ridges, mountains, and hills. It is formed in residuum and colluvium from sandstone and limestone. The Lundy series is formed in residuum and colluvium from shale and limestone and is shallow, well drained, moderately permeable. It is found on hillsides, ridges, and mountainsides (USDA-NRCS 2006). The effective rooting depth is 12 inches with a rocky profile. The soil texture is a sandy clay loam with a neutral pH (7.1). Relative bare ground cover was 24% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.8. The combined relative cover of vegetation and litter was 58% in 2006. The 2006 soil erosion condition rating was slight due to slight surface litter movement, 5-7 pedestals per 100 square feet, flow patterns covering less than 2% of the soil surface area, gullies with less than 2% of the gully showing active erosion, and slight soil movement.

#### Browse

The key browse species is mountain big sagebrush, which provided 8% cover in 2006. Sagebrush density was 1,580 plants/acre in 2006, 24% of which were decadent and 15% were classified as dying. Few seedlings were sampled. Use was light in 2006. Antelope bitterbrush was sampled at 320 plants/acre in 2006, 6% of which were young and 25% were decadent. Use was heavy on this species. Two other preferred browse species, Utah serviceberry and cliff rose, were sampled in the height/crown measurements. Whitestem rubber rabbitbrush, stickleaf low rabbitbrush, broom snakeweed, prickly pear cactus, snowberry, and gray horsebrush were also sampled.

The dominant species in 2006 was Utah juniper. It provided 14% canopy cover in 2006. Tausch and West (1994) showed that as pinyon-juniper cover increases, the herbaceous and browse understories decrease. Generally, pinyon-juniper cover of over 15% greatly diminishes the understory cover. Juniper density, from the point quarter method, was 140 trees/acre in 2006, with an average trunk diameter of 7.5 inches.

#### Herbaceous Understory

The understory is very diverse for a community that has been invaded by juniper. Ten species of grasses, one of which was an annual, and fifteen species of forbs were sampled in 2006. Grasses provided 12% cover in 2006 and forbs provided nearly 3%. The most abundant grasses were crested wheatgrass, thickspike wheatgrass, bluebunch wheatgrass, bulbous bluegrass, and Sandberg bluegrass. Cheatgrass was sampled in 2006 at a quadrat frequency of 22%, but it provided much less than 1% cover. Forbs, though diverse, were not abundant.

The 2006 Desirable Components Index score was poor-fair due to moderate browse cover, good perennial grass cover, but was penalized because of a moderate percentage of decadence and low percentage of young.

2006 winter range condition (DC Index) – poor-fair (49) Mid-level potential scale

BROWSE TRENDS --

Management unit 18R, Study no: 4

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier utahensis	0	-
B	Artemisia tridentata vaseyana	45	7.81
B	Chrysothamnus nauseosus albicaulis	2	.33
B	Chrysothamnus viscidiflorus viscidiflorus	2	.15
B	Cowania mexicana stansburiana	0	.38
B	Gutierrezia sarothrae	13	.03
B	Juniperus osteosperma	4	7.72
B	Opuntia sp.	3	-
B	Purshia tridentata	10	1.16
B	Symphoricarpos oreophilus	0	-
B	Tetradymia canescens	4	.00
Total for Browse		83	17.59

CANOPY COVER, LINE INTERCEPT --

Management unit 18R, Study no: 4

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	10.68
Chrysothamnus viscidiflorus viscidiflorus	.18
Juniperus osteosperma	13.68
Purshia tridentata	5.46

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 18R, Study no: 4

Species	Average leader growth (in)
	'06
Artemisia tridentata vaseyana	1.9
Purshia tridentata	2.2

POINT-QUARTER TREE DATA --  
Management unit 18R, Study no: 4

Species	Trees per Acre
	'06
Juniperus osteosperma	140

Average diameter (in)
'06
7.5

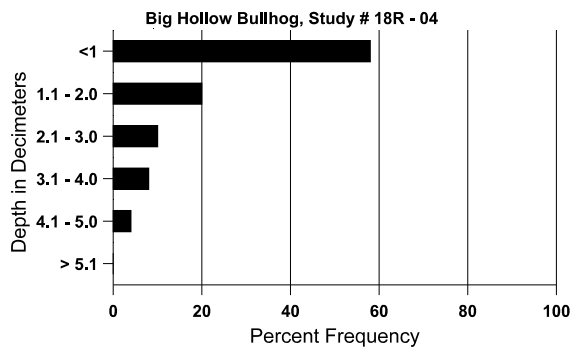
BASIC COVER --  
Management unit 18R, Study no: 4

Cover Type	Average Cover %
	'06
Vegetation	29.17
Rock	6.32
Pavement	14.86
Litter	39.44
Cryptogams	.92
Bare Ground	28.34

SOIL ANALYSIS DATA --  
Herd Unit 18R, Study # 4, Study Name: Big Hollow Bullhog

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
11.73	69.6 (14.57)	7.1	60.7	33.8	5.4	3.3	12.5	268.8	0.7

### Stoniness Index



PELLET GROUP DATA --  
Management unit 18R, Study no: 4

Type	Quadrat Frequency
	'06
Rabbit	60
Deer	12

Days use per acre (ha)
'06
-
7 (17)

## BROWSE CHARACTERISTICS --

Management unit 18R, Study no: 4

		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>Amelanchier utahensis</i>												
06	0	-	-	-	-	-	0	0	-	-	0	23/35
<i>Artemisia tridentata vaseyana</i>												
06	1580	60	-	1200	380	1040	9	1	24	15	15	22/30
<i>Chrysothamnus nauseosus albicaulis</i>												
06	40	-	20	-	20	-	0	0	50	-	0	20/27
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	40	-	-	40	-	-	0	0	-	-	0	16/22
<i>Cowania mexicana stansburiana</i>												
06	0	-	-	-	-	-	0	0	-	-	0	20/27
<i>Gutierrezia sarothrae</i>												
06	440	240	140	280	20	20	0	0	5	-	0	7/8
<i>Juniperus osteosperma</i>												
06	100	80	60	40	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
06	60	-	-	60	-	-	0	0	-	-	0	5/14
<i>Purshia tridentata</i>												
06	320	-	20	220	80	20	6	94	25	-	0	15/37
<i>Symphoricarpos oreophilus</i>												
06	0	-	-	-	-	-	0	0	-	-	0	13/18
<i>Tetradymia canescens</i>												
06	120	60	40	60	20	-	0	50	17	-	0	9/11

Trend Study 19R-5-06

Study site name: Goshute Chaining.

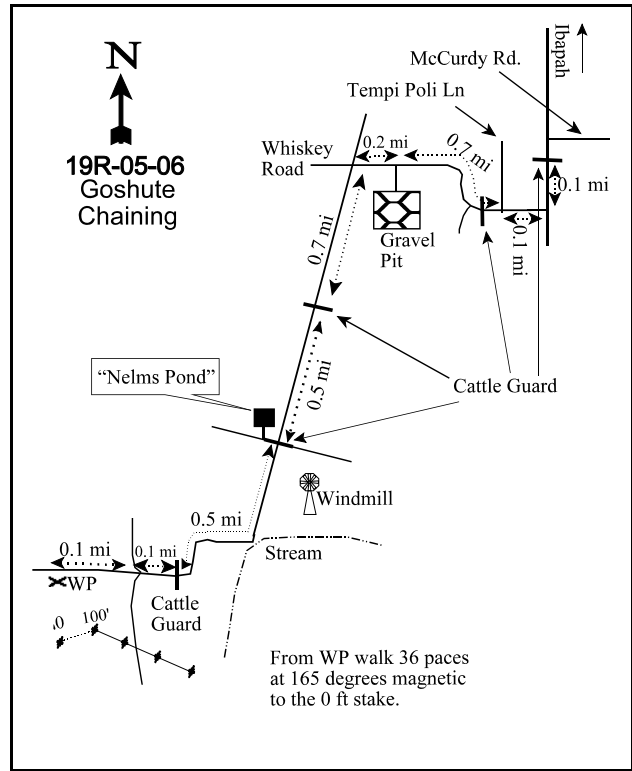
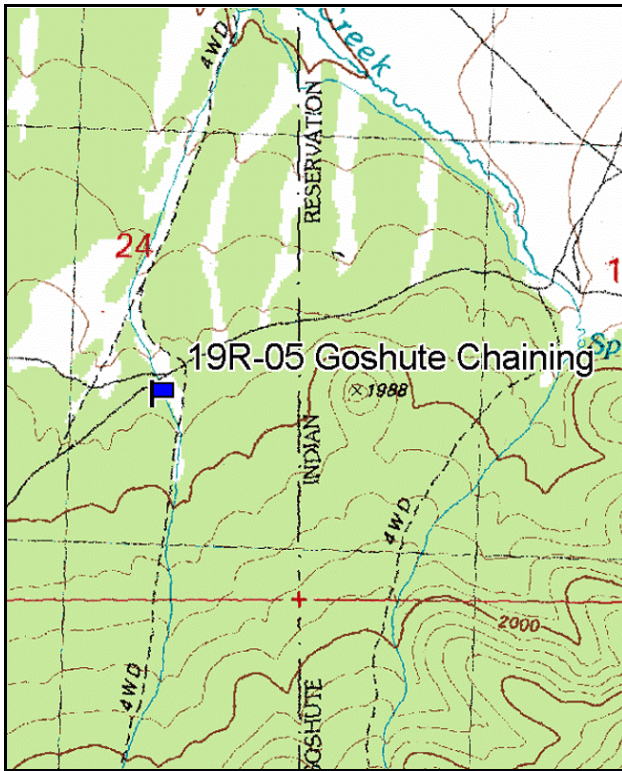
Vegetation type: Pinyon/Juniper.

Compass bearing: frequency baseline 0'-100' 42 degrees magnetic 100'-400' 95 degrees magnetic.

Frequency belt placement: line 1(11 ft & 71), line 2(34 ft), line 3(95 ft), line 4(59 ft).  
No Rebar.

LOCATION DESCRIPTION

Driving south on the main road from Ibapah, drive to the turn off to McCurdy Road and continue south to the first cattle guard. From the cattle guard drive 0.6 miles to Whiskey Road. Turn right (west) onto Whiskey Road and drive 0.1 miles to Tempy Poli Lane. Continue on Whiskey Road for approximately 0.7 miles to a gravel pit. Continue 0.2 miles to a junction. Turn left (south west) at the junction and drive 0.7 miles to a cattle guard. From the cattle guard drive 0.5 miles to a junction, cattle guard & sign that reads “Nelms Pond.” Continue straight on the road for 0.5 miles passing a windmill to another cattle guard. From the cattleguard drive 0.1 miles to a junction and continue straight for 0.1 miles to a witness post on the left. Walk 36 paces from the witness post at 165 degrees magnetic to the 0 foot stake marked with browse tag #142.



Map name: Weaver Canyon

Diagrammatic Sketch

Township 11S, Range 20W, Section 24.

UTM (NAD 83) 12T 4415520N 753124E



## DISCUSSION

### Goshute Chaining - Study No. 19R-5

#### Study Information

This study is located on the Goshute Indian Reservation approximately 3 miles southwest of Goshute, near the Nevada border (elevation: 6,350 feet, slope: 6%, aspect: northwest). It was established to monitor the effects of a chaining on a pinyon-juniper invaded sagebrush community. The pretreatment data collection was conducted in June 2006, days before the treatment. The 2006 pellet group data estimates were 3 elk, 3 deer, and 2 cow days use/acre (8 edu/ha, 7 ddu/ha, and 5 cdu/ha). All deer and elk pellets were from winter and early spring.

#### Soil

The soil is a Borvant gravelly loam. The Borvant series is found on fan remnants, hills, and ridges and is formed in alluvium and colluvium from limestone and sandstone. It is shallow and well drained (USDA-NRCS 2006). The effective rooting depth is 13 inches with a rocky and gravelly profile. The soil texture is a sandy clay loam with a mildly alkaline pH (7.5). Relative bare ground cover was 31% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.6. The combined relative cover of vegetation and litter was 44% in 2006. The 2006 soil erosion condition rating was stable due to the high pavement cover.

#### Browse

The preferred browse species are black sagebrush and Wyoming big sagebrush. Black sagebrush provided 5% cover in 2006 and Wyoming big sagebrush provided less than 1% cover. Black sagebrush density was 4,180 plants/acre in 2006, 31% of which were decadent and 22% were classified as dying. Young plants made up 4% of the population and only 120 seedlings/acre were sampled. Use was light and average leader growth was 1.1 inch. Wyoming big sagebrush was scattered and only 180 plants/acre were sampled. Decadent plants made up 22% of the population and plants classified as dying made up 11%. Vigor was poor, 67% of the population was classified as having poor vigor, much of which was due to an infestation of the sagebrush defoliator moth (*Aroga websterii*). Narrowleaf low rabbitbrush, prickly phlox, and Simpson's footcactus were also sampled in 2006.

The dominant species in 2006 were Utah juniper and singleleaf pinyon pine. Juniper provided 14% canopy cover and pinyon provided 8% cover in 2006. Tausch and West (1994) showed that as pinyon-juniper cover increases, the herbaceous and browse understories decrease. Generally, pinyon-juniper cover of over 15% greatly diminishes the understory cover. Juniper density, from the point quarter method, was 160 trees/acre in 2006, with an average trunk diameter of 2.6 inches. Pinyon density was 391 trees/acre with an average trunk diameter of 4.8 inches.

#### Herbaceous Understory

The understory was made up of 4 grass species and 19 forb species in 2006. The dominant species in 2006 were Sandberg bluegrass and American vetch. Sandberg bluegrass provided 4% cover in 2006, which was 90% of grass cover and 55% of the understory cover. American vetch provided 2% cover in 2006, which was 59% of the forb cover and 23% of understory cover. Cheatgrass was also sampled in 3% of the quadrats, but provided very little cover.

The 2006 Desirable Components Index score was fair due to moderate browse cover, moderate perennial grass cover, and moderate perennial forb cover.

2006 winter range condition (DC Index) – poor-fair (32) Low potential scale

HERBACEOUS TRENDS --  
Management unit 19R, Study no: 5

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron smithii	12	.07
G	Agropyron spicatum	25	.37
G	Bromus tectorum (a)	6	.02
G	Poa secunda	259	4.40
Total for Annual Grasses		6	0.01
Total for Perennial Grasses		296	4.85
Total for Grasses		302	4.87
F	Arabis sp.	4	.01
F	Arenaria sp.	47	.22
F	Astragalus calycosus	3	.02
F	Astragalus convallarius	3	.00
F	Astragalus sp.	4	.04
F	Compositae	2	.03
F	Collinsia parviflora (a)	4	.01
F	Crepis acuminata	-	.00
F	Cryptantha sp.	35	.31
F	Erigeron sp.	2	.03
F	Eriogonum ovalifolium	3	.00
F	Eriogonum umbellatum	5	.03
F	Lesquerella sp.	1	.00
F	Lygodesmia spinosa	1	.00
F	Phlox austromontana	48	.34
F	Phlox longifolia	27	.11
F	Ranunculus testiculatus (a)	33	.05
F	Townsendia sp.	2	.00
F	Vicia americana	54	1.83
Total for Annual Forbs		37	0.06
Total for Perennial Forbs		241	3.02
Total for Forbs		278	3.09

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

BROWSE TRENDS --

Management unit 19R, Study no: 5

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia nova	49	5.36
B	Artemisia tridentata wyomingensis	2	.45
B	Chrysothamnus viscidiflorus stenophyllus	7	.21
B	Juniperus osteosperma	21	6.93
B	Leptodactylon pungens	16	.29
B	Pediocactus simpsonii	0	-
B	Pinus monophylla	6	2.34
Total for Browse		101	15.60

CANOPY COVER, LINE INTERCEPT --

Management unit 19R, Study no: 5

Species	Percent Cover
	'06
Artemisia nova	6.26
Artemisia tridentata wyomingensis	.81
Chrysothamnus viscidiflorus stenophyllus	.21
Juniperus osteosperma	17.06
Leptodactylon pungens	.30
Pinus monophylla	7.91

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 19R, Study no: 5

Species	Average leader growth (in)
	'06
Artemisia nova	1.1

POINT-QUARTER TREE DATA --

Management unit 19R, Study no: 5

Species	Trees per Acre	Average diameter (in)
	'06	'06
Juniperus osteosperma	391	4.8
Pinus monophylla	160	2.6

**BASIC COVER --**

Management unit 19R, Study no: 5

Cover Type	Average Cover % '06
Vegetation	20.04
Rock	.58
Pavement	19.96
Litter	31.47
Cryptogams	7.84
Bare Ground	35.81

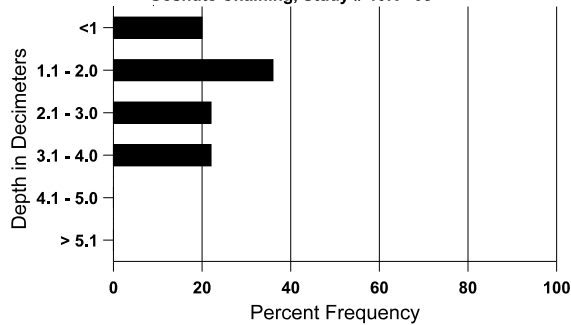
**SOIL ANALYSIS DATA --**

Herd Unit 19R, Study # 5, Study Name: Goshute Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
12.68	68.8 (13.62)	7.5	64.7	25.8	9.4	4.1	13.8	265.6	0.8

**Stoniness Index**

Goshute Chaining, Study # 19R - 05



**PELLET GROUP DATA --**

Management unit 19R, Study no: 5

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	28	-
Elk	4	3 (8)
Deer	3	3 (7)
Cattle	1	2 (5)

BROWSE CHARACTERISTICS --  
 Management unit 19R, 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)
<i>Artemisia nova</i>												
06	<b>4180</b>	120	160	2720	1300	2300	0	0	31	22	22	9/15
<i>Artemisia tridentata wyomingensis</i>												
06	<b>180</b>	-	-	140	40	20	0	0	22	11	67	31/66
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
06	<b>200</b>	-	40	160	-	-	0	0	-	-	0	11/15
<i>Juniperus osteosperma</i>												
06	<b>520</b>	400	340	180	-	20	0	0	-	-	8	-/-
<i>Leptodactylon pungens</i>												
06	<b>580</b>	-	-	540	40	-	0	0	7	3	3	7/8
<i>Pediocactus simpsonii</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	1/1
<i>Pinus monophylla</i>												
06	<b>180</b>	180	120	40	20	60	0	0	11	11	11	-/-

Trend Study 19R-6-06

Study site name: Sage Valley Dixie.

