

Trend Study 1R-2-04

Study site name: Rattlesnake Fire Seeded .

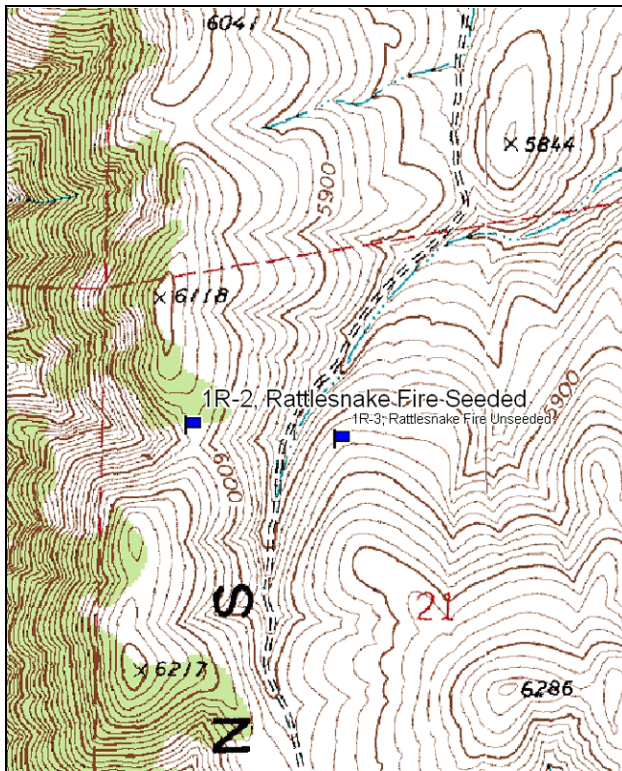
Vegetation type: Burn/Perennial Grass .

Compass bearing: frequency baseline 180 degrees magnetic.

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

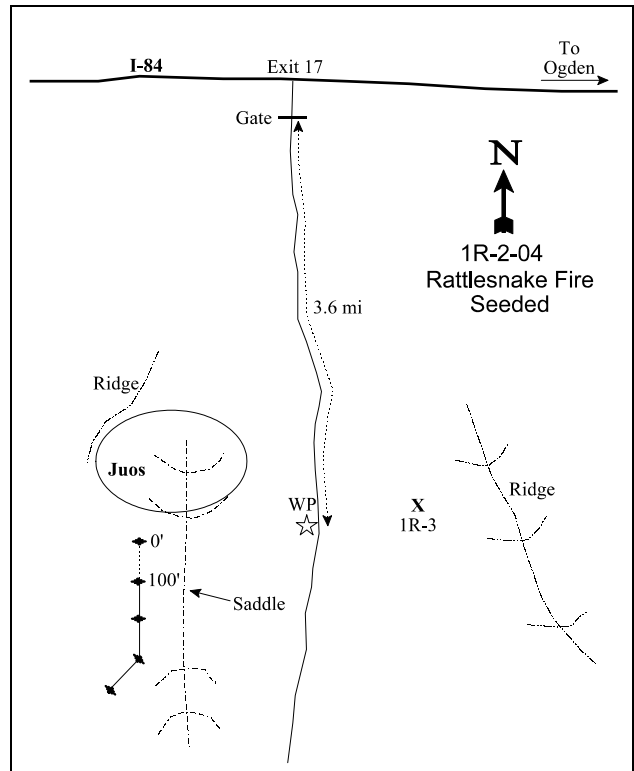
LOCATION DESCRIPTION

Take Exit 17 off of I-84 and pass through a gate. Travel south for 3.6 miles to a witness post on the right hand side of the road. The baseline is to the right (west) of the witness post and is on top of the saddle right outside of a clump of Juniper trees. The 0-foot post is marked with browse tag #30.



Map Name: Bulls Pass

Township 13N , Range 6W , Section 21



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4633737 N, 371351 E

## DISCUSSION

### Rattlesnake Fire Seeded - Trend Study No. 1R-02

Rattlesnake Fire Seeded is part of a two-treatment study on a burn that occurred in 2003 on the north end of the Promontory Mountains 3.5 miles south of I-15. This study site was established on the portion of the burn that was drill seeded in the fall of 2003. The comparison study site, Rattlesnake Fire Unseeded (1R-03), was established on an untreated portion of the burn to the west. This study site is located on a 20-30% slope with a western aspect, at an elevation of 5,900 feet. Wildlife use was estimated at 15 deer days use/acre (38 ddu/ha), most of which were at least a year old.

The soil is a shallow sandy clay loam with an effective rooting depth of about 11 inches. Phosphorus and potassium concentrations were high following the burn (Tiedemann and Lopez 2004). The soil pH is neutral (7.0). Rock and pavement are prevalent in the upper 4 inches and on the surface of the soil. Surface pavement cover was moderately high in 2004, likely a product of the 2003 fire. In 2004, bare ground cover was 44%, vegetation cover was 29%, and litter cover was only 10%. Despite the fire in 2003, the erosion state was stable in 2004.

Previous to the fire, mountain big sagebrush had been the dominant browse species. After the fire, sagebrush provided 1/100<sup>th</sup> of a percent cover in 2004. Only 80 sagebrush plants/acre were sampled, 60 of which were young individuals. One-fourth of the individuals were decadent. There were 360 seedlings/acre sampled, none of which had been seeded on the site. Stickyleaf low rabbitbrush was the dominant browse species after the fire with 3,540 plants/acre and 2% cover. Ninety-five percent of the individuals were mature and 5% were young. Snowberry and gray horsebrush were also present, but in low numbers. Whitestem rubber rabbitbrush had been seeded on the treatment, but had not yet established.

The grasses sampled in 2004 consist of bluebunch wheatgrass, cheatgrass, orchardgrass, mutton bluegrass, and Sandberg's bluegrass. Perennial grasses provided 13% cover in 2004. Bluebunch and Sandberg's bluegrass were the dominant grass species. Bluebunch, which was seeded on the treatment, provided 8% cover. Orchardgrass was also seeded on the treatment and provided only three-hundredths of one percent. Sandberg's bluegrass provided 4% cover. Cheatgrass provided less than 1% cover with a quadrat frequency of 35%.

The forb diversity is high. Ten annual and 20 perennial forb species were sampled in 2004. Perennial species provided nearly 5% cover. Annuals provided nearly 8% cover. None of the perennial species provided more than 1% cover individually. Two species, western yarrow and small burnet, had been included in the seed mix. Annuals provided most of the forb cover in 2004.

### 2004 Post-treatment Site Assessment

After the first growing season following the fire and seeding, only 4 of the 13 species seeded on the treatment have established (Bluebunch wheatgrass, orchardgrass, western yarrow, and small burnet). Vegetation cover is low and bare ground cover is still high. Forb cover is predominantly that of annuals. Very little mountain big sagebrush has survived the burn, although some natural seeding has taken place. Stickyleaf rabbitbrush is the dominant browse species, most of which are mature individuals. Whitestem rubber rabbitbrush, seeded in the treatment, has not yet established. The soil, despite the fire, showed little erosion. The Desirable Components Index score was poor to fair due to good perennial grass and forb cover, although there was no shrub cover.

2005 winter range condition (DC Index) – poor to fair (34) Mid-level potential scale

The following seed mix was drill seeded in the fall of 2003:

Seed Species	Bulk lbs in mix	Percent of Mix
Crested Wheatgrass "Douglas	450	3
Crested Wheatgrass "Hycrest"	1550	10
Western Wheatgrass "Arriba"	2000	13
Snake River Wheatgrass "Secar"	255	2
Bluebunch Wheatgrass "Goldar"	1750	11
Orchardgrass "Paiute"	2000	13
Russian Wildrye "Bozoisky"	350	2
Sheep Fescue	526	3
Western Yarrow	300	2
Alalfa "Ladak+"	2000	13
Sainfoin	2000	13
Small Burnet "Delar"	2500	16
<b>Total</b>	<b>15681</b>	<b>100</b>

HERBACEOUS TRENDS --

Management unit 01R, Study no: 2

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron spicatum	254	8.46
G	Bromus tectorum (a)	86	.82
G	Dactylis glomerata	5	.03
G	Poa fendleriana	21	.40
G	Poa secunda	188	3.96
Total for Annual Grasses		86	0.82
Total for Perennial Grasses		468	12.85
Total for Grasses		554	13.68
F	Achillea millefolium	5	.06
F	Agoseris glauca	83	.45
F	Alyssum alyssoides (a)	13	.04
F	Allium spp.	115	.52
F	Astragalus convallarius	11	.11
F	Astragalus spp.	16	.10
F	Astragalus utahensis	3	.00
F	Balsamorhiza sagittata	-	.03
F	Borago spp.	6	.21
F	Calochortus nuttallii	26	.09
F	Cirsium spp.	8	.22
F	Collomia linearis (a)	39	.14
F	Collinsia parviflora (a)	3	.00
F	Cymopterus spp.	44	.60

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
F	<i>Descurainia pinnata</i> (a)	9	.05
F	<i>Helianthus annuus</i> (a)	-	.15
F	<i>Hedysarum boreale</i>	3	.04
F	<i>Lappula occidentalis</i> (a)	11	.16
F	<i>Lactuca serriola</i>	8	.08
F	<i>Lomatium</i> spp.	-	.01
F	<i>Lupinus argenteus</i>	28	.70
F	<i>Lupinus</i> spp.	10	.54
F	<i>Mentzelia</i> spp.	2	.01
F	<i>Microsteris gracilis</i> (a)	8	.02
F	<i>Phlox austromontana</i>	24	.61
F	<i>Phlox longifolia</i>	19	.07
F	<i>Polygonum douglasii</i> (a)	2	.01
F	<i>Sanguisorba minor</i>	3	.01
F	<i>Sisymbrium altissimum</i> (a)	26	3.22
F	<i>Veronica biloba</i> (a)	277	3.81
Total for Annual Forbs		388	7.61
Total for Perennial Forbs		414	4.50
Total for Forbs		802	12.12

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

BROWSE TRENDS --

Management unit 01R, Study no: 2

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia tridentata vaseyana</i>	3	.01
B	<i>Chrysothamnus viscidiflorus</i> <i>viscidiflorus</i>	59	2.15
B	<i>Symphoricarpos oreophilus</i>	0	-
B	<i>Tetradymia canescens</i>	0	-
Total for Browse		62	2.16

CANOPY COVER, LINE INTERCEPT --  
 Management unit 01R, Study no: 2

Species	Percent Cover
	'04
Chrysothamnus viscidiflorus viscidiflorus	2.38

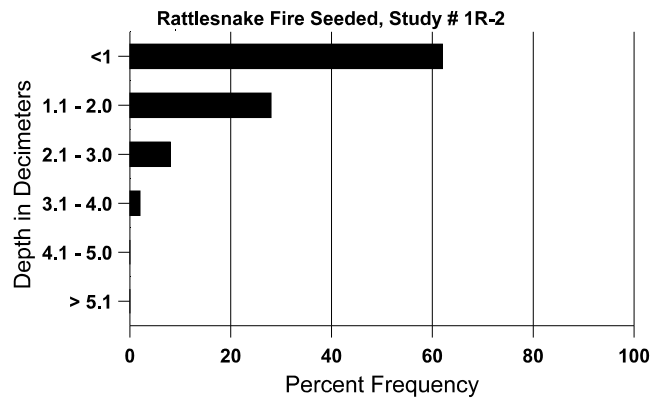
BASIC COVER --  
 Management unit 01R, Study no: 2

Cover Type	Average Cover %
	'04
Vegetation	29.43
Rock	6.19
Pavement	18.62
Litter	10.44
Cryptogams	.13
Bare Ground	43.52

SOIL ANALYSIS DATA --  
 Management unit 1R, Study no: 2, Study Name: Rattlesnake Fire Seeded

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.4	60.2 (14.1)	7.0	47.2	38.6	14.2	4.1	13.5	291.2	0.6

## Stoniness Index



PELLET GROUP DATA --  
 Management unit 01R, Study no: 2

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	1	-
Deer	5	15 (38)

BROWSE CHARACTERISTICS --  
 Management unit 01R, 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>												
04	<b>80</b>	360	60	-	20	520	0	25	25	-	0	9/19
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>3540</b>	300	160	3360	20	-	0	0	1	-	0	11/11
<i>Symphoricarpos oreophilus</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	10/21
<i>Tetradymia canescens</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	8/10

Trend Study 1R-3-04

Study site name: Rattlesnake Fire Unseeded .