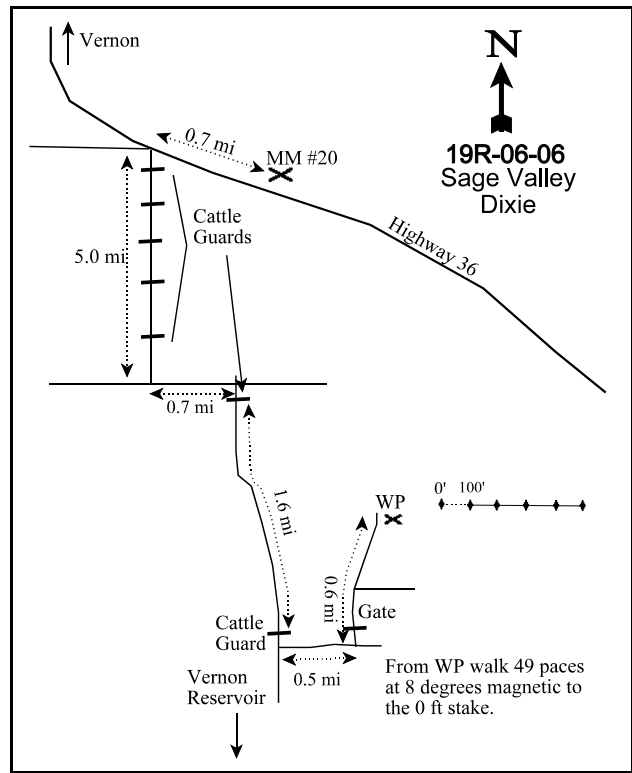
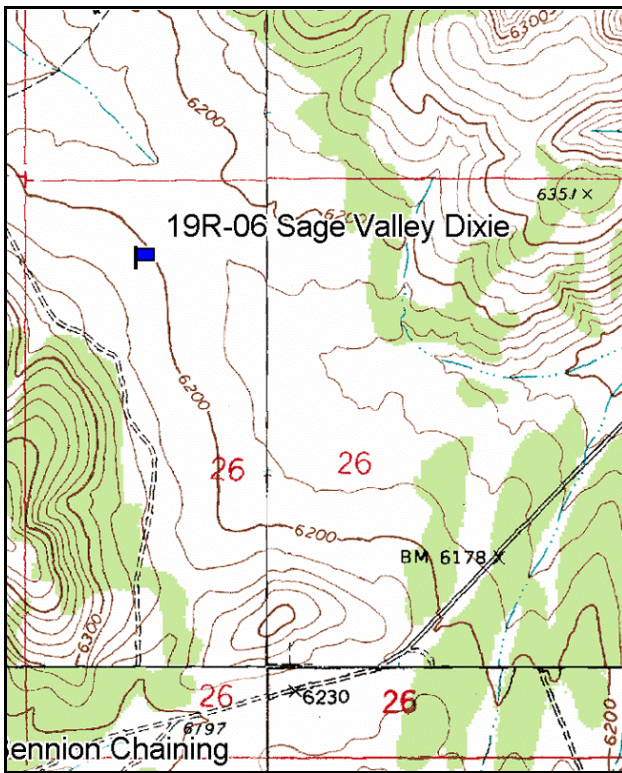
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 59 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5(95 ft).  
No Rebar.

LOCATION DESCRIPTION

From highway 36 south of Vernon, drive to mile marker #20. From there, drive 0.7 miles to a turn off on the left (west). Turn there and drive south for 5.0 miles passing several (4 or 5) cattle guards to a fork. Turn left and drive 0.7 miles to an intersection. Turn right (south) crossing a cattle guard and drive 1.6 miles to another cattle guard. Directly after the cattle guard turn left (east) and drive 0.5 miles to a road and gate on the left. Turn and go through the gate and drive 0.6 miles to a witness post on the right. Walk 49 paces at 8 degrees magnetic to the 0 foot stake marked with browse tag #154.



Map name: Vernon

Diagrammatic Sketch

Township 9S, Range 5W, Section 26.

UTM (NAD 83) 12T 4429773N 382215E

## DISCUSSION

### Sage Valley Dixie - Study No. 19R-6

#### Study Information

This study is located in an open Wyoming big sagebrush valley approximately 6 miles southeast of Vernon on US Forest Service-managed land (elevation: 6,200 feet, slope: 1%, aspect: southeast). It was established to monitor the effects of a seeding and dixie harrow treatment. The treatment was implemented in a mosaic pattern in November 2006. The pretreatment data collection was conducted in June 2006. The 2006 pellet group data estimates were 5 cow days use/acre (13 cdu/ha).

#### Soil

The soil is a Erda silt loam. The Erda series is made up of very deep, well drained, moderately slowly permeable soils formed in alluvium and lacustrine sediments derived from mixed rock. It is found on lake terraces, alluvial fans, and fan terraces (USDA-NRCS 2006). The effective rooting depth is 13 inches with a moderately rocky profile. The soil texture is a silt loam with a neutral pH (7.3). Relative bare ground cover was 44% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.3. The combined relative cover of vegetation and litter was 55% in 2006. The 2006 soil erosion condition rating was stable due to the moderate litter and vegetation cover.

#### Browse

Wyoming big sagebrush is the key browse species. It provided 14% cover in 2006. Sagebrush density was 3,440 plants/acre. Young plants made up 8% of the population and decadent individuals made up 23%. Plants classified as dying made up 13% of the population. A good density of seedlings, 760/acre, were also sampled. Average sagebrush leader growth was 1.6 inches in 2006. The sagebrush defoliator moth (*Aroga websterii*) were measured on 4% of the sagebrush in 2006. Stickleaf low rabbitbrush and gray horsebrush were also sampled in 2006. Although not sampled, a few young juniper trees are scattered on the study.

#### Herbaceous Understory

Species diversity was low in 2006. Eight grass species and 13 forb species were sampled in 2006. Crested wheatgrass, western wheatgrass, smooth brome, and Sandberg bluegrass were dominant grass species. These made up 96% of the 12% grass cover. Cheatgrass was sampled in 2006, but provided less than 1% cover and was sampled in 28% of the quadrats. Desert phlox was the dominant forb species at 1% cover.

The 2006 Desirable Components Index score was good-excellent due to good browse and perennial grass cover.

2006 winter range condition (DC Index) – good-excellent (62) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 19R, Study no: 6

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	101	3.90
G	Agropyron intermedium	4	.15
G	Agropyron smithii	170	3.31
G	Bromus inermis	110	3.13
G	Bromus tectorum (a)	79	.49
G	Oryzopsis hymenoides	4	.01

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Poa secunda</i>	41	1.47
G	<i>Sitanion hystrix</i>	9	.26
Total for Annual Grasses		79	0.49
Total for Perennial Grasses		439	12.27
Total for Grasses		518	12.76
F	<i>Agoseris glauca</i>	2	.01
F	<i>Alyssum alyssoides</i> (a)	225	.72
F	<i>Astragalus cibaricus</i>	14	.20
F	<i>Astragalus convallarius</i>	4	.22
F	<i>Chaenactis douglasii</i>	3	.00
F	<i>Collinsia parviflora</i> (a)	5	.01
F	<i>Crepis acuminata</i>	5	.06
F	<i>Microsteris gracilis</i> (a)	69	.16
F	<i>Phlox austromontana</i>	38	1.21
F	<i>Phlox longifolia</i>	26	.07
F	<i>Ranunculus testiculatus</i> (a)	112	.46
F	<i>Trifolium</i> sp.	3	.03
F	<i>Vicia americana</i>	44	.32
Total for Annual Forbs		411	1.36
Total for Perennial Forbs		139	2.13
Total for Forbs		550	3.50

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

#### BROWSE TRENDS --

Management unit 19R, Study no: 6

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	74	14.44
B	<i>Chrysothamnus viscidiflorus</i> <i>viscidiflorus</i>	67	5.02
B	<i>Pinus edulis</i>	0	.03
B	<i>Tetradymia canescens</i>	0	-
Total for Browse		141	19.51



CANOPY COVER, LINE INTERCEPT --  
Management unit 19R, Study no: 6

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	21.21
Chrysothamnus viscidiflorus viscidiflorus	5.75

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 19R, Study no: 6

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	1.6

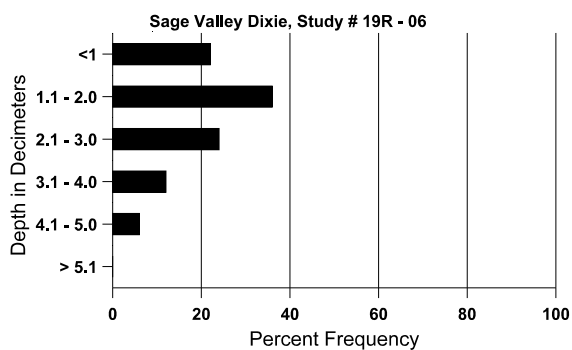
BASIC COVER --  
Management unit 19R, Study no: 6

Cover Type	Average Cover %
	'06
Vegetation	29.22
Rock	.11
Pavement	.97
Litter	34.16
Cryptogams	.11
Bare Ground	50.30

SOIL ANALYSIS DATA --  
Herd Unit 19R, Study # 6, Study Name: Sage Valley Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
12.8	67.4 (13.39)	7.3	32.2	56.0	11.8	2.5	20.3	336.0	0.8

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 19R, Study no: 6

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	76	-
Cattle	2	5 (13)

BROWSE CHARACTERISTICS --  
 Management unit 19R, Study no: 6

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
06	<b>3440</b>	760	280	2380	780	500	13	0	23	13	17	25/32
Chrysothamnus viscidiflorus viscidiflorus												
06	<b>4660</b>	-	380	4180	100	-	1	0	2	.42	.85	11/16
Tetradymia canescens												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	12/13

Trend Study 19R-7-06

Study site name: Bennion Aerator.

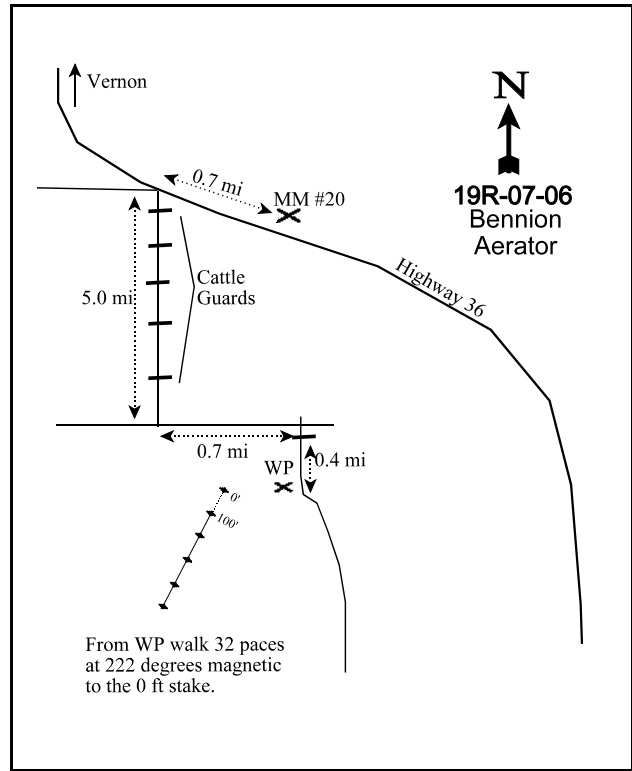
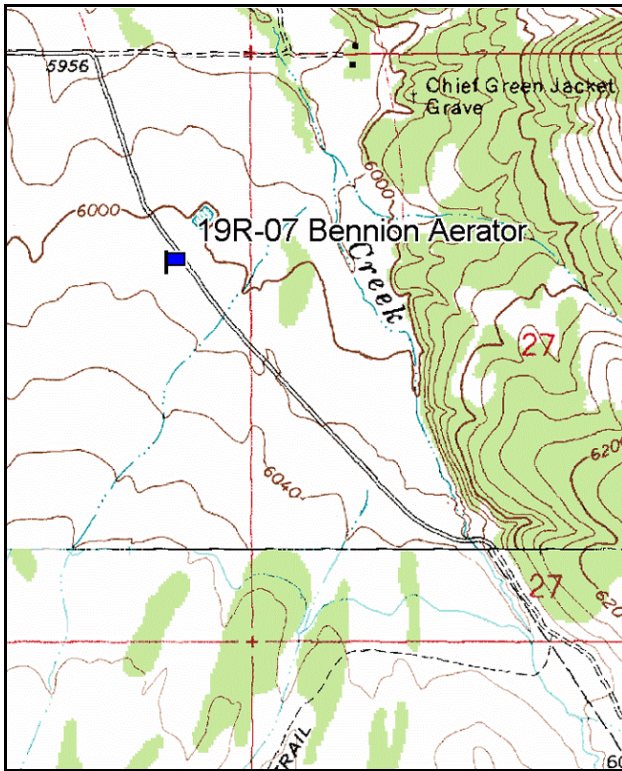
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 184 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5(95 ft).  
No Rebar.

LOCATION DESCRIPTION

From highway 36 south of Vernon, drive to mile marker #20. From there, drive 0.7 miles to a turn off on the left (west). Turn there and drive south for 5.0 miles passing several (4 or 5) cattle guards to a fork. Turn left and drive 0.7 miles to an intersection. Turn right (south) crossing a cattle guard and drive 0.4 miles to a witness post on the right. Walk 32 paces at 222 degrees magnetic to the 0 foot stake (no browse tag).



Map name: Vernon

Diagrammatic Sketch

Township 9S, Range 5W, Section 28.

UTM (NAD 83) 12T 4429455N 380054E

## DISCUSSION

### Bennion Aerator - Study No. 19R-7

#### Study Information

This study is located approximately 5.5 miles south of Vernon on the privately-owned Bennion Ranch (elevation: 6,000 feet, slope: 1%, aspect: east). It was established to monitor a Lawson aerator treatment in a Wyoming big sagebrush community that is being encroached by Utah juniper. The pretreatment data collection was conducted in June 2006. The 2006 pellet group data estimates were 2 elk, 3 deer, and 5 cow days use/acre (5 edu/ha, 7 ddu/ha, and 13 cdu/ha).

#### Soil

The soil is an Abela very gravelly loam. The Abela series is made up of very deep, well drained soils formed in alluvium and lacustrine sediments derived from limestone, sandstone, and quartzite. It is found on lake terraces and fan remnants (USDA-NRCS 2006). The effective rooting depth is 13 inches with only about 1% rock in the profile. The soil texture is a silt loam with a mildly alkaline pH (7.5). Relative bare ground cover was 41% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.4. The combined relative cover of vegetation and litter was 57% in 2006. The 2006 soil erosion condition rating was slight due to 7 to 10 pedestals per 100 square feet, rills 1 to 1.5 inches deep, gullies with 2% to 5% of the walls actively eroding, and slight soil movement.

#### Browse

The key browse species is Wyoming big sagebrush. It provided 11% cover in 2006, with a density of 2,140 plants/acre. The decadent plants made up 52% of the population and those classified as dying made up 48%. Young plants made up only 1% of the population and an estimated 320 seedlings/acre were sampled. The average sagebrush leader growth was 1.2 inches in 2006. The sagebrush defoliator moth (*Aroga websterii*) was sampled on 6% of the population in 2006. Whitestem rubber rabbitbrush, narrowleaf low rabbitbrush, and stickleaf low rabbitbrush were also sampled in 2006.

Utah juniper was encroaching the sagebrush in 2006. Juniper density estimates from the point quarter method were 63 trees/acre in 2006 with an average trunk diameter of 2.5 inches. The majority (85%) of juniper trees were less than 8 feet tall in 2006.

#### Herbaceous Understory

The herbaceous understory is made up of 8 grass and 13 forb species. Perennial grass cover was 16% in 2006. It was dominated by western wheatgrass (5% cover) and Sandberg bluegrass (7% cover). Other abundant grasses were bluebunch wheatgrass and Indian ricegrass. Cheatgrass was also abundant at 1% cover and sampled in 23% of the quadrats. Perennial forbs provided 3%, nearly all of which was provided by desert phlox. Annual forbs provided 4% cover, most of which was bur buttercup.

The 2006 Desirable Components Index score was good due to moderate browse cover, excellent perennial grass cover, and moderate perennial forb cover.

2006 winter range condition (DC Index) – good (52) Low potential scale

HERBACEOUS TRENDS --  
 Management unit 19R, Study no: 7

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron intermedium	6	.03
G	Agropyron smithii	229	4.59
G	Agropyron spicatum	44	1.73
G	Bromus tectorum (a)	65	1.14
G	Oryzopsis hymenoides	24	1.48
G	Poa bulbosa	45	.80
G	Poa secunda	212	6.71
G	Sitanion hystrix	18	.56
Total for Annual Grasses		65	1.14
Total for Perennial Grasses		578	15.93
Total for Grasses		643	17.08
F	Alyssum alyssoides (a)	112	.26
F	Allium sp.	7	.02
F	Astragalus convallarius	19	.16
F	Comandra pallida	19	.19
F	Crepis acuminata	8	.02
F	Cymopterus sp.	3	.00
F	Ipomopsis congesta	4	.01
F	Machaeranthera canescens	1	.00
F	Phlox austromontana	80	2.50
F	Phlox longifolia	7	.02
F	Ranunculus testiculatus (a)	262	3.89
F	Vicia americana	23	.16
F	Zigadenus paniculatus	2	.06
Total for Annual Forbs		374	4.15
Total for Perennial Forbs		173	3.17
Total for Forbs		547	7.32

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

BROWSE TRENDS --

Management unit 19R, Study no: 7

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata wyomingensis	58	10.82
B	Chrysothamnus nauseosus albicaulis	1	-
B	Chrysothamnus viscidiflorus stenophyllus	2	.15
B	Chrysothamnus viscidiflorus viscidiflorus	49	2.20
B	Juniperus osteosperma	1	.15
Total for Browse		111	13.33

CANOPY COVER, LINE INTERCEPT --

Management unit 19R, Study no: 7

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	15.36
Chrysothamnus nauseosus albicaulis	.18
Chrysothamnus viscidiflorus stenophyllus	.06
Chrysothamnus viscidiflorus viscidiflorus	1.75

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 19R, Study no: 7

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	1.2

POINT-QUARTER TREE DATA --

Management unit 19R, Study no: 7

Species	Trees per Acre	Average diameter (in)
	'06	'06
Juniperus osteosperma	63	2.5

**BASIC COVER --**

Management unit 19R, Study no: 7

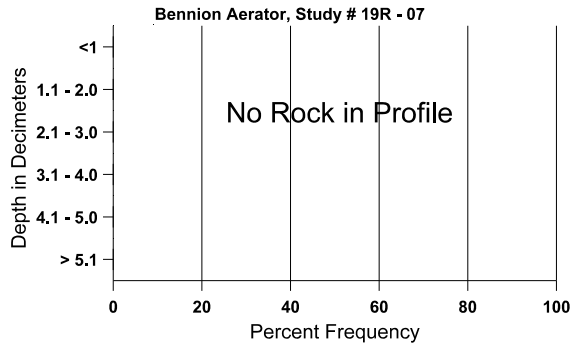
Cover Type	Average Cover % '06
Vegetation	33.43
Rock	.10
Pavement	.42
Litter	30.59
Cryptogams	2.03
Bare Ground	46.04

**SOIL ANALYSIS DATA --**

Herd Unit 19R, Study # 7, Study Name: Bennion Aerator

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
12.91	68.4 (13.78)	7.5	28.2	56.0	15.8	1.7	10.3	316.8	0.6

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 19R, Study no: 7

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	59	-
Elk	1	2 (5)
Deer	5	3 (7)
Cattle	1	5 (13)

BROWSE CHARACTERISTICS --  
 Management unit 19R, Study no: 7

		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>Artemisia tridentata wyomingensis</i>												
06	<b>2140</b>	320	20	1000	1120	1260	7	0	52	48	51	25/32
<i>Chrysothamnus nauseosus albicaulis</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	19/19
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
06	<b>40</b>	-	-	40	-	-	0	0	-	-	0	13/32
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>3100</b>	20	460	2640	-	-	0	3	-	-	0	9/12
<i>Juniperus osteosperma</i>												
06	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-



Trend Study 19R-8-06

Study site name: Bennion Spike I.