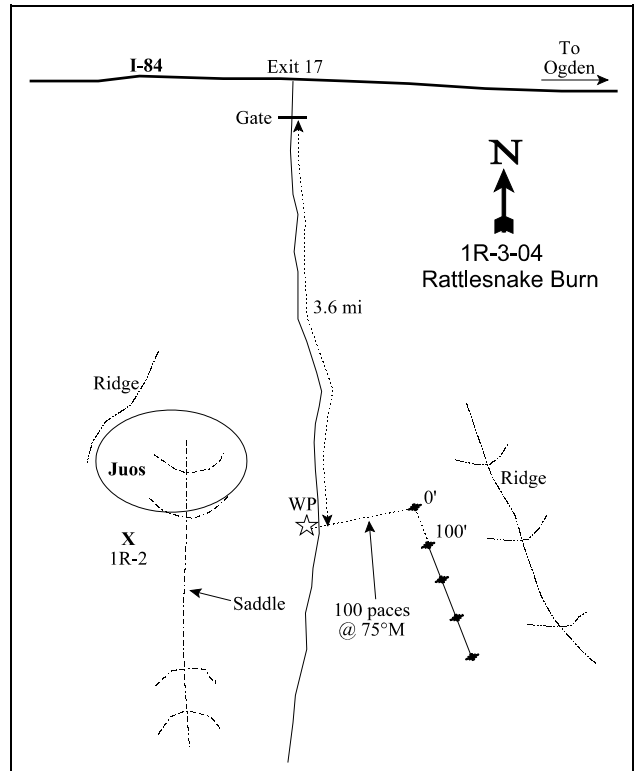
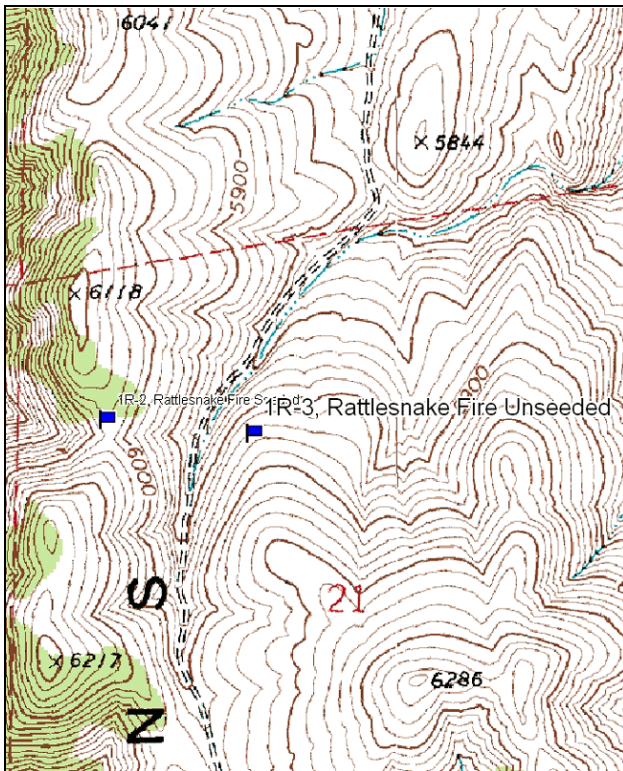
Vegetation type: Burn/Perennial Grass .

Compass bearing: frequency baseline 158 degrees magnetic.

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

LOCATION DESCRIPTION

Take Exit 17 off of I-84 and pass through a gate. Travel south for 3.6 miles to a witness post on the right hand side of the road. The beginning of the baseline is to the left of the witness post about 100 paces at 75°M. The 0-foot stake is marked with browse tag #31.



Map Name: Bulls Pass

Diagrammatic Sketch

Township 13N , Range 6W , Section 21

GPS: NAD 27, UTM 12T 4633702 N, 371677 E

## DISCUSSION

### Rattlesnake Fire Unseeded – Trend Study No. 1R-03

Rattlesnake Fire Unseeded is the untreated comparison study to Rattlesnake Fire Seeded (1R-02). It is located 1/5 mile west of the seeded study on an area that was not treated. It too is part of the fire that occurred in the northern Promontory Mountains in 2003. The study site is located on a northwest aspect with a 23% slope at 5,930 feet, quite similar to the comparison study. Wildlife use was lower than that of the comparison study at an estimated 5 deer days use/acre (13 ddu/ha).

The soil is a shallow stony loam with an effective rooting depth of around 11 inches. Soil phosphorus concentration was marginal and potassium was high in 2004 (Tiedemann and Lopez 2004). The soil pH is neutral at 7.0. The majority of rock and pavement were sampled in the upper 12 inches of the soil profile. Combined surface rock and pavement cover was 17% in 2004. In 2004, vegetation cover was 29%, litter cover was 19%, and bare ground cover was 43%. The erosion condition was considered stable in 2004.

The composition of browse species is slightly higher on this study than the comparison study. Six browse species were sampled: mountain big sagebrush, rubber rabbitbrush, stickyleaf rabbitbrush, corymbed eriogonum, broom snakeweed, and gray horsebrush. Stickyleaf rabbitbrush was dominant in 2004 with nearly 3% cover. The other browse species combined provided less than 1% cover. Mountain big sagebrush was sampled in the density measurements at 60 plants/acre, 40 of which were young individuals. Stickyleaf rabbitbrush density was 4,220 plants/acre, 95% of which were mature individuals, similar to the seeded study.

The grass diversity is low. Only four grass species were sampled in 2004: Bluebunch wheatgrass, cheatgrass, mutton bluegrass, and Sandberg's bluegrass. The dominant grasses were bluebunch, which provided 9% cover, and Sandberg's bluegrass, which provided 4% cover. Cheatgrass provided only 1% cover, but was sampled in 62% of the quadrats. Cheatgrass was distributed in small densities over much of the sampling area and can, and will likely, continue to increase.

The forb diversity is lower than that of the treated comparison site. Twelve perennial and 8 annual forbs were sampled in 2004. Perennial species provided nearly 5% cover and annuals provided over 3%. Silvery lupine and bilobed speedwell were the dominant forb species. Lupine provided nearly 2% cover and the speedwell nearly 3%.