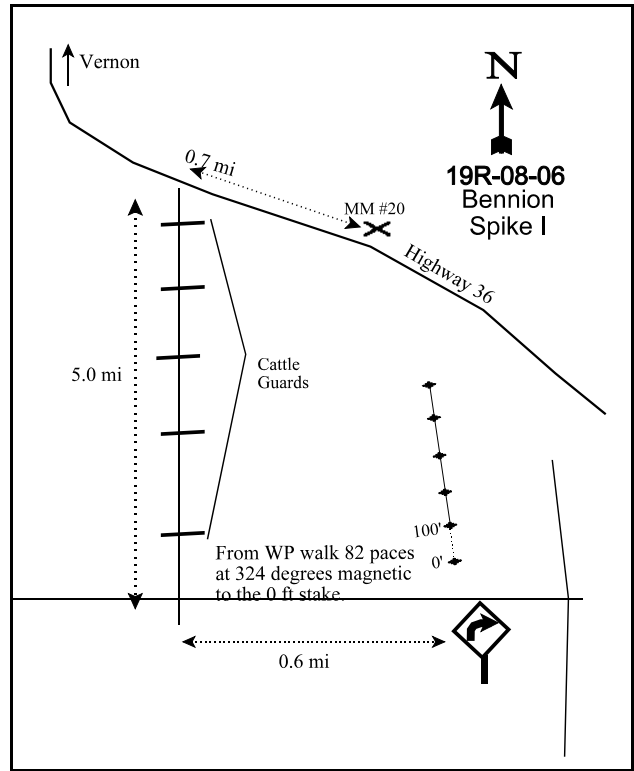
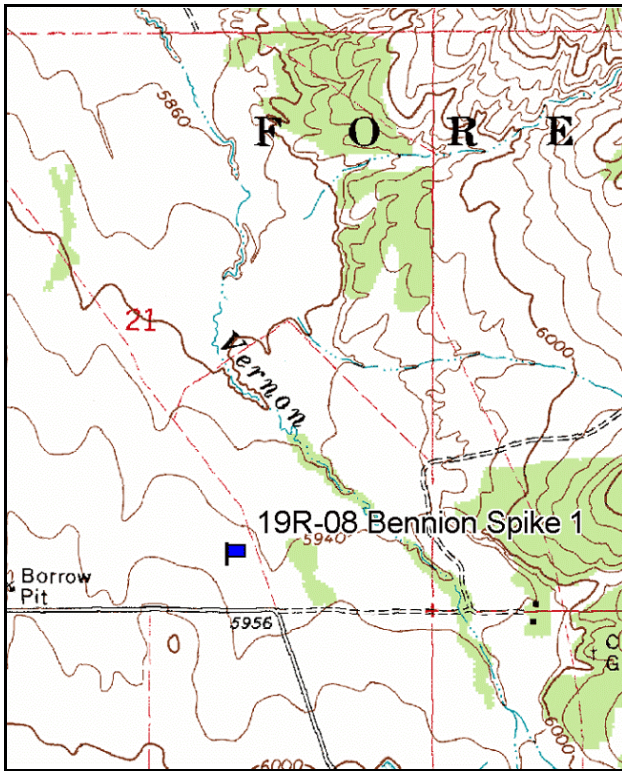
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 337 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5(95 ft).  
No Rebar.

LOCATION DESCRIPTION

From highway 36 south of Vernon, drive to mile marker #20. From there, drive 0.7 miles to a turn off on the left (west). Turn there and drive south for 5.0 miles passing several (4 or 5) cattle guards to a fork. Turn left and drive 0.6 miles to a road sign showing a bend in the road. Walk 82 paces at 324 degrees magnetic to the 0 foot stake marked with browse tag #176.



Map name: Vernon

Diagrammatic Sketch

Township 9S, Range 5W, Section 21.

UTM (NAD 83) 12T 4430198N 379721E

## DISCUSSION

### Bennion Spike 1 - Study No. 19R-8

#### Study Information

This study is located approximately 5 miles south of Vernon on the privately-owned Bennion Ranch (elevation: 6,000 feet, slope: 2%, aspect: northeast). It was established on a spike herbicide treatment on a Wyoming sagebrush community in the fall of 2006. The pretreatment data collection was conducted in August 2006. The 2006 pellet group data estimates were 4 deer and 19 cow days use/acre (10 ddu/ha and 47 cdu/ha).

#### Soil

The soil is an Erda silt loam. The Erda series is made up of very deep, well drained, moderately slowly permeable soils formed in alluvium and lacustrine sediments derived from mixed rock. It is found on lake terraces, alluvial fans, and fan terraces (USDA-NRCS 2006). The effective rooting depth is 13 inches with little rock in the profile. The soil texture is a clay loam with a mildly alkaline pH (7.5). Relative bare ground cover was 43% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.4. The combined relative cover of vegetation and litter was 54% in 2006. The 2006 soil erosion condition rating was slight due to slight surface litter movement, 5 to 7 pedestals per 100 square feet, flow patterns covering between 2% to 10% of the surface areas, and light soil movement.

#### Browse

The key browse species is Wyoming big sagebrush. It provided nearly 9% cover in 2006 with a density of 3,280 plants/acre. Decadent plants made up 49% of the population in 2006 and no young individuals were sampled. Plants classified as dying made up 36% of the population. Plants with poor vigor made up 40% of the population. Use was light. Average sagebrush annual leader growth was 1.7 inches in 2006. Other browse species sampled in 2006 include narrowleaf low rabbitbrush and stickleaf low rabbitbrush. Utah juniper was also sparse.

#### Herbaceous Understory

The herbaceous understory is sparse. Seven grass and forb species were sampled in 2006. Sandberg bluegrass provided nearly 11% cover and western wheatgrass provided nearly 3% cover. Cheatgrass was also sampled, but provided less than 1% cover and was sampled in 3% of the quadrats. The dominant forbs in 2006 were desert phlox and bur buttercup. Bur buttercup provided 3% cover with a quadrat frequency of 78% and desert phlox provided nearly 2% cover with a quadrat frequency of 34%.

The 2006 Desirable Components Index score was fair-good due to moderate browse cover, excellent perennial grass cover, and low perennial forb cover.

2006 winter range condition (DC Index) – fair-good (46) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 19R, Study no: 8

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	14	.27
G	Agropyron smithii	176	2.67
G	Agropyron spicatum	19	.68
G	Bromus tectorum (a)	7	.07
G	Oryzopsis hymenoides	15	.51

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Poa secunda</i>	276	10.66
G	<i>Sitanion hystrix</i>	30	.66
Total for Annual Grasses		7	0.07
Total for Perennial Grasses		530	15.46
Total for Grasses		537	15.53
F	<i>Alyssum alyssoides</i> (a)	24	.05
F	<i>Astragalus convallarius</i>	5	.06
F	<i>Crepis acuminata</i>	3	.03
F	<i>Cymopterus</i> sp.	7	.04
F	<i>Phlox austromontana</i>	79	1.54
F	<i>Phlox longifolia</i>	2	.01
F	<i>Ranunculus testiculatus</i> (a)	276	2.94
Total for Annual Forbs		300	2.99
Total for Perennial Forbs		96	1.70
Total for Forbs		396	4.69

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

#### BROWSE TRENDS --

Management unit 19R, Study no: 8

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	81	8.63
B	<i>Chrysothamnus viscidiflorus</i> <i>stenophyllus</i>	11	.15
B	<i>Chrysothamnus viscidiflorus</i> <i>viscidiflorus</i>	0	.00
B	<i>Juniperus osteosperma</i>	2	-
Total for Browse		94	8.79

CANOPY COVER, LINE INTERCEPT --

Management unit 19R, Study no: 8

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	15.19
Chrysothamnus viscidiflorus stenophyllus	.80
Juniperus osteosperma	.05

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 19R, Study no: 8

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	1.7

BASIC COVER --

Management unit 19R, Study no: 8

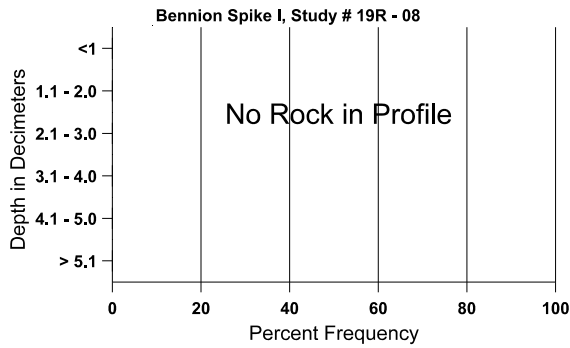
Cover Type	Average Cover %
	'06
Vegetation	28.52
Rock	.19
Pavement	.46
Litter	35.15
Cryptogams	2.77
Bare Ground	50.37

SOIL ANALYSIS DATA --

Herd Unit 19R, Study # 8, Study Name: Bennion Spike I

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	ppm P	ppm K	dS/m
12.56	73.6 (7.2)	7.5	25.2	45.0	29.8	1.9	8.7	467.2	0.6

# Stoniness Index



## PELLET GROUP DATA --

Management unit 19R, Study no: 8

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	52	-
Horse	1	-
Deer	2	4 (10)
Cattle	9	19 (47)

## BROWSE CHARACTERISTICS --

Management unit 19R, Study no: 8

		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>Artemisia tridentata wyomingensis</i>												
06	<b>3280</b>	180	-	1680	1600	1900	6	3	49	36	40	28/31
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
06	<b>240</b>	60	-	240	-	-	17	0	-	-	0	12/14
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	14/19
<i>Juniperus osteosperma</i>												
06	<b>40</b>	20	20	20	-	-	0	0	-	-	50	-/-

Trend Study 19R-9-06

Study site name: Bennion Spike II.

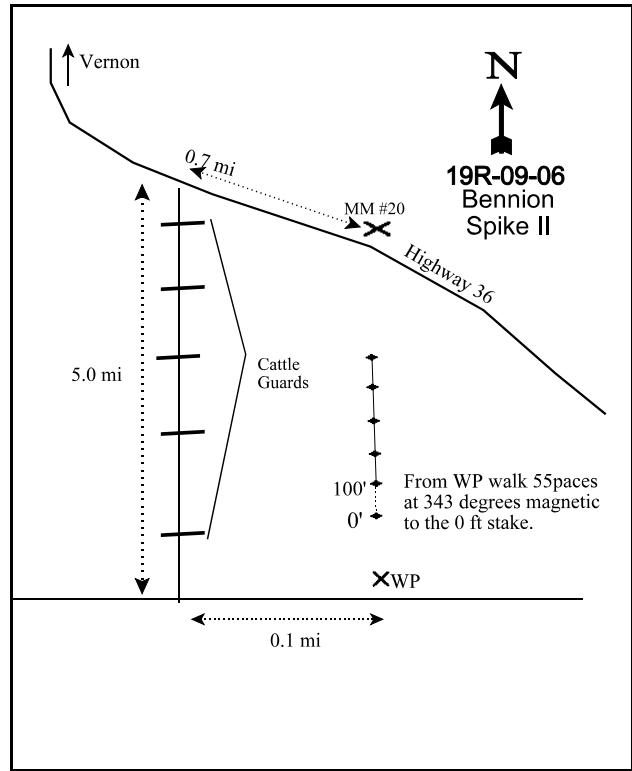
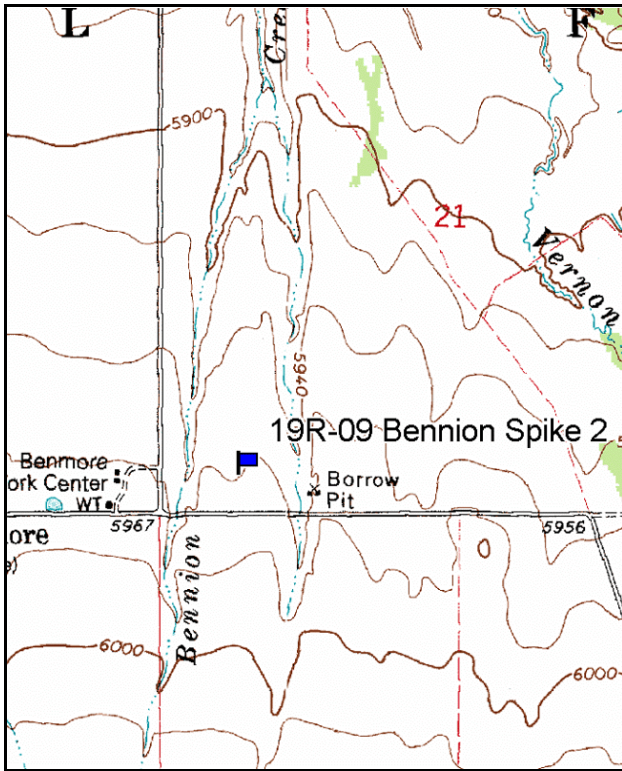
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 346 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5(95 ft).  
No Rebar.

LOCATION DESCRIPTION

From highway 36 south of Vernon, drive to mile marker #20. From there, drive 0.7 miles to a turn off on the left (west). Turn there and drive south for 5.0 miles passing several (4 or 5) cattle guards to a fork. Turn left and drive 0.1 miles to a witness post on the left. Walk 55 paces at 343 degrees magnetic to the 0 foot stake marked with browse tag #174.



Map name: Vernon

Diagrammatic Sketch

Township 9S, Range 5W, Section 21.

UTM (NAD 83) 12T 4430193N 378898E

## DISCUSSION

### Bennion Spike 2 - Study No. 19R-9

#### Study Information

This study is located approximately 5 miles south of Vernon on the privately-owned Bennion Ranch (elevation: 6,000 feet, slope: 2%, aspect: north). It was established on a spike herbicide treatment on a Wyoming sagebrush community in the fall of 2006. The pretreatment data collection was conducted in August 2006. The 2006 pellet group data estimates were 1 deer and 12 cow days use/acre (2 ddu/ha and 30 cdu/ha).

#### Soil

The soil is a Kapod loam. The Kapod series is made up of soils formed in alluvium derived from sandstone and limestone on fan remnants. It consists of very deep, well drained, and moderately permeable soils (USDA-NRCS 2006). The effective rooting depth is 9 inches with little rock in the profile. The soil texture is a clay loam with a mildly alkaline pH (7.6). Relative bare ground cover was 49% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.2. The combined relative cover of vegetation and litter was 46% in 2006. The 2006 soil erosion condition rating was slight due to due sparsely scattered pedestals and light soil movement.

#### Browse

The key browse species is Wyoming big sagebrush. It provided 11% cover in 2006 with a density of 2,800 plants/acre. Decadent plants made up 41% of the population in 2006 and young individuals made up 8% of the population. Plants classified as dying made up 18% of the population. Plants with poor vigor made up 26% of the population. Use was light. Average sagebrush annual leader growth was 1.4 inches in 2006. Utah serviceberry and gray horsebrush were both sampled at 40 plants/acre in 2006.

#### Herbaceous Understory

The herbaceous understory is sparse. Five grass and six forb species were sampled in 2006. Crested wheatgrass provided 3% cover and Sandberg bluegrass provided nearly 1% cover. Cheatgrass was also sampled, but provided less than 1% cover and was sampled in 8% of the quadrats. The dominant forbs in 2006 were desert phlox and bur buttercup. Both provided less than 1% cover.

The 2006 Desirable Components Index score was fair due to moderate browse cover, low perennial grass cover, and low perennial forb cover.

2006 winter range condition (DC Index) – fair (35) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 19R, Study no: 9

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	132	3.42
G	Agropyron smithii	82	.29
G	Bromus tectorum (a)	19	.09
G	Oryzopsis hymenoides	6	.05
G	Poa secunda	102	.91
G	Sitanion hystrix	13	.25
Total for Annual Grasses		19	0.08

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
	Total for Perennial Grasses	335	4.93
	Total for Grasses	354	5.02
F	Alyssum alyssoides (a)	128	.26
F	Arenaria sp.	4	.00
F	Crepis acuminata	3	.00
F	Phlox austromontana	21	.69
F	Ranunculus testiculatus (a)	212	.72
F	Zigadenus paniculatus	1	.00
	Total for Annual Forbs	340	0.98
	Total for Perennial Forbs	29	0.71
	Total for Forbs	369	1.69

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

#### BROWSE TRENDS --

Management unit 19R, Study no: 9

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier utahensis	1	-
B	Artemisia tridentata wyomingensis	74	11.19
B	Tetradymia canescens	1	.03
	Total for Browse	76	11.22

#### CANOPY COVER, LINE INTERCEPT --

Management unit 19R, Study no: 9

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	18.64

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 19R, Study no: 9

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	1.4



BASIC COVER --

Management unit 19R, Study no: 9

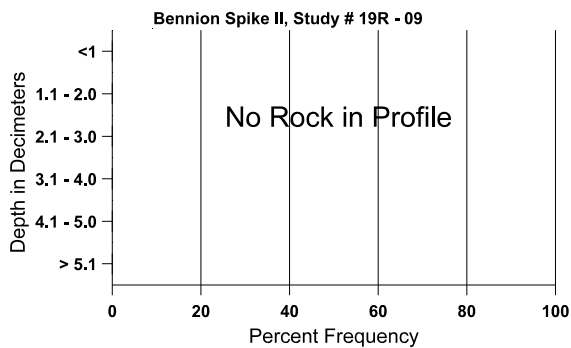
Cover Type	Average Cover % '06
Vegetation	15.19
Rock	.63
Pavement	2.42
Litter	36.13
Cryptogams	2.89
Bare Ground	54.09

SOIL ANALYSIS DATA --

Herd Unit 19R, Study # 9, Study Name: Bennion Spike II

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
8.82	74.6 (8.19)	7.6	33.2	36.0	30.8	1.6	21.2	336.0	0.6

### Stoniness Index



PELLET GROUP DATA --

Management unit 19R, Study no: 9

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	86	-
Deer	-	1 (2)
Cattle	1	12 (30)

BROWSE CHARACTERISTICS --  
 Management unit 19R, Study no: 9

		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>Amelanchier utahensis</i>												
06	<b>40</b>	-	-	-	40	-	0	0	100	100	100	-/-
<i>Artemisia tridentata wyomingensis</i>												
06	<b>2800</b>	180	220	1420	1160	1000	5	0	41	18	26	29/39
<i>Tetradymia canescens</i>												
06	<b>40</b>	-	-	-	40	-	0	100	100	100	100	15/26

Trend Study 20R-3-06

Study site name: Bowler Chaining.

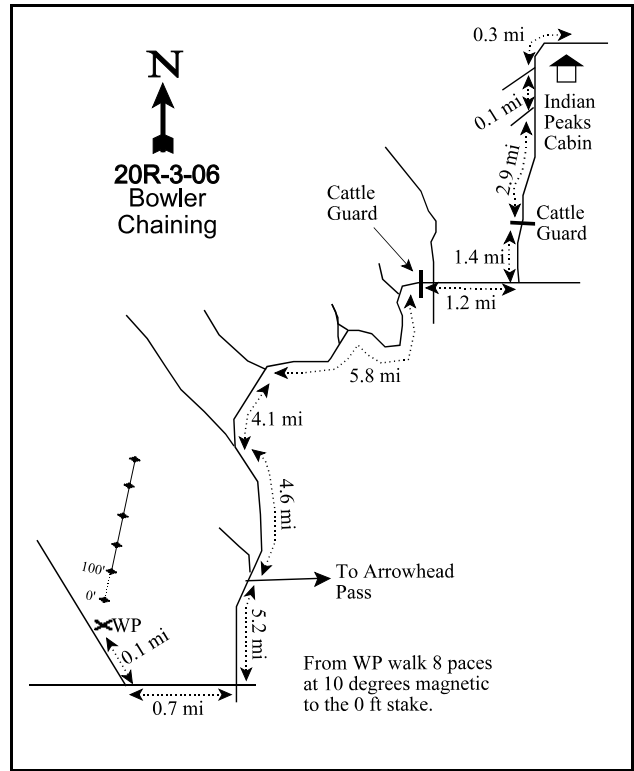
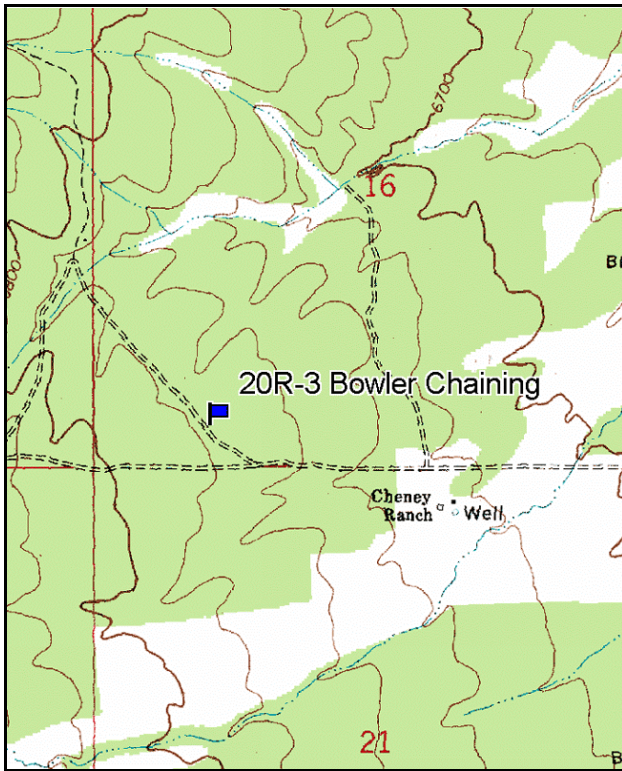
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 19 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5(95 ft).  
No Rebar.

LOCATION DESCRIPTION

From the Indian Peaks Cabin drive 0.3 miles to a fork and take a left then 0.1 miles to another fork again staying left. From there drive 2.9 miles to a cattle guard. From the cattle guard drive 1.4 miles to a junction. Take a right and drive 1.2 miles to an intersection. Go straight crossing a cattle guard. From the cattle guard drive 5.8 miles staying on the main road to a fork. Take a left and drive 4.1 miles to another fork. Go left again for 4.6 miles to a fork leading to Arrowhead Pass. Stay right for another 5.2 miles to an intersection and take a right. Drive 0.7 miles to a fork and go right. Drive 0.1 miles to a witness post on the right. Walk 8 paces at 10 degrees magnetic to the 0 foot stake marked with browse tag #160.



Map name: Steamboat Mountain SW

Diagrammatic Sketch

Township 32S , Range 19W , Section 16 .

UTM (NAD 83) 12S 4211558N 238018E

## DISCUSSION

### Bowler Chaining - Study No. 20R-3

#### Study Information

This study is located on private land approximately 15 miles north of Modena (elevation: 6,800 feet, slope: 3%, aspect: northeast). It was established to monitor the effects of a pinyon-juniper chaining in mule deer winter range. The pretreatment data was collected in July of 2006. Animal use is low and only 2 deer days use/acre (5 ddu/ha) were measured in 2006.

#### Soil

The soil is a Red Butte very gravelly loam. The Red Butte series is formed in alluvium and colluvium that was derived from sedimentary and igneous rocks and is deposited on alluvial slopes, colluvial slopes, and rolling hills. The soil is very deep, well drained, and moderately permeable (USDA-NRCS 2006). The effective rooting depth is 14 inches with little rock in the profile. The soil texture is a clay loam with a slightly acidic pH (6.4). Relative bare ground cover was 18% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.8. The combined relative cover of vegetation and litter was 52% in 2006. The 2006 soil erosion condition rating was slight due to moderate surface litter movement, slight surface rock movement, 7 to 10 pedestals per 100 square feet, flow patterns covering between 2% to 10% of the surface area, rills 0.5 to 1 inch deep, and light soil movement.

#### Browse

The key browse species is Wyoming big sagebrush. It is depressed by the high pinyon-juniper cover and only provided 1% cover in 2006. Wyoming big sagebrush density was 700 plants/acre in 2006, 11% of which were young and 26% were decadent. Seedling density was 160 plants/acre. Plants classified as dying made up 11% of the population in 2006. The average big sagebrush leader growth was 1.2 inches in 2006. Use was light. Black sagebrush was also sampled at 100 plants/acre in 2006. Other browse species sampled in 2006 include stickleaf low rabbitbrush, broom snakeweed, prickly phlox, and prickly pear cactus.

Pinyon and juniper dominant the study area. Singleleaf pinyon canopy cover was nearly 7% in 2006 and that of Utah juniper was nearly 18%. Tausch and West (1994) showed that as pinyon-juniper cover increases, the herbaceous and browse understories decrease. Generally, pinyon-juniper cover of over 15% greatly diminishes the understory cover. The 2006 juniper point quarter density estimate was 212 trees/acre with an average trunk diameter of 8.9 inches. The majority of juniper trees were greater than 12 feet tall. The 2006 pinyon point quarter density estimate was 411 trees/acre with an average trunk diameter of 1.5 inches. The majority of pinyon trees were seedlings less than 1 foot tall.

#### Herbaceous Understory

The herbaceous understory is moderately diverse for a pinyon-juniper invaded sagebrush community, but the understory abundance is low. Seven species of grasses and twenty-two species of forbs were sampled in 2006. Perennial grass cover was only 3%, 56% of which was provided by bottlebrush squirreltail. Cheatgrass was sampled in one quadrat and provided very little cover. Perennial forb cover was 6%, 69% of which was provided by mat eriogonum. All other forbs were scattered and abundance was low.

The 2006 Desirable Components Index score was poor due to low browse cover, low perennial grass cover, and excellent perennial forb cover.

2006 winter range condition (DC Index) – poor (19) Low potential scale

HERBACEOUS TRENDS --  
Management unit 20R, Study no: 3

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron smithii	2	.04
G	Bromus tectorum (a)	1	.03
G	Oryzopsis hymenoides	21	.39
G	Poa fendleriana	3	.06
G	Poa secunda	31	.70
G	Sitanion hystrix	124	1.86
G	Stipa pinetorum	7	.24
Total for Annual Grasses		1	0.03
Total for Perennial Grasses		188	3.30
Total for Grasses		189	3.33
F	Arabis sp.	10	.03
F	Astragalus convallarius	13	.07
F	Astragalus utahensis	6	.04
F	Chaenactis douglasii	22	.10
F	Cryptantha sp.	5	.01
F	Eriogonum caespitosum	150	4.11
F	Eriogonum umbellatum	2	.06
F	Hedysarum boreale	14	.13
F	Holosteum umbellatum (a)	11	.02
F	Ipomopsis congesta	90	.69
F	Lappula occidentalis (a)	28	.06
F	Leucelene ericoides	-	.00
F	Lesquerella sp.	38	.21
F	Lupinus argenteus	7	.19
F	Lupinus kingii (a)	24	.07
F	Microsteris gracilis (a)	3	.00
F	Penstemon sp.	8	.04
F	Phlox austromontana	7	.07
F	Phlox longifolia	8	.03
F	Polygonum douglasii (a)	67	.14
F	Senecio multilobatus	8	.02
F	Trifolium sp.	32	.08
Total for Annual Forbs		133	0.30
Total for Perennial Forbs		420	5.92
Total for Forbs		553	6.22

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

BROWSE TRENDS --

Management unit 20R, Study no: 3

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia nova	4	.03
B	Artemisia tridentata wyomingensis	27	1.25
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Gutierrezia sarothrae	15	.09
B	Juniperus osteosperma	16	8.85
B	Leptodactylon pungens	1	-
B	Opuntia sp.	0	-
B	Pinus monophylla	17	5.48
Total for Browse		80	15.71

CANOPY COVER, LINE INTERCEPT --

Management unit 20R, Study no: 3

Species	Percent Cover
	'06
Artemisia nova	.03
Artemisia tridentata wyomingensis	1.20
Gutierrezia sarothrae	.11
Juniperus osteosperma	17.89
Pinus monophylla	6.61

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 20R, Study no: 3

Species	Average leader growth (in)
	'06
Artemisia nova	0.6
Artemisia tridentata wyomingensis	1.2

POINT-QUARTER TREE DATA --  
Management unit 20R, Study no: 3

Species	Trees per Acre	Average diameter (in)
	'06	'06
Juniperus osteosperma	212	8.9
Pinus monophylla	411	1.5

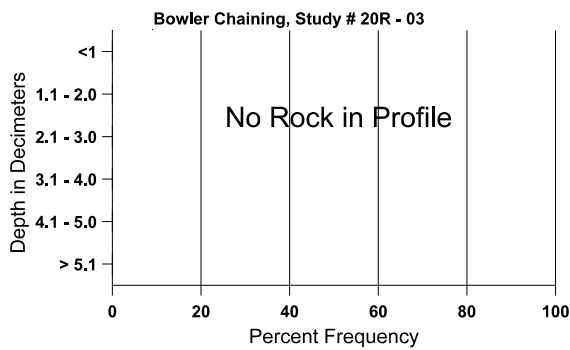
BASIC COVER --  
Management unit 20R, Study no: 3

Cover Type	Average Cover %
	'06
Vegetation	21.79
Rock	5.63
Pavement	27.65
Litter	38.63
Cryptogams	1.82
Bare Ground	21.53

SOIL ANALYSIS DATA --  
Herd Unit 20R, Study # 3, Study Name: Bowler Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
13.5	75 (10.24)	6.4	30.0	33.1	36.9	1.7	10.1	188.8	0.5

### Stoniness Index



PELLET GROUP DATA --  
Management unit 20R, Study no: 3

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	46	-
Deer	3	2 (5)

BROWSE CHARACTERISTICS --  
Management unit 20R, Study no: 3

		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>Artemisia nova</i>												
06	<b>100</b>	-	20	-	80	40	0	0	80	80	80	11/20
<i>Artemisia tridentata wyomingensis</i>												
06	<b>700</b>	160	80	440	180	320	0	0	26	11	11	18/25
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	6/7
<i>Gutierrezia sarothrae</i>												
06	<b>540</b>	220	140	400	-	-	0	0	-	-	0	8/8
<i>Juniperus osteosperma</i>												
06	<b>320</b>	40	-	260	60	20	0	0	19	-	0	-/-
<i>Leptodactylon pungens</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	2/7
<i>Opuntia sp.</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	6/20
<i>Pinus monophylla</i>												
06	<b>520</b>	720	420	100	-	-	0	0	-	-	0	-/-



Trend Study 20R-4-06

Study site name: Blawn Wash Dixie.

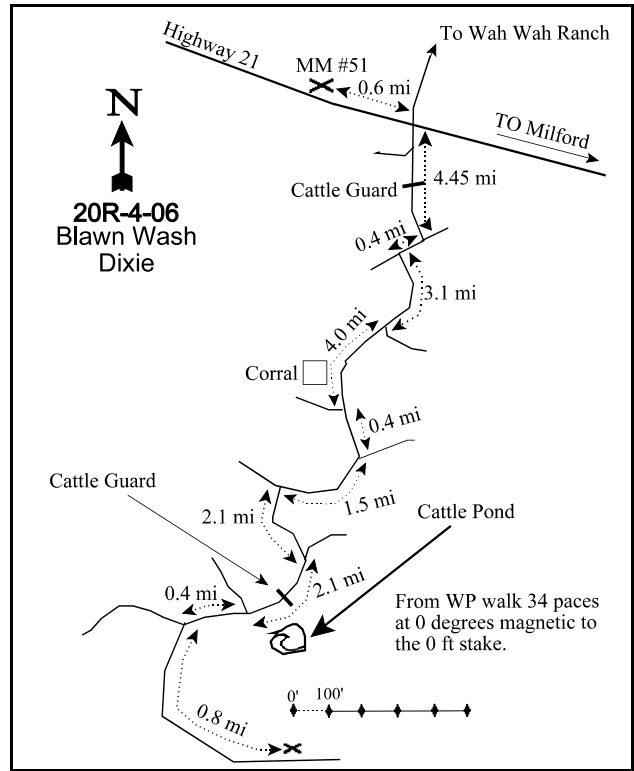
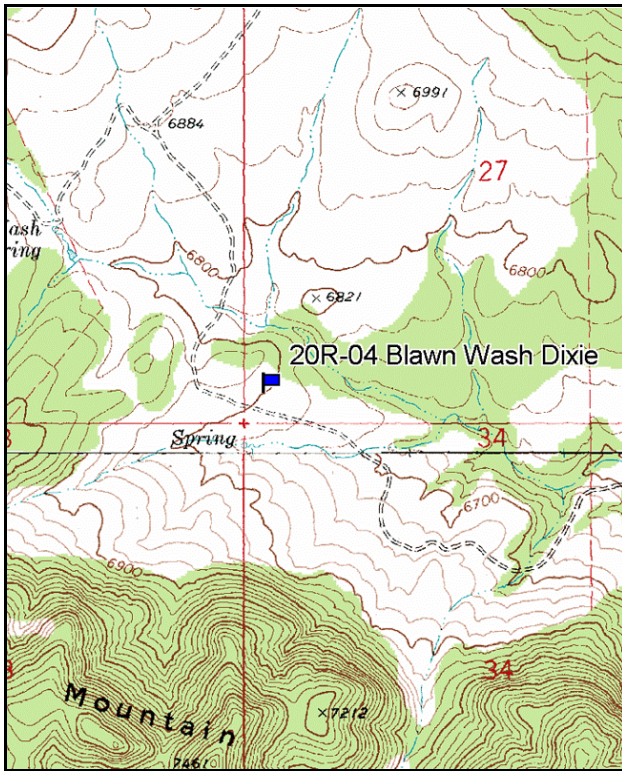
Vegetation type: Mountain Big Sagebrush.

Compass bearing: frequency baseline 96 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5(95 ft).  
No Rebar.

LOCATION DESCRIPTION

From mile marker #51 on highway 21 drive east 0.6 miles to an intersection. Turn right and drive 4.45 miles crossing a cattle guard to a junction. Take a right and drive 0.4 miles to another junction and take a left. Drive 3.1 miles to a fork and stay right for 4.0 miles passing a fence and corral to a fork. At the fork go left for 0.4 miles to another fork staying right for 1.5 miles to a junction. From there turn left and drive 2.1 miles to a fork and to right. Drive 2.1 miles crossing one cattle guard to another fork. Stay left for 0.4 miles to a fork again staying left for 0.8 miles to a witness post on the left. Walk 34 paces at 0 degrees magnetic to the 0 foot stake marked with browse tag #173.



Map name: Lamerdorf Peak

Diagrammatic Sketch

Township 29S , Range 15W , Section 27 .

UTM (NAD 83) 12S 4236755N 278971E

## DISCUSSION

### Blawn Wash Dixie - Study No. 20R-4

#### Study Information

This study is located approximately 33 miles west of Minersville in a mountain big sagebrush community (elevation: 6,800 feet, slope: 9%, aspect: southeast). The area appeared, by the presence of crested and intermediate wheatgrasses, to have been treated historically. The study was established to monitor the effects of a dixie harrow treatment planned to be implemented in 2006. The area is critical mule deer winter range. The pretreatment data was collected in July 2006. The 2006 pellet group estimates were 5 elk, 5 deer, 7 cow, and 7 horse days use/acre (12 edu/ha, 13 ddu/ha, 9 cdu/ha, and 17 hdu/ha). Mustangs were spotted southeast of the study in 2006.