### 2004 Post-treatment Site Assessment

When comparing the seeded and unseeded studies, there are few differences in composition and density of herbaceous species between the two sites. The only difference in grass composition is that orchardgrass was sampled on the seeded site in small numbers. Fewer perennial forbs, eight species, and two fewer annual forbs were sampled on the unseeded study. Only one of the seeded forb species, small burnet, was sampled on the treated area than on the unseeded. Bare ground and vegetation cover were identical on both studies. More total browse cover was sampled on the unseeded area, but the dominant browse species, stickyleaf rabbitbrush, cover was very similar between the treatments. The Desirable Components Index rating was poor to fair due to no browse cover, good perennial grass cover, and excellent perennial forb cover.

2005 winter range condition (DC Index) – poor to fair (34) Mid-level potential scale



HERBACEOUS TRENDS --  
Management unit 01R, Study no: 3

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	<i>Agropyron spicatum</i>	292	9.10
G	<i>Bromus tectorum</i> (a)	189	1.08
G	<i>Poa fendleriana</i>	2	.03
G	<i>Poa secunda</i>	233	3.80
Total for Annual Grasses		189	1.08
Total for Perennial Grasses		527	12.94
Total for Grasses		716	14.03
F	<i>Achillea millefolium</i>	7	.19
F	<i>Agoseris glauca</i>	38	.10
F	<i>Alyssum alyssoides</i> (a)	95	.38
F	<i>Allium</i> spp.	89	.35
F	<i>Astragalus convallarius</i>	47	.59
F	<i>Camelina microcarpa</i> (a)	1	.00
F	<i>Calochortus nuttallii</i>	20	.08
F	<i>Chenopodium</i> spp. (a)	6	.01
F	<i>Cymopterus</i> spp.	58	.39
F	<i>Descurainia pinnata</i> (a)	19	.19
F	<i>Lactuca serriola</i>	8	.05
F	<i>Lupinus argenteus</i>	31	1.52
F	<i>Lupinus</i> spp.	20	.66
F	<i>Phlox austromontana</i>	28	.24
F	<i>Phlox longifolia</i>	89	.33
F	<i>Polygonum douglasii</i> (a)	1	.00
F	<i>Ranunculus testiculatus</i> (a)	2	.00
F	<i>Sisymbrium altissimum</i> (a)	2	.00
F	<i>Tragopogon dubius</i>	3	.15
F	<i>Veronica biloba</i> (a)	304	2.84
Total for Annual Forbs		430	3.46
Total for Perennial Forbs		438	4.68
Total for Forbs		868	8.14

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

BROWSE TRENDS --

Management unit 01R, Study no: 3

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata vaseyana	2	-
B	Chrysothamnus nauseosus	1	.00
B	Chrysothamnus viscidiflorus viscidiflorus	71	2.75
B	Eriogonum corymbosum	4	.03
B	Gutierrezia sarothrae	1	.00
B	Tetradymia canescens	26	.92
Total for Browse		105	3.71

CANOPY COVER, LINE INTERCEPT --

Management unit 01R, Study no: 3

Species	Percent Cover
	'04
Chrysothamnus nauseosus	.13
Chrysothamnus viscidiflorus viscidiflorus	3.70
Tetradymia canescens	1.03

BASIC COVER --

Management unit 01R, Study no: 3

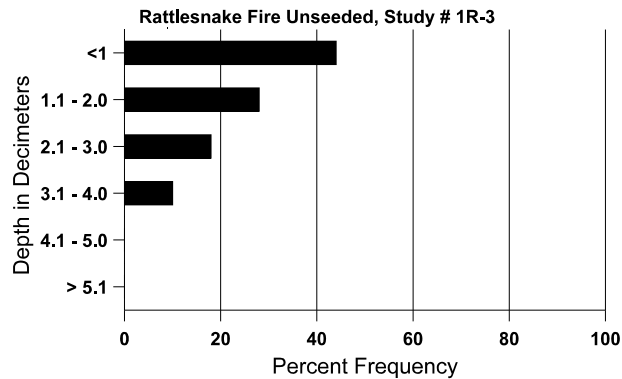
Cover Type	Average Cover %
	'04
Vegetation	29.12
Rock	4.49
Pavement	12.78
Litter	18.79
Bare Ground	42.95

SOIL ANALYSIS DATA --

Management unit 1R, Study no: 3, Study Name: Rattlesnake Fire Unseeded

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.9	64.2 (12.6)	7.0	47.2	38.6	14.2	5.1	13.5	291.2	0.6

# Stoniness Index



PELLET GROUP DATA --  
Management unit 01R, Study no: 3

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	1	-
Deer	-	5 (13)

BROWSE CHARACTERISTICS --  
Management unit 01R, 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>												
04	<b>60</b>	60	40	20	-	1080	0	0	-	-	0	35/42
<i>Chrysothamnus nauseosus</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	17/18
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>4220</b>	4160	160	4020	40	720	0	0	1	-	0	11/13
<i>Eriogonum corymbosum</i>												
04	<b>140</b>	-	-	140	-	-	0	0	-	-	0	8/10
<i>Gutierrezia sarothrae</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	7/5
<i>Tetradymia canescens</i>												
04	<b>1380</b>	-	260	1120	-	-	0	0	-	-	0	11/16

Trend Study 2R-9-04

Study site name: Rabbit Creek Burn.