#### Soil

The soil texture is a sandy clay loam with a neutral pH (6.8). The effective rooting depth is 10 inches with a very rocky profile. Relative bare ground cover was 12% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.7. The combined relative cover of vegetation and litter was 49% in 2006. The 2006 soil erosion condition rating was slight due to light surface litter movement, moderate surface rock movement, 2 to 5 pedestals per 100 square feet, flow patterns covering between 2% to 10% of the surface area, rills less than 0.5 inch deep, and light soil movement.

#### Browse

The preferred browse species in 2006 were mountain big sagebrush and antelope bitterbrush. Sagebrush cover (line intercept) was 24% in 2006 and sagebrush density was very dense at 8,920 plant/acre. The majority of the population were in the mature age class, but 1% were young and 35% were decadent. Plants classified as dying made up 17% of the population. Use was light-moderate and the average annual leader growth was less than 1 inch. Bitterbrush cover was 4% in 2006 and density was 260 plants/acre. The majority of the population were mature, but 8% were young and 8% were decadent. Use was moderate in 2006 and the average annual leader growth was 1.8 inches. Other browse species sampled were dwarf rabbitbrush, graystem rabbitbrush, low rabbitbrush, Nevada ephedra, broom snakeweed, and prickly pear cactus.

Utah juniper and singleleaf pinyon were encroaching into the sagebrush community in 2006. Pinyon canopy cover was less than 1% in 2006 and juniper was not sampled. The juniper point quarter density estimate in 2006 was 61 trees/acre with an average trunk diameter of 7.5 inches. The pinyon density estimate in 2006 was 18 trees/acre with an average trunk diameter of 0.5 inch. Nearly all of the pinyon trees were seedlings under 1 foot tall.

#### Herbaceous Understory

Six species of grasses and ten species of forbs were sampled in 2006. Perennial grasses provided nearly 10% cover in 2006, 89% of which was contributed by crested wheatgrass. Cheatgrass was also abundant with nearly 4% cover and a quadrat frequency of 65%. Perennial forbs provided very little cover (much less than 1%) in 2006.

The 2006 Desirable Components Index score was fair due to excellent browse cover and moderate perennial grass cover, but was penalized because of high decadence and poor perennial forb cover.

2006 winter range condition (DC Index) – fair (53) Mid-level potential scale

HERBACEOUS TRENDS --  
 Management unit 20R, Study no: 4

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	131	8.71
G	Agropyron intermedium	23	.58
G	Bromus tectorum (a)	198	3.57
G	Oryzopsis hymenoides	1	.15
G	Poa fendleriana	3	.03
G	Sitanion hystrix	14	.31
Total for Annual Grasses		198	3.57
Total for Perennial Grasses		172	9.78
Total for Grasses		370	13.36
F	Astragalus lentiginosus	-	.03
F	Chaenactis douglasii	10	.02
F	Collinsia parviflora (a)	6	.04
F	Leucelene ericoides	8	.01
F	Lesquerella sp.	1	.00
F	Lupinus argenteus	-	.03
F	Microsteris gracilis (a)	2	.00
F	Penstemon sp.	1	.03
F	Senecio multilobatus	6	.01
F	Tragopogon dubius	1	.00
Total for Annual Forbs		8	0.04
Total for Perennial Forbs		27	0.15
Total for Forbs		35	0.19

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

BROWSE TRENDS --

Management unit 20R, Study no: 4

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata vaseyana	96	20.73
B	Chrysothamnus depressus	0	
B	Chrysothamnus nauseosus hololeucus	5	.00
B	Chrysothamnus viscidiflorus	1	-
B	Ephedra nevadensis	0	-
B	Gutierrezia sarothrae	42	1.56
B	Juniperus osteosperma	0	-
B	Opuntia sp.	0	-
B	Pinus monophylla	2	.03
B	Purshia tridentata	12	2.16
Total for Browse		158	24.50

CANOPY COVER, LINE INTERCEPT --

Management unit 20R, Study no: 4

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	24.31
Chrysothamnus nauseosus hololeucus	.83
Gutierrezia sarothrae	.98
Pinus monophylla	.68
Purshia tridentata	4.18

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 20R, Study no: 4

Species	Average leader growth (in)
	'06
Artemisia tridentata vaseyana	0.9
Purshia tridentata	1.8

POINT-QUARTER TREE DATA --  
 Management unit 20R, Study no: 4

Species	Trees per Acre
	'06
Juniperus osteosperma	61
Pinus monophylla	18

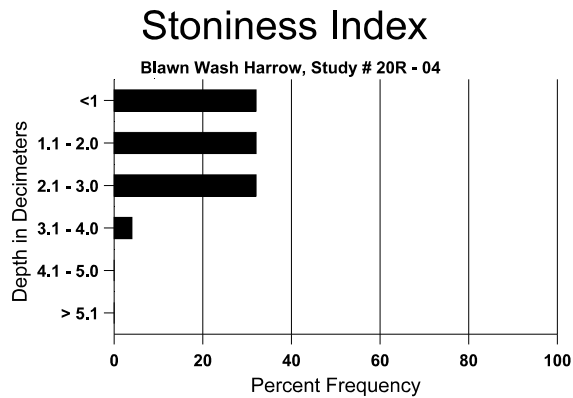
Average diameter (in)
'06
7.5
0.5

BASIC COVER --  
 Management unit 20R, Study no: 4

Cover Type	Average Cover %
	'06
Vegetation	32.26
Rock	15.81
Pavement	28.80
Litter	24.12
Cryptogams	.29
Bare Ground	13.24

SOIL ANALYSIS DATA --  
 Herd Unit 20R, Study # 4, Study Name: Blawn Wash Harrow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
10.16	75.6 (9.45)	6.8	56.0	18.1	25.6	2.1	12.6	240.0	0.7



PELLET GROUP DATA --  
 Management unit 20R, Study no: 4

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	55	-
Horse	5	7 (17)
Elk	1	5 (12)
Deer	8	5 (13)

BROWSE CHARACTERISTICS --  
 Management unit 20R, Study no: 4

		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>Artemisia tridentata vaseyana</i>												
06	<b>8920</b>	-	80	5680	3160	980	34	3	35	17	17	15/27
<i>Chrysothamnus depressus</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	4/7
<i>Chrysothamnus nauseosus hololeucus</i>												
06	<b>120</b>	-	-	60	60	-	0	50	50	33	33	23/27
<i>Chrysothamnus viscidiflorus</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	5/7
<i>Ephedra nevadensis</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	10/12
<i>Gutierrezia sarothrae</i>												
06	<b>1560</b>	320	140	1240	180	480	0	0	12	9	9	8/10
<i>Juniperus osteosperma</i>												
06	<b>0</b>	20	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	3/5
<i>Pinus monophylla</i>												
06	<b>40</b>	100	40	-	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
06	<b>260</b>	-	20	220	20	-	62	0	8	-	8	17/40

Trend Study 20R-5-06

Study site name: Salt Cabin Dixie.

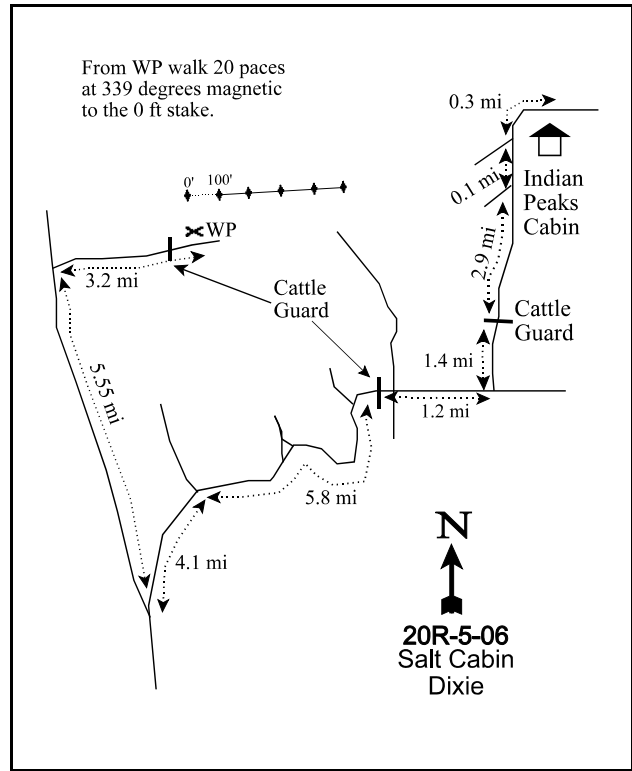
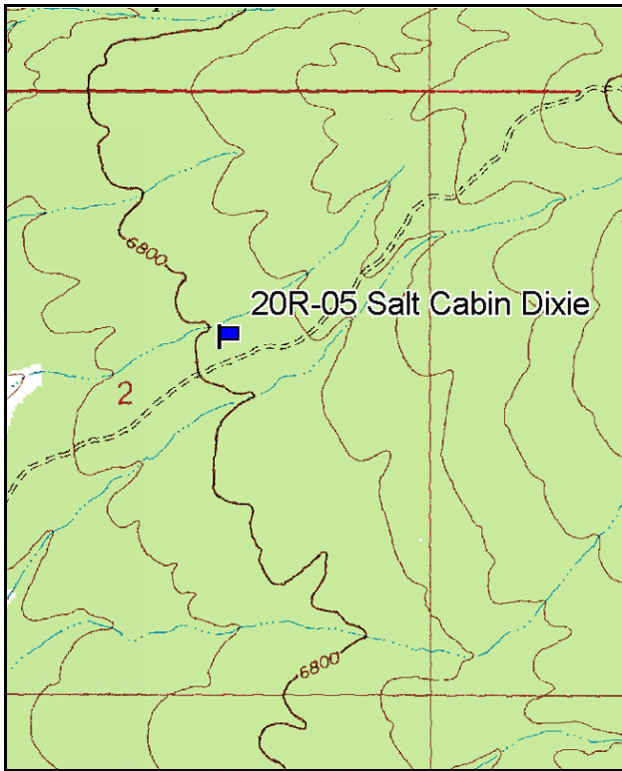
Vegetation type: Pinyon/Juniper Chaining.

Compass bearing: frequency baseline 50 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5(95 ft).  
No Rebar.

LOCATION DESCRIPTION

From the Indian Peaks Cabin drive 0.3 miles to a fork and take a left then 0.1 miles to another fork again staying left. From there drive 2.9 miles to a cattle guard. From the cattle guard drive 1.4 miles to a junction. Take a right and drive 1.2 miles to an intersection. Go straight crossing a cattle guard. From the cattle guard drive 5.8 miles staying on the main road to a fork. Take a left and drive 4.1 miles to another fork. Turn right (north) and drive 5.55 miles to a junction. Turn right and proceed 3.2 miles to a witness post on the left. Walk 20 paces at 339 degrees magnetic to the 0 foot stake marked with browse tag #172.



Map name: Atchison Creek

Diagrammatic Sketch

Township 30S, Range 19W, Section 2.

UTM (NAD 83) 12S 4235345N 242923E

## DISCUSSION

### Salt Cabin Dixie - Study No. 20R-5

#### Study Information

This study is located approximately 55 miles west of Minersville and 6 miles southwest of the Indian Peaks DWR cabin in an old pinyon-juniper chaining (elevation: 6,800 feet, slope: 4%, aspect: west). It was established in July 2006 to monitor a dixie harrow treatment in mule deer winter range. The 2006 pellet group estimates were 17 elk, 7 deer, 8 cow, and 27 horse days use/acre (41 edu/ha, 17 ddu/ha, 20 cdu/ha, and 66 hdu/ha).

#### Soil

The soil texture is a sandy loam with a neutral pH (7.1). The effective rooting depth is 11 inches with a very rocky profile. Relative bare ground cover was 21% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.7. The combined relative cover of vegetation and litter was 53% in 2006. The 2006 soil erosion condition rating was stable due to the abundance of rhizomatous grasses.

#### Browse

The preferred browse species provided approximately 4% cover in 2006. These species were black sagebrush, Wyoming big sagebrush, and antelope bitterbrush. Black sagebrush provided 1% cover and at a density of 480 plants/acre in 2006. The majority of the plants were mature, but young plants made up 25% of the density and decadent plants made up 4%. Seedlings were abundant at 240 plants/acre. Use was light and average annual leader growth was 0.8 inches. Wyoming big sagebrush was sparse (less than 1% cover) at only 80 plants/acre. However, 140 seedlings/acre were also sampled in 2006. Use on Wyoming big sagebrush was moderate. Bitterbrush provided nearly 2% cover at a density of 100 plants/acre. The majority of the bitterbrush were mature, with the exception of 20% of population, which were decadent. A few seedlings were also sampled. Use on bitterbrush was moderate-heavy and the average annual leader growth was 2.0 inches in 2006. Other browse species sampled in 2006 include dwarf rabbitbrush, whitestem rubber rabbitbrush, graystem rubber rabbitbrush, low rabbitbrush, broom snakeweed, and prickly pear cactus.

Several pinyon and juniper trees have re-invaded the treatment. Canopy cover of juniper was 5% in 2006 and 2% of pinyon. Utah juniper point quarter density estimate was 91 trees/acre in 2006 with an average trunk diameter of 4.7 inches. The singleleaf pinyon point quarter density estimate was 48 trees/acre in 2006 with an average trunk diameter of 2.7 inches. Most junipers were between 4 and 8 feet tall and most pinyons were between 1 and 4 feet tall.

#### Herbaceous Understory

The herbaceous understory was dominated by two grass species, but 8 grass and 14 forb species were sampled in 2006. Grasses provided nearly 17% cover and forbs provided nearly 2% cover. Crested wheatgrass provided 5% cover, which was 29% of herbaceous cover, and smooth brome provided nearly 10% cover, 53% of the herbaceous cover. Cheatgrass was sampled in 2006, but it provided less than 1% cover and was sampled in only 7% of the quadrats.

The 2006 Desirable Components Index score was fair due to low browse cover, excellent perennial grass cover, and low perennial forb cover.

2006 winter range condition (DC Index) – fair (39) Low potential scale



HERBACEOUS TRENDS --  
Management unit 20R, Study no: 5

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Agropyron cristatum</i>	159	5.33
G	<i>Agropyron intermedium</i>	48	.63
G	<i>Aristida purpurea</i>	-	.00
G	<i>Bromus inermis</i>	212	9.64
G	<i>Bromus tectorum</i> (a)	18	.11
G	<i>Oryzopsis hymenoides</i>	18	.53
G	<i>Sitanion hystrix</i>	3	.07
G	<i>Stipa comata</i>	15	.40
Total for Annual Grasses		18	0.10
Total for Perennial Grasses		455	16.62
Total for Grasses		473	16.73
F	<i>Astragalus</i> sp.	11	.23
F	<i>Astragalus utahensis</i>	3	.00
F	<i>Cryptantha</i> sp.	8	.08
F	<i>Eriogonum cernuum</i> (a)	2	.00
F	<i>Gilia</i> sp. (a)	6	.01
F	<i>Ipomopsis congesta</i>	8	.06
F	<i>Lappula occidentalis</i> (a)	2	.01
F	<i>Lygodesmia spinosa</i>	1	.00
F	<i>Machaeranthera canescens</i>	6	.04
F	<i>Penstemon</i> sp.	1	.03
F	<i>Penstemon</i> sp.	36	.35
F	<i>Senecio multilobatus</i>	12	.12
F	<i>Sphaeralcea coccinea</i>	41	.55
F	<i>Tragopogon dubius</i>	3	.03
Total for Annual Forbs		10	0.02
Total for Perennial Forbs		130	1.51
Total for Forbs		140	1.54

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

BROWSE TRENDS --

Management unit 20R, Study no: 5

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia nova	8	1.22
B	Artemisia tridentata wyomingensis	4	.76
B	Chrysothamnus depressus	1	.03
B	Chrysothamnus nauseosus hololeucus	27	1.80
B	Chrysothamnus viscidiflorus	5	.45
B	Gutierrezia sarothrae	9	.16
B	Juniperus osteosperma	7	3.74
B	Opuntia sp.	3	.03
B	Pinus monophylla	3	1.41
B	Purshia tridentata	5	1.71
Total for Browse		72	11.34

CANOPY COVER, LINE INTERCEPT --

Management unit 20R, Study no: 5

Species	Percent Cover
	'06
Artemisia nova	1.21
Artemisia tridentata wyomingensis	.23
Chrysothamnus depressus	.05
Chrysothamnus nauseosus	2.41
Chrysothamnus nauseosus hololeucus	-
Chrysothamnus viscidiflorus	.30
Gutierrezia sarothrae	.20
Juniperus osteosperma	4.78
Pinus monophylla	2.31
Purshia tridentata	1.50

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 20R, Study no: 5

Species	Average leader growth (in)
	'06
Artemisia nova	0.8
Purshia tridentata	2.0

POINT-QUARTER TREE DATA --  
 Management unit 20R, Study no: 5

Species	Trees per Acre
	'06
Juniperus osteosperma	91
Pinus monophylla	48

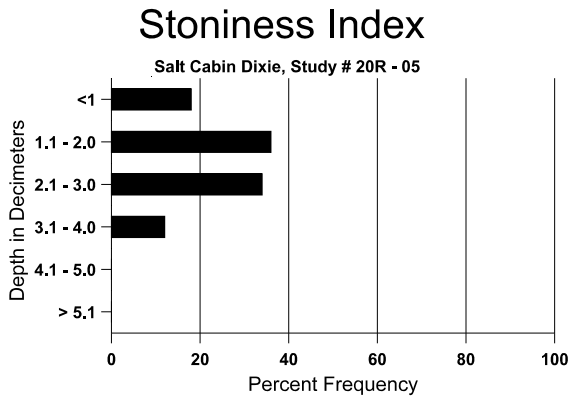
Average diameter (in)
'06
4.7
2.7

BASIC COVER --  
 Management unit 20R, Study no: 5

Cover Type	Average Cover %
	'06
Vegetation	27.63
Rock	1.84
Pavement	28.37
Litter	33.91
Cryptogams	.18
Bare Ground	23.90

SOIL ANALYSIS DATA --  
 Herd Unit 20R, Study # 5, Study Name: Salt Cabin Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
10.94	77.6 (11.02)	7.1	61.0	19.1	19.9	2.8	19.6	188.8	0.7



PELLET GROUP DATA --  
 Management unit 20R, Study no: 5

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	55	-
Horse	17	27 (66)
Elk	11	17 (41)
Deer	10	7 (17)
Cattle	4	8 (20)

BROWSE CHARACTERISTICS --  
 Management unit 20R, 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)
<i>Artemisia nova</i>												
06	<b>480</b>	240	120	340	20	-	0	0	4	-	0	14/26
<i>Artemisia tridentata wyomingensis</i>												
06	<b>80</b>	140	-	80	-	-	75	0	-	-	0	24/30
<i>Chrysothamnus depressus</i>												
06	<b>20</b>	-	20	-	-	-	0	0	-	-	0	3/6
<i>Chrysothamnus nauseosus hololeucus</i>												
06	<b>1120</b>	460	720	400	-	-	7	2	-	-	29	25/40
<i>Chrysothamnus viscidiflorus</i>												
06	<b>220</b>	80	100	120	-	-	0	18	-	-	0	14/26
<i>Gutierrezia sarothrae</i>												
06	<b>480</b>	140	20	320	140	20	0	0	29	29	29	9/11
<i>Juniperus osteosperma</i>												
06	<b>140</b>	-	40	60	40	20	0	0	29	-	0	-/-
<i>Opuntia sp.</i>												
06	<b>60</b>	60	-	60	-	-	0	0	-	-	0	4/8
<i>Pinus monophylla</i>												
06	<b>60</b>	20	40	20	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
06	<b>100</b>	40	-	80	20	-	60	40	20	20	20	28/67

Trend Study 22R-9-06

Study site name: South Beaver Dixie.