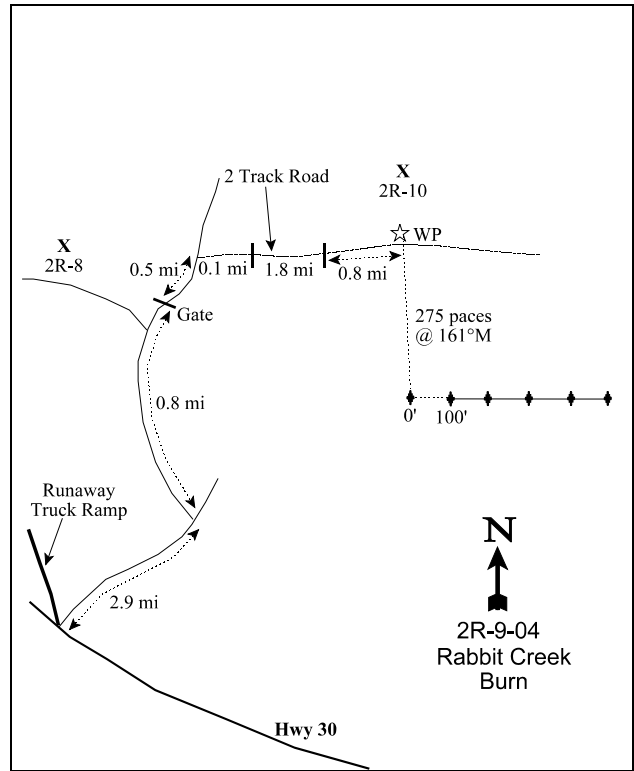
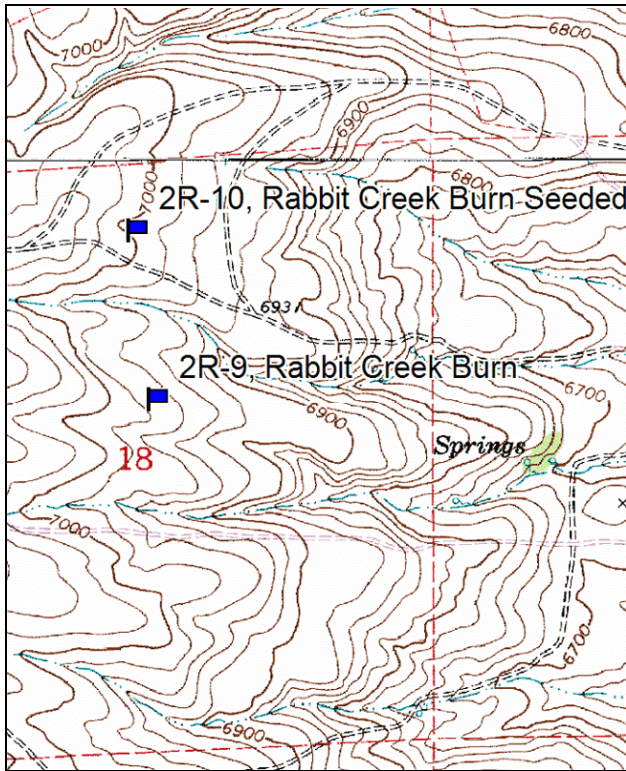
Vegetation type: Burn/Perennial Grass.

Compass bearing: frequency baseline 76 degrees magnetic.

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

LOCATION DESCRIPTION

Traveling on Highway 30, toward Bear Lake from Sage Creek Junction, turn right on a road that turns off the highway along with a runaway truck ramp. The road turns to the west of the ramp. Follow this road for 2.9 miles to a road that comes in on the left. Turn here and travel 0.8 miles, staying right at the fork, to a gate. Continue 0.5 miles to a two-track road on the right. Turn onto this and follow it for 0.1 miles to a gate, continue 1.8 miles to another gate. Then travel 0.8 miles to the witness post on the left side of the road. The 0-foot post is 275 paces at 161°M from the witness post, and is marked with browse tag #33.



Map Name: Sage Creek

Diagrammatic Sketch

Township 13N , Range 7E , Section 18

GPS: NAD 27, UTM 12T 4635007 N, 483789 E

## DISCUSSION

### Rabbit Creek Burn - Trend Study No. 2R-9

This study was established on private land in 2004 to monitor the vegetation response to the naturally caused fire which burned about 800 acres in the fall of 2003. This study area was not rehabilitated. One third of a mile to the north is study 2R-10 which was drill seeded after the fire. Prior to the fire this area was dominated by Wyoming big sagebrush. The study is located at an elevation of 7,000 feet with an eastern aspect. The slope is 4-7%. This area is important habitat for antelope, wintering deer, and sage grouse. About a dozen sage grouse were seen west of the study in some unburned sagebrush. Cattle also graze the area. A pellet group transect along the baseline in 2004 estimated 1 cow days use/acre (2 cdu/ha). Sage grouse pellets were sampled in 1% of the quadrats.

The effective rooting depth is shallow at 14 inches. Texture is silt loam and pH is neutral at 6.8. Soil phosphorus is marginal at only 7 ppm, which may be limiting to plant growth and development (Tiedemann and Lopez 2004). Bare ground was high (over 50%) after the fire, but an erosion condition class rating rated erosion as stable. Much of the soil surface is covered by pavement.

Wyoming big sagebrush was the dominant browse species prior to the burn. It provided important habitat for sage grouse. Only a few remnant plants survived the fire and no plants were sampled in 2004. No preferred browse species were present after the fire. Stickyleaf low rabbitbrush was the most abundant species in 2004. This species resprouts after fire. Rabbitbrush density was 8,340 plants/acre in 2004, which provided about 4% cover. Other species found in 2004 include: corymbed buckwheat, snowberry, and gray horsebrush.

The herbaceous understory was diverse and abundant, especially considering 2004 was the first growing season after the fire. Six perennial grass species were sampled. Western wheatgrass was the most abundant as it was sampled in 79% of the quadrats and cover was 4%. Mutton bluegrass and Sandberg bluegrass were both sampled in 26% and 23% of the quadrats respectively. Cheatgrass was the only annual species sampled and was only found in 1% of the quadrats. Hopefully, competition from the perennial species can keep cheatgrass to a minimum. Forbs were very diverse in 2004 with 33 species sampled. Pale agoseris, an astragalus, thistle, and clover were the most abundant species with each having more than 1% cover.