Vegetation type: Wyoming Big Sagebrush.

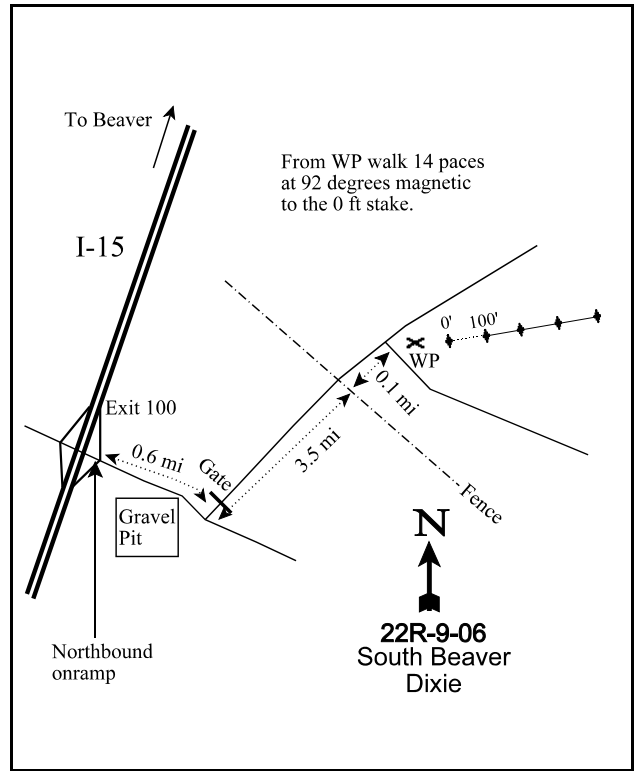
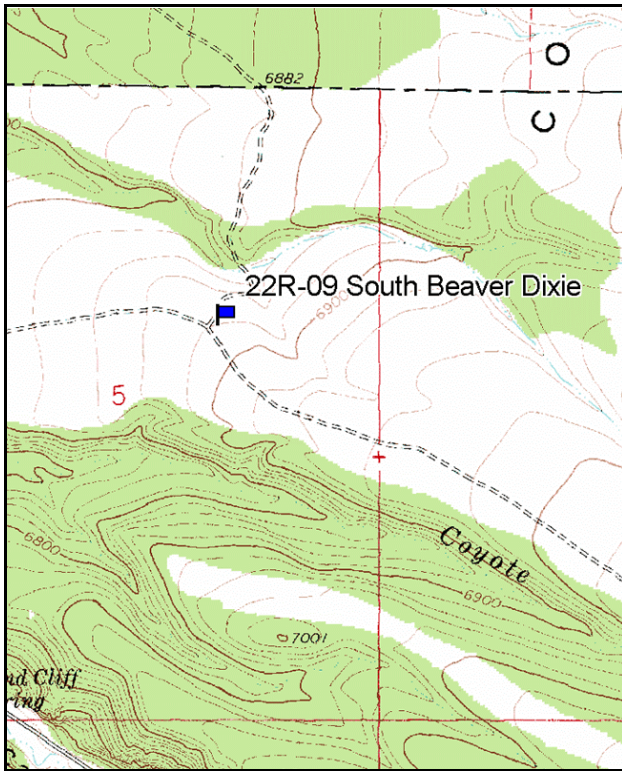
Compass bearing: frequency baseline 93 degrees magnetic.

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

No Rebar.

LOCATION DESCRIPTION

Take exit 100 from I-15. From the northbound on-ramp drive east 0.6 miles to a fork. Turn left and drive through a gate, continue 3.5 miles to a fence. From the fence drive 0.1 miles to another fork and a witness post between the forks. Walk 14 paces at 92 degrees magnetic to the 0 foot stake marked with browse tag #168.



Map name: Kane Canyon

Diagrammatic Sketch

Township 31S, Range 6W, Section 5.

UTM (NAD 83) 12S 4222601N 363482E

## DISCUSSION

### South Beaver Dixie - Study No. 22R-9

#### Study Information

This study is located approximately 10 miles southeast of Beaver, east of I-15 (elevation: 6,900 feet, slope: 2%, aspect: northeast). It is in a Wyoming big sagebrush community in a historic chaining that is being re-invaded by juniper and pinyon. It was established to monitor the effects of a dixie harrow treatment in mule deer winter range. The pretreatment measurements were collected in July 2006. The 2006 pellet group estimates were 1 elk, 3 deer, and 2 cow days use/acre (2 edu/ha, 7 ddu/ha, and 5 cdu/ha).

#### Soil

The soil is a Pavant cobbly loam. The Pavant series is found on alluvial fans and rolling hills. It is made of shallow well drained soils with a calcium carbonate cemented hardpan (USDA-NRCS 2006). The effective rooting depth is 11 inches with moderately rocky profile. The soil texture is a loam with a neutral pH (6.4). Relative bare ground cover was 21% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.3. The combined relative cover of vegetation and litter was 52% in 2006. The 2006 soil erosion condition rating was slight due to slight surface litter movement, slight surface rock movement, 7 to 10 pedestals per 100 square feet, flow patterns covering between 10% to 25% of the surface area, rills less than 0.5 inch deep, and slight soil movement.

#### Browse

The preferred browse species are Wyoming big sagebrush and antelope bitterbrush. Sagebrush cover 16% in 2006 with a density of 5,640 plants/acre. Only 1% of the population were young and 42% were decadent. Plants classified as dying made up 21% of the population. Use was light and the average annual leader growth was 0.8 inch. Antelope bitterbrush provided little cover and density was only 80 plants/acre, but use was 100% heavy. Broom snakeweed and prickly pear cactus were the only other browse species sampled in 2006.

Pinyon and juniper were encroaching into the sagebrush when the study was established in 2006. In 2006, juniper canopy cover was less than 1%, but pinyon cover was 4%. The 2006 juniper point quarter density estimate was 34 trees/acre with an average trunk diameter of 6.2 inches. The 2006 pinyon point quarter density was 84 trees/acre with an average trunk diameter of 3.5 inches. For both pinyon and juniper, the majority of the trees were between 4 and 8 feet tall in 2006. Pinyon-juniper cover is low enough that it is not yet substantially decreasing browse and understory cover.

#### Herbaceous Understory

The herbaceous understory is made up of 5 grass and 9 forb species, but is dominated by crested wheatgrass. Crested wheatgrass provided 7% cover in 2006, 83% of all herbaceous understory cover. Cheatgrass was sampled in 2006, but with less than 1% cover and a quadrat frequency of 34%.

The 2006 Desirable Components Index score was fair due to good browse cover, moderate perennial grass cover, and low perennial forb cover.

2006 winter range condition (DC Index) – fair (42) Low potential scale

HERBACEOUS TRENDS --  
 Management unit 22R, Study no: 9

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron cristatum	210	7.11
G	Bromus tectorum (a)	94	.56
G	Oryzopsis hymenoides	-	.00
G	Poa secunda	2	.03
G	Stipa comata	1	.00
Total for Annual Grasses		94	0.56
Total for Perennial Grasses		213	7.15
Total for Grasses		307	7.72
F	Arabis sp.	3	.01
F	Astragalus lentiginosus	23	.38
F	Chaenactis douglasii	3	.01
F	Draba sp. (a)	5	.01
F	Erigeron sp.	50	.31
F	Galium aparine (a)	3	.00
F	Microsteris gracilis (a)	7	.01
F	Polygonum douglasii (a)	3	.00
F	Ranunculus testiculatus (a)	20	.06
Total for Annual Forbs		38	0.09
Total for Perennial Forbs		79	0.71
Total for Forbs		117	0.80

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

BROWSE TRENDS --  
 Management unit 22R, Study no: 9

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata wyomingensis	91	15.81
B	Gutierrezia sarothrae	12	.18
B	Juniperus osteosperma	1	.53
B	Opuntia sp.	1	-
B	Pinus edulis	4	3.82
B	Purshia tridentata	4	.21
Total for Browse		113	20.56

CANOPY COVER, LINE INTERCEPT --  
 Management unit 22R, Study no: 9

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	22.66
Gutierrezia sarothrae	.23
Juniperus osteosperma	.70
Pinus edulis	4.16
Purshia tridentata	.90

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 22R, Study no: 9

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	0.8

POINT-QUARTER TREE DATA --  
 Management unit 22R, Study no: 9

Species	Trees per Acre	Average diameter (in)
	'06	'06
Juniperus osteosperma	34	6.2
Pinus edulis	84	3.5

BASIC COVER --  
 Management unit 22R, Study no: 9

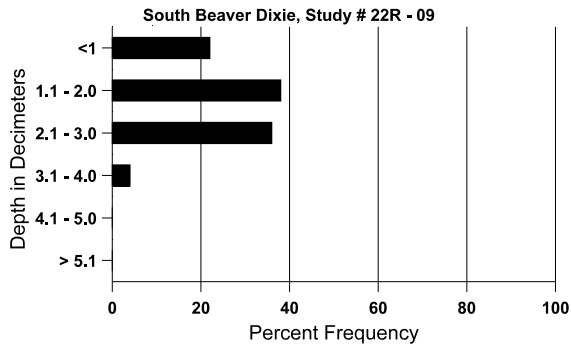
Cover Type	Average Cover %
	'06
Vegetation	28.01
Rock	20.23
Pavement	9.93
Litter	32.88
Cryptogams	1.81
Bare Ground	24.68

SOIL ANALYSIS DATA --  
 Herd Unit 22R, Study # 9, Study Name: South Beaver Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
10.08	72 (11.26)	7.3	39.0	34.1	26.9	2.8	13.9	252.8	0.6



# Stoniness Index



## PELLET GROUP DATA --

Management unit 22R, Study no: 9

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	40	-
Elk	-	1 (2)
Deer	8	3 (7)
Cattle	2	2 (5)

## BROWSE CHARACTERISTICS --

Management unit 22R, Study no: 9

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
06	<b>5640</b>	-	40	3220	2380	840	.70	.70	42	21	21	22/32
<i>Gutierrezia sarothrae</i>												
06	<b>480</b>	-	20	460	-	-	0	0	-	-	0	9/10
<i>Juniperus osteosperma</i>												
06	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	5/5
<i>Pinus edulis</i>												
06	<b>80</b>	100	20	60	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
06	<b>80</b>	-	-	80	-	-	0	100	-	-	0	41/66

Trend Study 22R-10-06

Study site name: South Beaver Bullhog.

Vegetation type: Pinyon/Juniper/Wyoming Big Sagebrush.

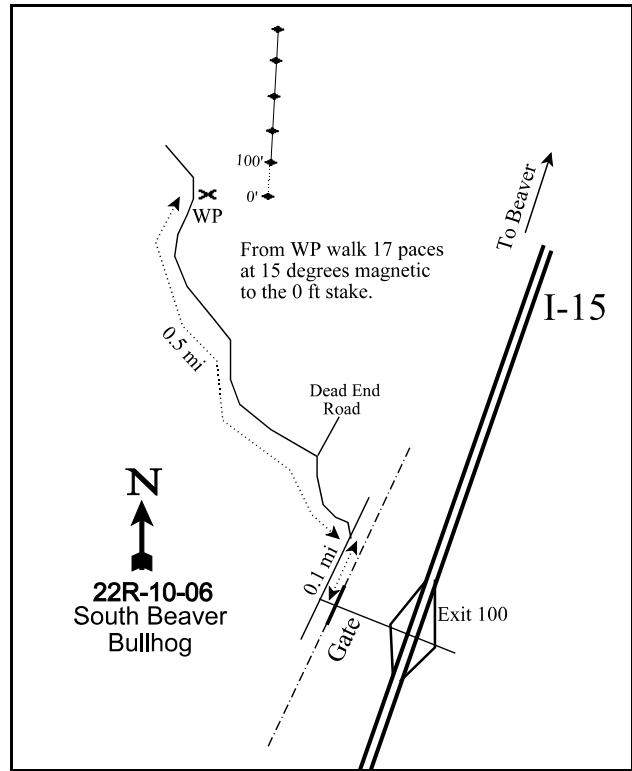
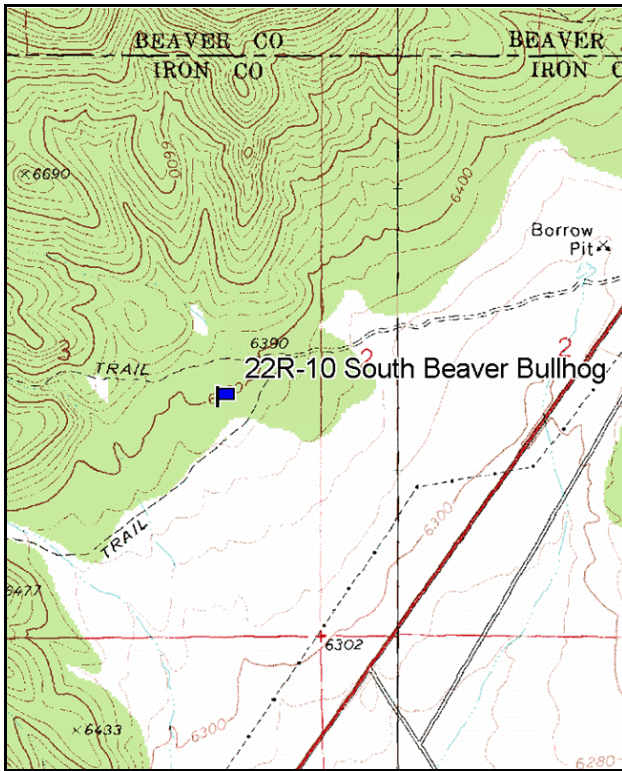
Compass bearing: frequency baseline 300 degrees magnetic.

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

No Rebar.

LOCATION DESCRIPTION

Take exit 100 from I-15. From the off-ramp turn right and proceed to a gate. Go through the gate and turn right. Drive 0.1 miles to a fork. Turn left and drive 0.5 miles through a harrow project to a witness post on the right. Walk 17 paces at 15 degrees magnetic to the 0 foot stake marked with browse tag #167.



Map name: Greenville Bench

Diagrammatic Sketch

Township 31S, Range 7W, Section 3.

UTM (NAD 83) 12S 4222402N 356966E

## DISCUSSION

### South Beaver Bullhog - Study No. 22R-10

#### Study Information

This study is located approximately 9 miles south of Beaver, west of I-15 (elevation: 6,200 feet, slope: 6%, aspect: southeast). It is in a Wyoming big sagebrush community that has been invaded by Pinyon pine and Utah juniper. It was established to monitor the effects of a bullhog mastication treatment in this mule deer winter range. The pretreatment measurements were collected in July 2006. No pellet groups from within a year old were sampled. There were, however, remnants pellets older than a year on the study.

#### Soil

The soil is a Manderfield gravelly sandy loam. The Manderfield series is found on fan remnants and is made of very deep, well drained, moderately slowly permeable soils that formed in mixed alluvium (USDA-NRCS 2006). The effective rooting depth is 12 inches with few rocks in the profile. The soil texture is a loam with a neutral pH (6.9). Relative bare ground cover was 16% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:3.8. The combined relative cover of vegetation and litter was 65% in 2006. The 2006 soil erosion condition rating was slight due to slight surface litter movement, 7 to 10 pedestals per 100 square feet, flow patterns covering between 10% to 25% of the surface area, and slight soil movement.

#### Browse

The key browse species is Wyoming big sagebrush. It provided 7% cover in 2006 with a density of 2,460 plants/acre. The majority of the population was mature, but 5% was made up of young individuals and 41% were decadent. Plants classified as dying made up 25% of the population. Use was light and the average annual leader growth was 0.6 inch. Other browse species sampled in 2006 include broom snakeweed, prickly phlox, prickly pear cactus, and Simpson's footcactus.

The area is dominated by pinyon and juniper. In 2006, pinyon canopy cover was 21% and juniper canopy cover was 10%. Tausch and West (1994) showed that as pinyon-juniper cover increases, the herbaceous and browse understories decrease. Generally, pinyon-juniper cover of over 15% greatly diminishes the understory cover. The 2006 juniper point quarter density estimate was 53 trees/acre with an average trunk diameter of 7.2 inches. The 2006 pinyon point quarter density estimate was 177 trees/acre with an average trunk diameter of 3.8 inches. During the pretreatment sampling, a few pinyon trees had been cut down with chainsaws. Around the cut trees were some sagebrush plants with exceptional vigor and health.

#### Herbaceous Understory

The herbaceous understory composition was made of 7 grass and 6 forb species in 2006, but cheatgrass dominated. The total understory cover was 14% in 2006 and cheatgrass made up 89% of that (nearly 13% cover). Cheatgrass quadrat frequency was 89% in 2006. The herbaceous understory is very poor; it is likely being greatly affected by the dense pinyon-juniper cover.

The 2006 Desirable Components Index score was very poor due to moderate-low browse cover, low perennial grass cover, and low perennial forb cover.