### 2004 winter range condition (DC Index) - Poor (22) Lower Potential scale

#### HERBACEOUS TRENDS --

Management unit 02R, Study no: 9

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron smithii	271	4.30
G	Agropyron spicatum	1	.03
G	Bromus tectorum (a)	1	.00
G	Poa fendleriana	64	1.07
G	Poa secunda	60	.40
G	Sitanion hystrix	6	.04
G	Stipa lettermani	7	.01
Total for Annual Grasses		1	0.00
Total for Perennial Grasses		409	5.86

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
Total for Grasses		410	5.86
F	Agoseris glauca	174	1.14
F	Alyssum alyssoides (a)	3	.00
F	Allium spp.	8	.01
F	Antennaria rosea	3	.00
F	Astragalus cibarius	2	.03
F	Astragalus convallarius	24	.15
F	Astragalus spp.	123	1.93
F	Calochortus nuttallii	5	.01
F	Chenopodium album (a)	2	.01
F	Chenopodium spp. (a)	3	.00
F	Chenopodium fremontii (a)	1	.00
F	Cirsium spp.	52	1.65
F	Collomia linearis (a)	13	.03
F	Collinsia parviflora (a)	8	.01
F	Cordylanthus spp. (a)	6	.01
F	Crepis acuminata	10	.16
F	Descurainia pinnata (a)	26	.48
F	Erigeron corymbosus	37	.66
F	Gayophytum ramosissimum(a)	3	.04
F	Lomatium spp.	13	.25
F	Lupinus argenteus	4	.03
F	Microsteris gracilis (a)	2	.00
F	Penstemon radicosus	24	.10
F	Phlox hoodii	48	.31
F	Phlox longifolia	72	.28
F	Polygonum douglasii (a)	2	.01
F	Schoenocrambe linifolia	36	.30
F	Senecio integerrimus	15	.11
F	Tragopogon dubius	9	.10
F	Trifolium spp.	146	1.10
F	Veronica biloba (a)	2	.01
F	Viola spp.	5	.01
F	Zigadenus paniculatus	3	.00
Total for Annual Forbs		71	0.63
Total for Perennial Forbs		813	8.40
Total for Forbs		884	9.03

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

BROWSE TRENDS --

Management unit 02R, Study no: 9

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Chrysothamnus viscidiflorus viscidiflorus	88	3.92
B	Eriogonum corybosum	1	-
B	Symphoricarpos oreophilus	5	.15
B	Tetradymia canescens	43	.66
Total for Browse		137	4.73

CANOPY COVER, LINE INTERCEPT --

Management unit 02R, Study no: 9

Species	Percent Cover
	'04
Chrysothamnus viscidiflorus viscidiflorus	4.50
Symphoricarpos oreophilus	.48
Tetradymia canescens	.55

BASIC COVER --

Management unit 02R, Study no: 9

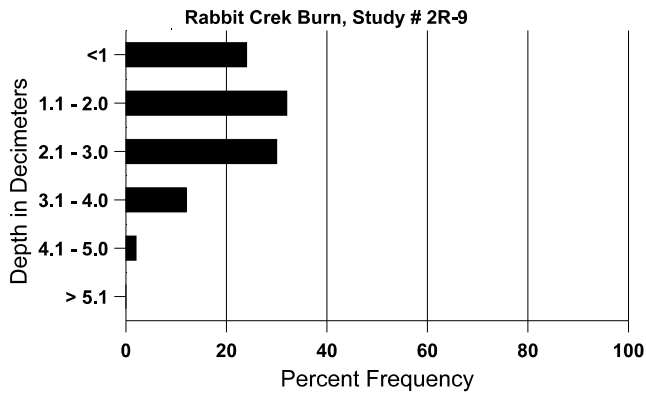
Cover Type	Average Cover %
	'04
Vegetation	22.79
Rock	.59
Pavement	28.48
Litter	1.61
Bare Ground	53.30

SOIL ANALYSIS DATA --

Management unit 2R, Study no: 9, Study Name: Rabbit Creek Burn

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
14.0	59.8 (17.2)	6.8	34.6	47.9	17.5	3.2	7.2	336.0	0.8

# Stoniness Index



## PELLET GROUP DATA --

Management unit 02R, Study no: 9

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	1	-
Grouse	1	-
Cattle	-	1 (2)

## BROWSE CHARACTERISTICS --

Management unit 02R, 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>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>8340</b>	200	5180	3160	-	-	0	0	-	-	0	8/10
<i>Eriogonum corymbosum</i>												
04	<b>20</b>	-	20	-	-	-	0	0	-	-	0	5/7
<i>Symphoricarpos oreophilus</i>												
04	<b>180</b>	-	160	20	-	-	0	0	-	-	0	14/19
<i>Tetradymia canescens</i>												
04	<b>1160</b>	380	920	240	-	-	0	0	-	-	0	7/9



Trend Study 2R-10-04

Study site name: Rabbit Creek Burn Seeded .

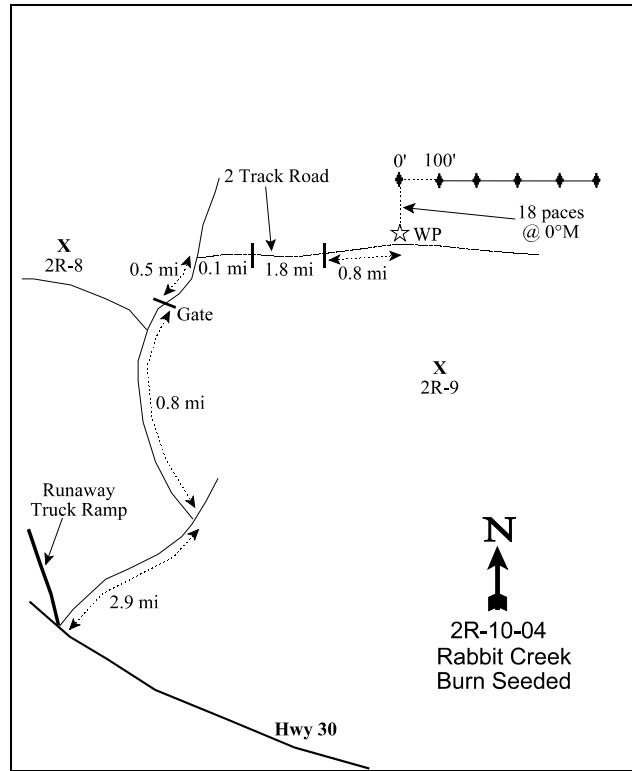
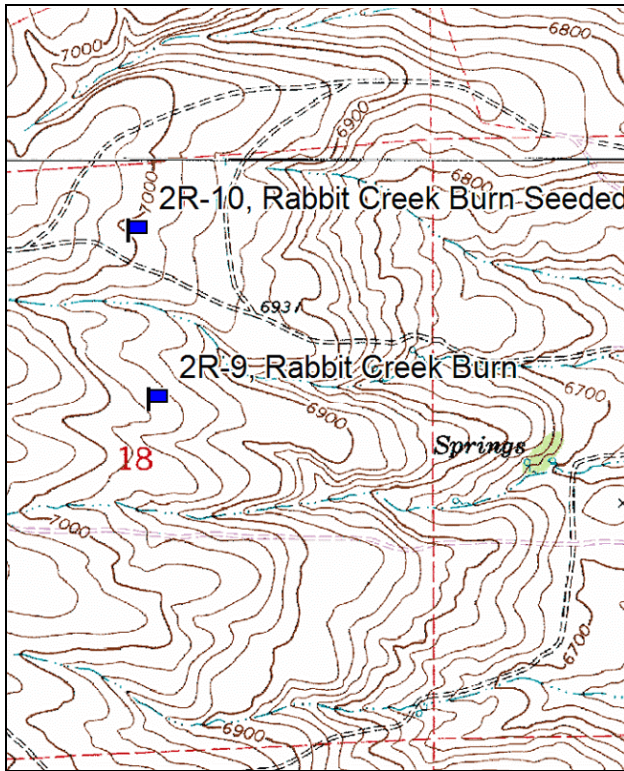
Vegetation type: Burn/Perennial Grass .

Compass bearing: frequency baseline 90 degrees magnetic.

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

LOCATION DESCRIPTION

Traveling on Highway 30, toward Bear Lake from Sage Creek Junction, turn right on a road that turns off the highway along with a runaway truck ramp. The road turns to the west of the ramp. Follow this road for 2.9 miles to a road that comes in on the left. Turn here and travel 0.8 miles, staying right at the fork, to a gate. Continue 0.5 miles to a two-track road on the right. Turn onto this and follow it for 0.1 miles to a gate, continue 1.8 miles to another gate. Then travel 0.8 miles to the witness post on the left side of the road. The 0-foot post is 18 paces at 0°M from the witness post, and is marked with browse tag #34.



Map Name: Sage Creek

Diagrammatic Sketch

Township 13N , Range 7E , Section 18

GPS: NAD 27, UTM 12T 4635470 N, 483734 E

## DISCUSSION

### Rabbit Creek Burn Seeded - Trend Study No. 2R-10

This study was established on private land in 2004 to monitor the vegetation response to the naturally caused fire which burned in the fall of 2003. The burn encompassed 500 acres of private land and 300 acres of BLM land. The private land was drill seeded. Burdett Weston, the private landowner, payed for grass seed and labor, while the DWR supplied the forb and browse seed. The owner agreed to rest the pasture for two growing seasons following the seeding. This area has value for sage grouse and mule deer. A dozen sage grouse were seen just east of the study site in some sagebrush that survived the fire. The study site is located at an elevation of 7,000 feet with an eastern aspect and a slope of 2-5%. A single cow was seen on the site in June of 2004. A pellet group transect along the baseline estimated 1 cow day use/acre (4 cdu/ha).

The effective rooting depth is considered shallow at 13 inches. The soil texture is clay loam with a neutral pH (6.6). An erosion condition class rating rated the site as stable. There was abundant vegetation just a year after the fire to hold the soil in place, but bare ground was high at 65%. This is typical after a fire with a lack of litter.

Wyoming big sagebrush was the dominant browse species prior to the burn and provided important habitat for sage grouse. Only a few remnant plants survived the fire. In 2004, 120 seedlings/acre and 20 young sagebrush plants/acre were sampled. No other preferred browse species were present after the fire. Stickyleaf low rabbitbrush was the most abundant species in 2004. This species resprouts after fire. Rabbitbrush density was 5,780 plants/acre in 2004, which provided about 2% cover. Other species found in 2004 include: corymbed buckwheat, snowberry, and gray horsebrush. Fourwing saltbush and bitterbrush were seeded as part of the mix, but were not sampled in 2004 during the first growing season.

The seed mix also included three grasses and two forbs. During the first growing season in 2004, orchard grass was the most abundant seeded species. It was sampled in 48% of the quadrats with about 2% cover. Intermediate wheatgrass was sampled in 14% of the quadrats with about 0.6% cover. Russian wildrye was not sampled, but may have been difficult to identify during the first growing season. The native, rhizomatous, western wheatgrass was the most abundant grass, found in 75% of the quadrats with 4% cover. Cheatgrass was sampled but was not abundant in 2004. Quadrat frequency was only 8%. Of the two seeded forbs, small burnet was seeded at a higher rate and was found with greater frequency. It was sampled in 47% of the quadrats with cover at about 1.5%. This is quite abundant for this species. Alfalfa was sampled in 21 quadrats. Clover, fleabane, pale agoseris, and an astragalus were native perennial forbs all found with 1% or greater cover.

After one year, the drill seeding appears to have successfully augmented the herbaceous understory. The two studies were quite similar in 2004 with the addition of the seeded species where the burn had been drill seeded. The seeded portion of the burn had slightly higher amounts of grasses and forbs. Perennial grass cover was about 4% higher for the seeded area. Seeded species had about 3% cover in 2004. Perennial forb cover was about 3% higher for the seeded site, while seeded forb cover was 2%. No seeded browse species were sampled, but future monitoring should determine if this was really not successful.

2004 winter range condition (DC Index) - Fair (29) Lower Potential scale

<b>Rabbit Creek Seed Mix</b>	Bulk lbs/acre
Alfalfa, "Ranger"	1.0
Small Burnet, VNS	2.4
Fourwing Saltbush	0.5
Bitterbrush	0.2
Orchardgrass	1.0
Great Basin Wildrye	1.0
Russian Wildrye	2.0
Intermediate Wheatgrass	1.0
<b>Total Bulk lbs/acre</b>	<b>9.1</b>

HERBACEOUS TRENDS --  
Management unit 02R, Study no: 10

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron cristatum	5	.18
G	Agropyron intermedium	30	.63
G	Agropyron smithii	228	4.40
G	Bromus tectorum (a)	14	.24
G	Dactylis glomerata	116	2.22
G	Melica bulbosa	-	.00
G	Oryzopsis hymenoides	3	.00
G	Poa fendleriana	23	.66
G	Poa secunda	41	.98
G	Sitanion hystrix	1	.00
G	Stipa columbiana	15	.39
G	Stipa comata	4	.03
G	Stipa lettermani	16	.12
<b>Total for Annual Grasses</b>		<b>14</b>	<b>0.24</b>
<b>Total for Perennial Grasses</b>		<b>482</b>	<b>9.65</b>
<b>Total for Grasses</b>		<b>496</b>	<b>9.89</b>
F	Achillea millefolium	2	.15
F	Agoseris glauca	124	1.00
F	Allium spp.	-	.00
F	Astragalus cibaricus	15	.97
F	Astragalus convallarius	6	.02
F	Astragalus spp.	104	1.06
F	Calochortus nuttallii	3	.01
F	Chenopodium album (a)	18	.10
F	Chenopodium fremontii (a)	2	.03
F	Chenopodium leptophyllum(a)	1	.00
F	Cirsium spp.	12	.15
F	Collinsia parviflora (a)	52	.39