2006 winter range condition (DC Index) – very poor (9) Low potential scale

HERBACEOUS TRENDS --

Management unit 22R, Study no: 10

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Bouteloua gracilis</i>	12	.13
G	<i>Bromus tectorum</i> (a)	340	12.64
G	<i>Oryzopsis hymenoides</i>	12	.20
G	<i>Poa secunda</i>	5	.03
G	<i>Sitanion hystrix</i>	37	.77
G	<i>Stipa lettermani</i>	9	.09
G	<i>Vulpia octoflora</i> (a)	64	.26
Total for Annual Grasses		404	12.91
Total for Perennial Grasses		75	1.24
Total for Grasses		479	14.15
F	<i>Alyssum alyssoides</i> (a)	5	.01
F	<i>Caulanthus crassicaulis</i>	4	.01
F	<i>Chaenactis douglasii</i>	5	.01
F	<i>Euphorbia</i> sp.	5	.01
F	<i>Ipomopsis aggregata</i>	1	.03
F	<i>Sphaeralcea coccinea</i>	1	.00
Total for Annual Forbs		5	0.00
Total for Perennial Forbs		16	0.06
Total for Forbs		21	0.07

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

BROWSE TRENDS --

Management unit 22R, Study no: 10

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	67	7.00
B	<i>Gutierrezia sarothrae</i>	29	.80
B	<i>Juniperus osteosperma</i>	1	1.63
B	<i>Leptodactylon pungens</i>	5	.30
B	<i>Opuntia</i> sp.	0	-
B	<i>Pediocactus simpsonii</i>	0	-
B	<i>Pinus edulis</i>	10	10.01
Total for Browse		112	19.75

CANOPY COVER, LINE INTERCEPT --  
Management unit 22R, Study no: 10

Species	Percent Cover '06
Artemisia tridentata wyomingensis	8.00
Gutierrezia sarothrae	1.43
Juniperus osteosperma	9.80
Leptodactylon pungens	.13
Pinus edulis	21.29

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 22R, Study no: 10

Species	Average leader growth (in) '06
Artemisia tridentata wyomingensis	0.6

POINT-QUARTER TREE DATA --  
Management unit 22R, Study no: 10

Species	Trees per Acre '06	Average diameter (in) '06
Juniperus osteosperma	53	7.2
Pinus edulis	177	3.8

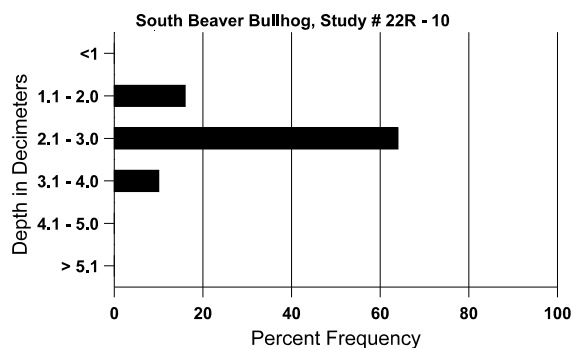
BASIC COVER --  
Management unit 22R, Study no: 10

Cover Type	Average Cover % '06
Vegetation	33.05
Rock	8.02
Pavement	14.64
Litter	45.77
Cryptogams	.01
Bare Ground	18.84

SOIL ANALYSIS DATA --  
Herd Unit 22R, Study # 10, Study Name: South Beaver Bullhog

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	ppm P	ppm K	dS/m
12.05	77.6 (8.9)	6.9	38.0	39.1	22.9	1.5	22.7	182.4	0.6

## Stoniness Index



### PELLET GROUP DATA --

Management unit 22R, Study no: 10

Type	Quadrat Frequency	Days use per acre (ha)
	'06	'06
Rabbit	51	-

### BROWSE CHARACTERISTICS --

Management unit 22R, Study no: 10

		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>Artemisia tridentata wyomingensis</i>												
06	<b>2460</b>	840	120	1340	1000	580	2	2	41	25	25	23/30
<i>Gutierrezia sarothrae</i>												
06	<b>1800</b>	20	120	1620	60	-	0	1	3	-	0	10/10
<i>Juniperus osteosperma</i>												
06	<b>20</b>	40	-	20	-	-	0	0	-	-	0	-/-
<i>Leptodactylon pungens</i>												
06	<b>100</b>	20	-	100	-	-	20	0	-	-	0	6/10
<i>Opuntia sp.</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	4/10
<i>Pediocactus simpsonii</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	2/3
<i>Pinus edulis</i>												
06	<b>220</b>	220	120	100	-	20	0	0	-	-	0	-/-

Trend Study 23R-10-06

Study site name: Twin Peaks Dixie.

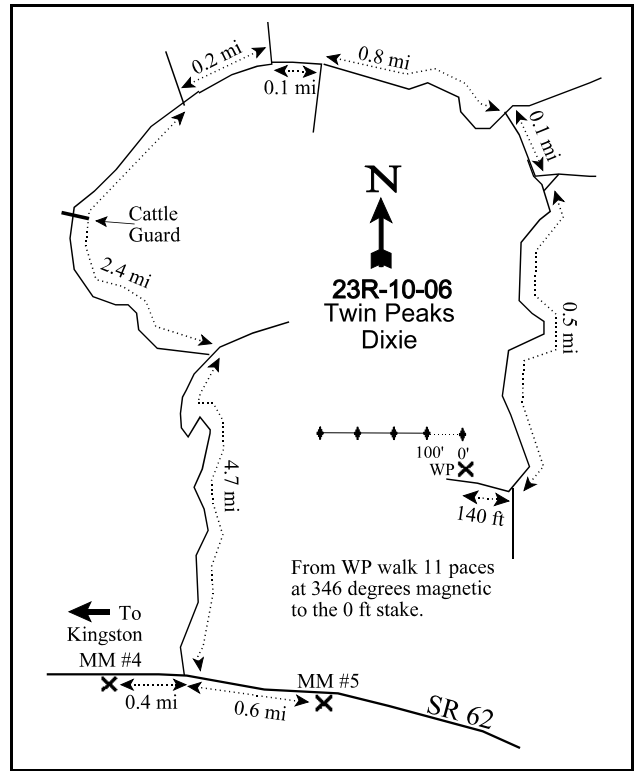
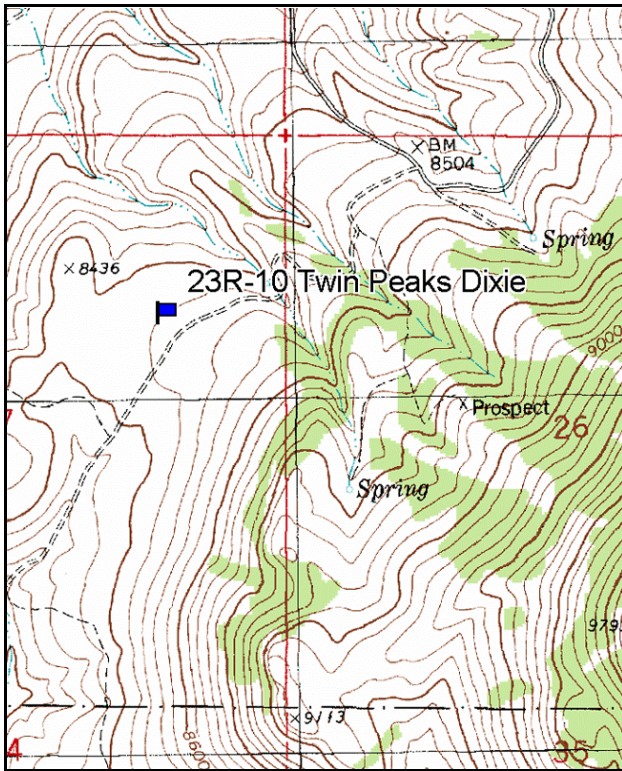
Vegetation type: Mountain Brush.

Compass bearing: frequency baseline 259 degrees magnetic.

Frequency belt placement: line 1(11 ft & 95 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft).  
No Rebar.

LOCATION DESCRIPTION

Driving east on SR 62 drive 0.4 miles from mile marker 4 or driving west on SR 62 drive 0.6 miles from mile marker 5 turn onto a road heading north. Proceed 4.7 miles to a fork. Turn left and drive 2.4 miles to a fork. Stay right for 0.2 miles to another fork. Go right and drive 0.1 miles to another fork. Stay left and drive 0.8 miles to another fork. Take a right and drive 0.1 miles to another fork. Stay right and drive 0.5 miles to a road on the right (west). Turn here and drive 140 feet to a witness post on the right. From the witness post walk 11 paces at 346 degrees magnetic to the 0 foot stake marked with browse tag #170.



Map name: Malmsten Peak

Diagrammatic Sketch

Township 31S, Range 7W, Section 3.

UTM (NAD 83) 12S 4235410N 403551E

## DISCUSSION

### Twin Peaks Dixie - Study No. 23R-10

#### Study Information

This study is located approximately 7 miles east of Junction in a mountain browse/mountain big sagebrush community (elevation: 8,400 feet, slope: 2%, aspect: northwest). It was established to monitor the effects of a dixie harrow treatment in this summer range. The pretreatment measurements were collected in July 2006. The 2006 pellet group estimates were 9 elk, 51 deer, and 20 cow days use/acre (22 edu/ha, 126 ddu/ha, and 48 cdu/ha). The majority of the pellets were from fall, spring, and summer.

#### Soil

The soil texture is a loam with a neutral pH (6.6). The effective rooting depth is 11 inches with a rocky profile. Relative bare ground cover was only 8% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:5.2. The combined relative cover of vegetation and litter was 84% in 2006. The 2006 soil erosion condition rating was stable due to the abundance of vegetation and litter.

#### Browse

The preferred browse species are Utah serviceberry, mountain big sagebrush, and antelope bitterbrush. Sagebrush, the key browse species, provided 21% cover in 2006 with a density of 4,020 plants/acre. The majority of the sagebrush are mature individuals, but young plants made up 9% of the population and decadent individuals made up 34%. Seedlings were abundant at 640 seedlings/acre. Plants classified as dying made up only 19% of the population. Use was light in 2006 and the average annual leader growth was 1.6 inches. Utah serviceberry provided little cover and density was 140 plants/acre. Decadent individuals made up 43% of the population and young plants made up 14%. Seedlings were also abundant at 140 plants/acre. Use was moderate-heavy and average annual leader growth was 4.2 inches. Antelope bitterbrush provided 9% cover with a density of 2,420 plants/acre. Decadent individuals made up 17% of the population and young plants made up 28%. Plants classified as dying made up 8% of the population. Use was heavy and the average annual leader growth was only 1.9 inches.

Other browse species sampled in 2006 include stickyleaf low rabbitbrush, slenderbush eriogonum, prickly pear cactus, snowberry, and gray horsebrush.

#### Herbaceous Understory

The herbaceous understory is moderately diverse with 7 grass and 20 forb species. In 2006, grasses provided 13% cover and forbs provided 8% cover. The dominant grasses were bluebunch wheatgrass, mutton bluegrass, bottlebrush squirreltail, and Letterman needlegrass. Letterman needlegrass and mutton bluegrass provided nearly 5% cover each, bottlebrush squirreltail provided nearly 2% cover, and bluebunch wheatgrass provided 1% cover. The other 3 grass species provided less than 1% cover combined. The dominant forbs were desert phlox and Watson penstemon, which provided 4% and 1% cover, respectively.

Because of the high site potential of this community, it will be very resilient to the harrow treatment.

The 2006 Desirable Components Index score was good due to excellent browse cover, good perennial grass cover, and excellent perennial forb cover.

2006 winter range condition (DC Index) – good (80) High potential scale



HERBACEOUS TRENDS --  
Management unit 23R, Study no: 10

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Agropyron spicatum	43	1.26
G	Carex sp.	5	.03
G	Poa fendleriana	184	4.58
G	Poa pratensis	7	.41
G	Poa secunda	9	.33
G	Sitanion hystrix	78	1.54
G	Stipa lettermani	150	4.75
Total for Annual Grasses		0	0
Total for Perennial Grasses		476	12.92
Total for Grasses		476	12.92
F	Agoseris glauca	44	.20
F	Arabis sp.	11	.03
F	Astragalus convallarius	3	.00
F	Astragalus lentiginosus	9	.01
F	Aster sp.	13	.19
F	Astragalus utahensis	5	.01
F	Chaenactis douglasii	1	.03
F	Collinsia parviflora (a)	68	.16
F	Descurainia sophia	-	.00
F	Draba sp. (a)	3	.00
F	Erigeron eatonii	36	.25
F	Eriogonum racemosum	54	.70
F	Eriogonum umbellatum	21	.35
F	Galium aparine (a)	10	.07
F	Holosteum umbellatum (a)	11	.02
F	Lupinus argenteus	12	.28
F	Penstemon watsonii	41	1.33
F	Phlox austromontana	139	4.34
F	Phlox longifolia	12	.06
F	Trifolium sp.	19	.07
Total for Annual Forbs		92	0.26
Total for Perennial Forbs		420	7.89
Total for Forbs		512	8.16

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

BROWSE TRENDS --

Management unit 23R, Study no: 10

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Amelanchier utahensis	6	.30
B	Artemisia tridentata vaseyana	90	20.63
B	Chrysothamnus viscidiflorus viscidiflorus	10	.06
B	Eriogonum microthecum	8	.63
B	Opuntia sp.	1	-
B	Purshia tridentata	74	9.23
B	Symphoricarpos oreophilus	9	.16
B	Tetradymia canescens	0	-
Total for Browse		198	31.02

CANOPY COVER, LINE INTERCEPT --

Management unit 23R, Study no: 10

Species	Percent Cover
	'06
Artemisia tridentata vaseyana	24.13
Chrysothamnus viscidiflorus viscidiflorus	.08
Eriogonum microthecum	.16
Purshia tridentata	13.91
Symphoricarpos oreophilus	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23R, Study no: 10

Species	Average leader growth (in)
	'06
Amelanchier utahensis	1.7
Artemisia tridentata vaseyana	1.6
Purshia tridentata	1.9

BASIC COVER --

Management unit 23R, Study no: 10

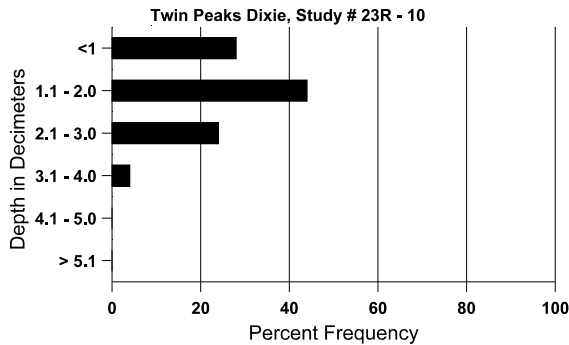
Cover Type	Average Cover % '06
Vegetation	46.31
Rock	2.54
Pavement	6.18
Litter	56.16
Cryptogams	.31
Bare Ground	9.70

SOIL ANALYSIS DATA --

Herd Unit 23R, Study # 10, Study Name: Twin Peaks Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
10.47	64 (12.2)	6.6	38.0	35.1	26.9	3.9	36.2	435.2	0.9

Stoniness Index



PELLET GROUP DATA --

Management unit 23R, Study no: 10

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	66	-
Elk	7	9 (22)
Deer	19	51 (126)
Cattle	8	20 (48)

BROWSE CHARACTERISTICS --  
 Management unit 23R, Study no: 10

		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>Amelanchier utahensis</i>												
06	<b>140</b>	180	20	60	60	-	29	43	43	29	29	30/27
<i>Artemisia tridentata vaseyana</i>												
06	<b>4020</b>	640	360	2300	1360	1440	13	1	34	19	19	34/40
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
06	<b>200</b>	20	40	160	-	-	0	20	-	-	0	10/9
<i>Eriogonum microthecum</i>												
06	<b>260</b>	20	40	200	20	-	8	38	8	8	8	5/9
<i>Opuntia sp.</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	4/17
<i>Purshia tridentata</i>												
06	<b>2420</b>	80	680	1320	420	300	18	63	17	8	8	27/38
<i>Symphoricarpos oreophilus</i>												
06	<b>200</b>	-	80	40	80	40	0	0	40	40	40	16/27
<i>Tetradymia canescens</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	5/6

Trend Study 23R-11-06

Study site name: Box Creek Dixie.

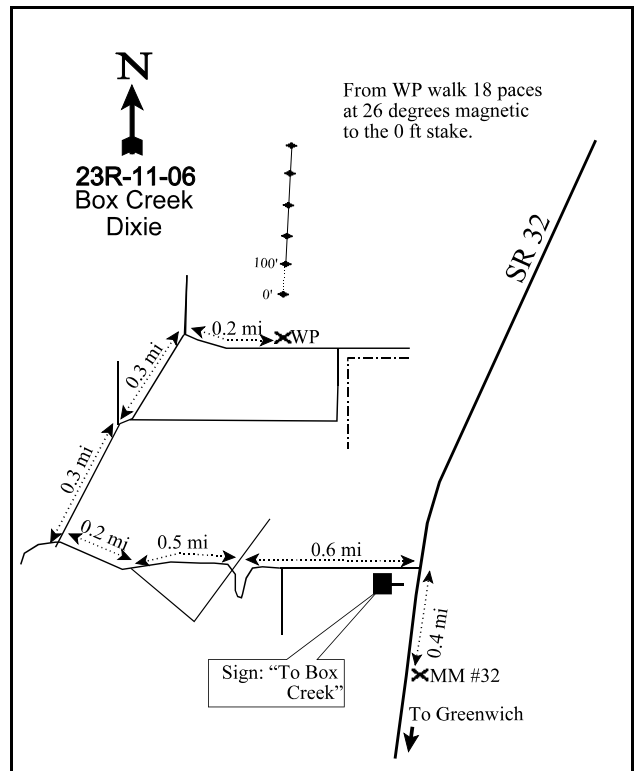
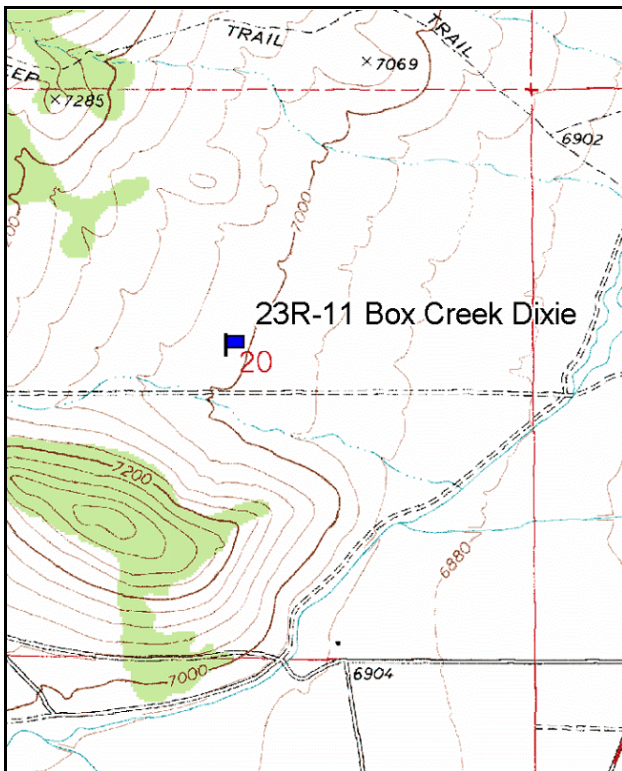
Vegetation type: Mountain Big Sagebrush.

Compass bearing: frequency baseline 21 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5(95 ft).  
No Rebar.

LOCATION DESCRIPTION

From mile marker 32 on SR 62 drive north 0.4 miles to a turn off on the left with a sign showing “To Boxcreek”. Turn here and drive 0.6 miles to a cross roads. Continue straight for 0.5 miles to a fork. Turn right and drive 0.2 miles to another fork and turn right. Drive 0.3 miles to an intersection, continue straight (northwest) for 0.3 miles to a fork and turn right. Go 0.2 miles to a witness post on the left. From the witness post walk 18 paces at 26 degrees magnetic to the 0 foot stake marked with browse tag #169.



Map name: Greenwich

Diagrammatic Sketch

Township 27S , Range 1W , Section 3 .

UTM (NAD 83) 12S 4255979N 418610E

## DISCUSSION

### Box Creek Dixie - Study No. 23R-11

#### Study Information

This study is located in the Wyoming big sagebrush covered foothills approximately 1 mile northeast of Greenwich (elevation: 7,000 feet, slope: 5%, aspect: east). It was established to monitor a dixie harrow treatment in this critical mule deer winter range. The pretreatment measurements were collected in July 2006. The 2006 pellet group estimates were 12 deer days use/acre (30 ddu/ha).

#### Soil

The soil texture is a loam with a mildly alkaline pH (7.4). The effective rooting depth is 11 inches with about 5% rock in the profile. Relative bare ground cover was only 31% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:1.5. The combined relative cover of vegetation and litter was 39% in 2006. Pavement cover was 24% in 2006. Erosion is a problem on this site. The 2006 soil erosion condition rating was critical due to moderately high surface litter movement, 2% to 10% of the surface rock fragments having recently moved, 5 to 7 pedestals per 100 square feet, flow patterns covering greater than 50% of the soil surface, rills between 0.5 and 1 inch deep, gullies with 2% to 5% showing active erosion, and a high rate of soil movement.

#### Browse

The key browse species is Wyoming big sagebrush. It provided 19% cover in 2006 at a density of 3,440 plants/acre. Young plants made up 24%, decadent plants made up 33%, and plants classified as decadent made up 19% of the population. Seedlings were abundant at 800/acre. Use was light and the average annual leader growth was 1.6 inches. Broom snakeweed and prickly pear cactus were also sampled in low numbers.

#### Herbaceous Understory

The herbaceous understory is sparse and not diverse. Two grass and four forb species were sampled in 2006. All six species provided less than 1% cover combined and the combined quadrat frequency was 27%.

The 2006 Desirable Components Index score was good due to excellent browse cover, good browse recruitment, but also has low perennial grass and forb cover.

2006 winter range condition (DC Index) – good (47) Low potential scale

#### HERBACEOUS TRENDS --

Management unit 23R, Study no: 11

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	Oryzopsis hymenoides	7	.04
G	Sitanion hystrix	22	.31
Total for Annual Grasses		0	0
Total for Perennial Grasses		29	0.35
Total for Grasses		29	0.35
F	Astragalus lentiginosus	3	.03
F	Caulanthus crassicaulis	2	.01
F	Descurainia pinnata (a)	36	.51
F	Ipomopsis aggregata	3	.02

T y p e	Species	Nested Frequency	Average Cover %
		'06	'06
	Total for Annual Forbs	36	0.50
	Total for Perennial Forbs	8	0.06
	Total for Forbs	44	0.56

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

**BROWSE TRENDS --**

Management unit 23R, Study no: 11

T y p e	Species	Strip Frequency	Average Cover %
		'06	'06
B	Artemisia tridentata wyomingensis	82	19.25
B	Gutierrezia sarothrae	0	-
B	Opuntia sp.	0	.03
	Total for Browse	82	19.28

**CANOPY COVER, LINE INTERCEPT --**

Management unit 23R, Study no: 11

Species	Percent Cover
	'06
Artemisia tridentata wyomingensis	21.73
Opuntia sp.	.16

**KEY BROWSE ANNUAL LEADER GROWTH --**

Management unit 23R, Study no: 11

Species	Average leader growth (in)
	'06
Artemisia tridentata wyomingensis	1.6

**BASIC COVER --**

Management unit 23R, Study no: 11

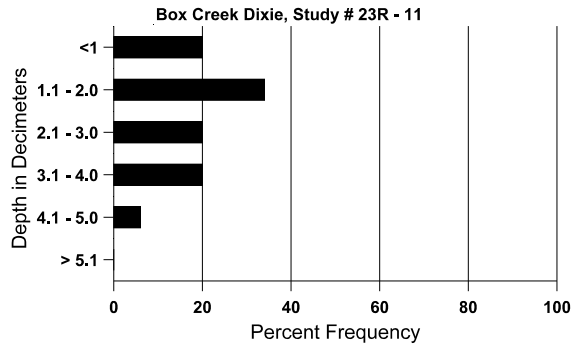
Cover Type	Average Cover % '06
Vegetation	19.60
Rock	5.97
Pavement	26.96
Litter	23.73
Cryptogams	1.20
Bare Ground	34.43

**SOIL ANALYSIS DATA --**

Herd Unit 23R, Study # 11, Study Name: Box Creek Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
13.39	73.2 (13.94)	7.4	46.0	29.1	24.9	1.6	15.74	163.2	0.6

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 23R, Study no: 11

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	65	-
Deer	12	12 (30)



BROWSE CHARACTERISTICS --  
 Management unit 23R, Study no: 11

		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>Artemisia tridentata wyomingensis</i>												
06	<b>3440</b>	800	840	1480	1120	1240	3	2	33	19	19	25/38
<i>Gutierrezia sarothrae</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	5/9
<i>Opuntia sp.</i>												
06	<b>0</b>	20	-	-	-	-	0	0	-	-	0	4/9

Trend Study 30R-2-06

Study site name: Square Fire Rehab.

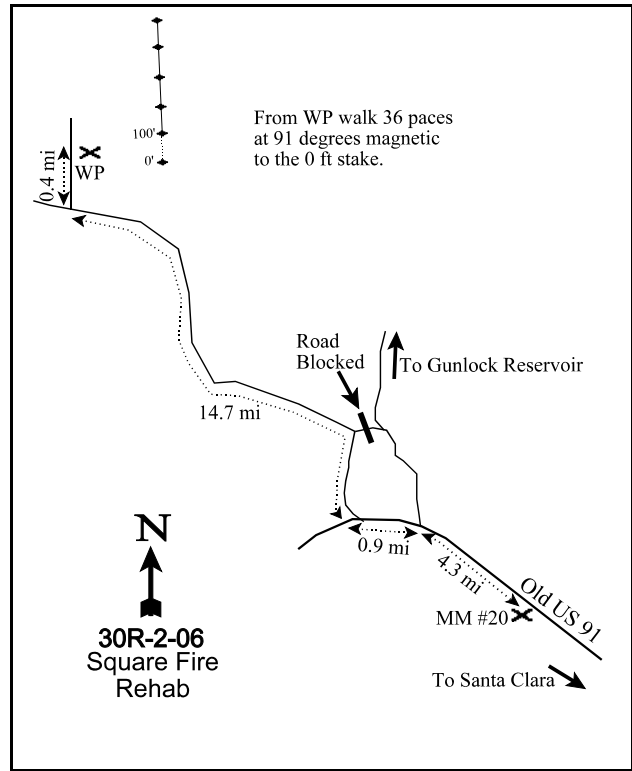
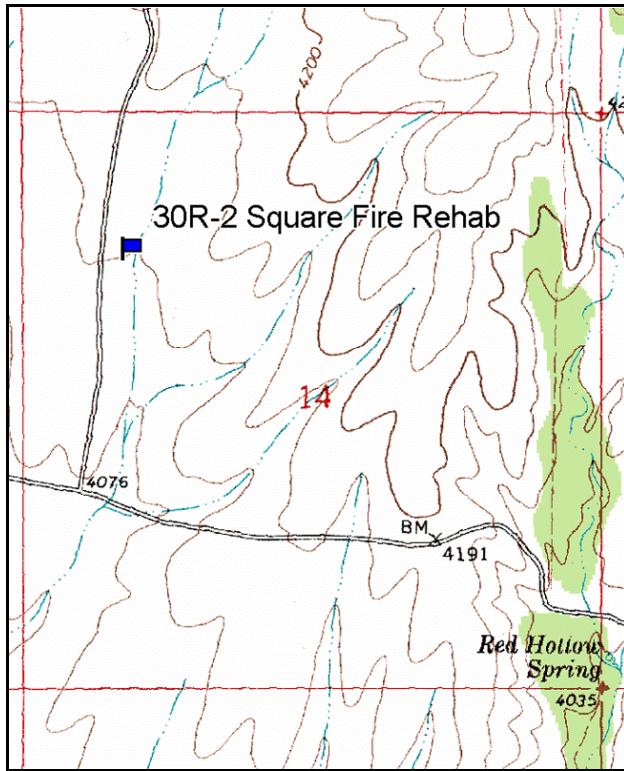
Vegetation type: Burn.

Compass bearing: frequency baseline 353 degrees magnetic.

Frequency belt placement: line 1(11 ft), line 2(34 ft), line 3(59 ft), line 4(71 ft), line 5(95 ft).  
No Rebar.

LOCATION DESCRIPTION

From mile marker 20 on Old US 91 drive north west 4.3 miles to a fork. Turn left and drive 0.9 miles to another fork. Take a right and drive 14.7 miles to a road on the right. Turn here and drive 0.4 miles to a witness post on the right. From the witness post walk 36 paces at 91 degrees magnetic to the 0 foot stake marked with browse tag #171.



Map name: Motoqua

Diagrammatic Sketch

Township 40S , Range 19W , Section 14 .

UTM (NAD 83) 12S 4133535N 238660E

## DISCUSSION

### Square Fire Rehab - Study No. 30R-2

#### Study Information

This study is located in an area approximately 14 miles northwest of Shivwits (elevation: 4,100 feet, slope: 1%, aspect: south). It was established to monitor a 16,368-acre burn that occurred in 2004 and was revegetated the following fall. The burn area was chained and seeded with a standard BLM mix, then aerially seeded with forage kochia (1 lb/acre). The study was established in July 2006, following the fire and revegetation. It is located within mule deer winter range. The 2006 pellet group data estimates were 3 deer days use/acre (8 ddu/ha).

#### Soil

The soil is a Cave very gravelly sandy loam. The Cave series is found on fan terraces, fan piedmonts, and stream terraces. It is made of very shallow and shallow to a hardpan, well drained soil formed in mixed alluvium (USDA-NRCS 2006). The effective rooting depth is 8 inches with some rock in the profile. The soil texture is a loam with a mildly alkaline pH (7.5). Relative bare ground cover was 37% in 2006 and the ratio of the nested frequency of bare ground to protective ground cover (vegetation, litter, and cryptogam) was 1:2.1. The combined relative cover of vegetation and litter was 47% in 2006. The 2006 soil erosion condition rating was slight due to slight surface litter movement, slight surface rock movement, 2 to 5 pedestals per 100 square feet, flow patterns covering between 2% to 10% of the surface area, rills less than 0.5 inch deep, and slight soil movement.

#### Browse

The key browse species was blackbrush before the burn, but was forage kochia following. Kochia cover was 8% in 2006 with a very high density of 60,680 plants/acre. Most of the population (81%) were young, none were decadent or dying. Seedlings were also abundant at 6,140 plants/acre. Use was light and the average annual leader growth was 2.4 inches in 2006. It will be interesting to monitor the self-thinning of this kochia population as the plants mature. Other species sampled in lower densities include blackbrush, Nevada ephedra, broom snakeweed, prickly pear cactus, desert peach, antelope bitterbrush, currant, and banana yucca.

#### Herbaceous Understory

The understory is dominated by annuals, despite the high kochia abundance. Five species of grasses were sampled in 2006, three of which were weedy annuals. Annual grasses provided 7% cover, 97% of grass cover and 57% of the herbaceous cover. Cheatgrass was the dominant grass with 7% cover and 100% quadrat frequency. Red brome was also sampled, but provided less than 1% cover with a quadrat frequency of 41%. Nineteen species of forbs were sampled in 2006, twelve of which were annuals. Forbs provided 5% cover in 2006, 4% cover was provided by annuals. Woolly plantain was the most abundant. It provided 3% cover (23% of herbaceous cover) with a quadrat frequency of 97%.

It should be interesting to see if the kochia is able to out-compete the cheatgrass and other annuals.

The 2006 Desirable Components Index score was fair due to moderate browse cover, low browse decadence, high browse recruitment, but also has low perennial grass and forb cover and low annual grass cover.

2006 winter range condition (DC Index) – fair (47) Low potential scale

HERBACEOUS TRENDS --  
Management unit 30R, Study no: 2

Type	Species	Nested Frequency	Average Cover %
		'06	'06
G	<i>Bouteloua curtipendula</i>	36	.17
G	<i>Bromus rubens</i> (a)	113	.36
G	<i>Bromus tectorum</i> (a)	399	7.00
G	<i>Sporobolus cryptandrus</i>	3	.03
G	<i>Vulpia octoflora</i> (a)	11	.02
Total for Annual Grasses		523	7.39
Total for Perennial Grasses		39	0.20
Total for Grasses		562	7.59
F	<i>Alyssum alyssoides</i> (a)	1	.00
F	<i>Astragalus</i> sp.	3	.01
F	<i>Convolvulus arvensis</i>	3	.03
F	<i>Collomia linearis</i> (a)	50	.14
F	<i>Descurainia pinnata</i> (a)	5	.01
F	<i>Draba</i> sp. (a)	6	.01
F	<i>Eriogonum cernuum</i> (a)	3	.00
F	<i>Erodium cicutarium</i> (a)	42	.84
F	<i>Euphorbia</i> sp.	29	.08
F	<i>Lappula occidentalis</i> (a)	1	.00
F	<i>Lepidium</i> sp. (a)	78	.20
F	<i>Linum lewisii</i>	60	.28
F	<i>Plantago patagonica</i> (a)	372	3.01
F	<i>Ranunculus testiculatus</i> (a)	2	.00
F	<i>Salsola iberica</i> (a)	4	.03
F	<i>Sanguisorba minor</i>	32	.44
F	<i>Sphaeralcea grossulariifolia</i>	5	.22
F	Unknown forb-annual (a)	3	.00
F	<i>Verbena bracteata</i>	-	.03
Total for Annual Forbs		567	4.28
Total for Perennial Forbs		132	1.09
Total for Forbs		699	5.38

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

BROWSE TRENDS --

Management unit 30R, Study no: 2

Type	Species	Strip Frequency	Average Cover %
		'06	'06
B	Coleogyne ramosissima	1	.01
B	Ephedra nevadensis	3	.03
B	Gutierrezia sarothrae	34	.87
B	Kochia prostrata	99	8.44
B	Opuntia sp.	0	-
B	Prunus fasciculata	17	1.14
B	Purshia tridentata	0	-
B	Ribes sp.	1	-
B	Yucca baccata	1	-
Total for Browse		156	10.51

CANOPY COVER, LINE INTERCEPT --

Management unit 30R, Study no: 2

Species	Percent Cover
	'06
Ephedra nevadensis	.30
Gutierrezia sarothrae	2.16
Kochia prostrata	12.25
Prunus fasciculata	2.75

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30R, Study no: 2

Species	Average leader growth (in)
	'06
Kochia prostrata	2.4

BASIC COVER --

Management unit 30R, Study no: 2

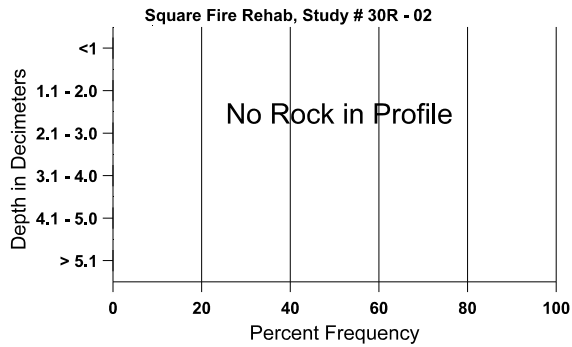
Cover Type	Average Cover % '06
Vegetation	22.92
Rock	4.61
Pavement	13.99
Litter	29.09
Cryptogams	.00
Bare Ground	40.68

SOIL ANALYSIS DATA --

Herd Unit 30R, Study # 2, Study Name: Square Fire Rehab

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
8.46	88.6 (8.5)	7.5	49.0	28.1	22.9	0.7	19.1	236.8	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 30R, Study no: 2

Type	Quadrat Frequency '06	Days use per acre (ha) '06
Rabbit	78	-
Deer	8	3 (8)
Cattle	1	-

BROWSE CHARACTERISTICS --  
 Management unit 30R, Study no: 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)
<i>Coleogyne ramosissima</i>												
06	<b>20</b>	40	-	-	20	-	0	0	100	100	100	26/40
<i>Ephedra nevadensis</i>												
06	<b>140</b>	-	40	100	-	20	0	0	-	-	86	19/25
<i>Gutierrezia sarothrae</i>												
06	<b>1680</b>	100	120	1560	-	-	4	0	-	-	0	10/12
<i>Kochia prostrata</i>												
06	<b>60680</b>	6140	49420	11260	-	-	.03	0	-	-	0	7/10
<i>Opuntia sp.</i>												
06	<b>0</b>	-	-	-	-	20	0	0	-	-	0	9/25
<i>Prunus fasciculata</i>												
06	<b>380</b>	-	120	260	-	-	5	0	-	-	0	24/39
<i>Purshia tridentata</i>												
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	12/22
<i>Ribes sp.</i>												
06	<b>60</b>	-	-	60	-	-	0	0	-	-	0	-/-
<i>Yucca baccata</i>												
06	<b>20</b>	-	-	20	-	-	0	0	-	-	0	13/28