Type	Species	Nested Frequency	Average Cover %
		'04	'04
F	Cordylanthus spp. (a)	3	.00
F	Crepis acuminata	14	.04
F	Cryptantha spp.	5	.01
F	Descurainia pinnata (a)	129	3.69
F	Draba spp. (a)	1	.03
F	Erigeron corymbosus	82	2.32
F	Erigeron filifolius	8	.15
F	Eriogonum umbellatum	1	.03
F	Gayophytum ramosissimum(a)	4	.03
F	Lactuca serriola	-	.00
F	Linum lewisii	1	.00
F	Medicago sativa	50	.38
F	Microsteris gracilis (a)	2	.01
F	Penstemon radicosus	1	.00
F	Phlox hoodii	24	.14
F	Phlox longifolia	73	.26
F	Polygonum douglasii (a)	25	.18
F	Ranunculus testiculatus (a)	7	.03
F	Sanguisorba minor	110	1.56
F	Schoenocrambe linifolia	14	.55
F	Senecio integerrimus	20	.81
F	Sphaeralcea grossulariaefolia	3	.03
F	Taraxacum officinale	3	.06
F	Tragopogon dubius	-	.00
F	Trifolium spp.	198	1.79
F	Viola spp.	26	.20
Total for Annual Forbs		244	4.51
Total for Perennial Forbs		899	11.78
Total for Forbs		1143	16.30

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

BROWSE TRENDS --

Management unit 02R, Study no: 10

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia tridentata wyomingensis</i>	1	.01
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	80	2.17
B	<i>Eriogonum corymbosum</i>	2	.03
B	<i>Symphoricarpos oreophilus</i>	1	-
B	<i>Tetradymia canescens</i>	26	.27
Total for Browse		110	2.50

CANOPY COVER, LINE INTERCEPT --

Management unit 02R, Study no: 10

Species	Percent Cover
	'04
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	2.46
<i>Eriogonum corymbosum</i>	.11
<i>Symphoricarpos oreophilus</i>	.31
<i>Tetradymia canescens</i>	.25

BASIC COVER --

Management unit 02R, Study no: 10

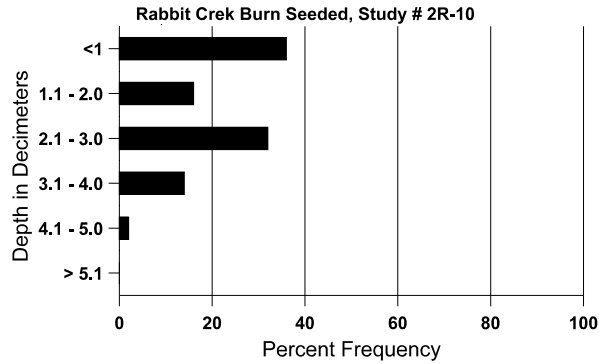
Cover Type	Average Cover %
	'04
Vegetation	32.12
Rock	.53
Pavement	9.01
Litter	1.81
Bare Ground	65.31

SOIL ANALYSIS DATA --

Management unit 2R, Study no: 10, Study Name: Rabbit Creek Burn Seeded

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.1	63.8 (15.0)	6.6	32.6	40.1	27.3	3.9	19.1	195.2	0.9

# Stoniness Index



## PELLET GROUP DATA --

Management unit 02R, Study no: 10

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Grouse	1	-
Cattle	-	1 (4)

## BROWSE CHARACTERISTICS --

Management unit 02R, Study no: 10

		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>												
04	<b>20</b>	120	20	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>5780</b>	720	2820	2960	-	-	0	0	-	-	0	8/9
<i>Eriogonum corymbosum</i>												
04	<b>60</b>	-	60	-	-	-	0	0	-	-	0	6/6
<i>Symphoricarpos oreophilus</i>												
04	<b>40</b>	-	40	-	-	-	0	0	-	-	0	24/41
<i>Tetradymia canescens</i>												
04	<b>900</b>	60	680	220	-	-	0	0	-	-	0	8/10

Trend Study 6R-1-04

Study site name: Cache Cave 1.

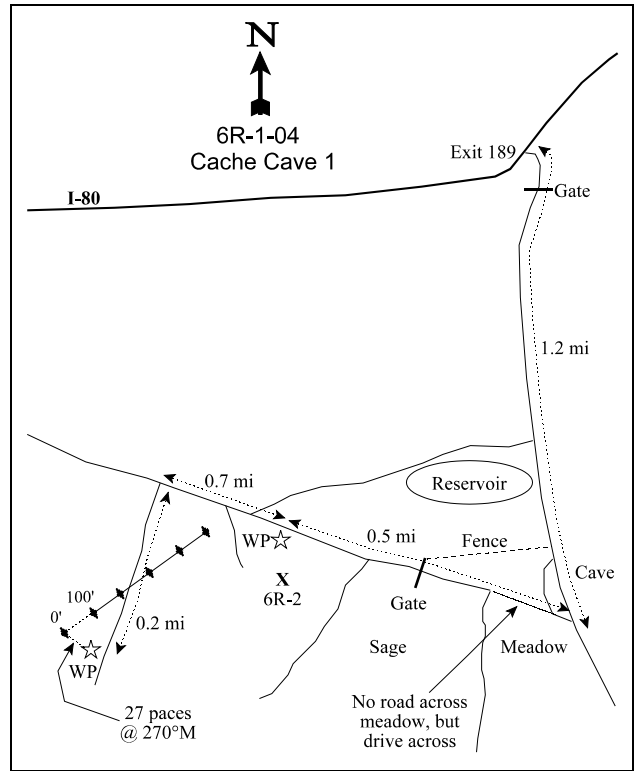
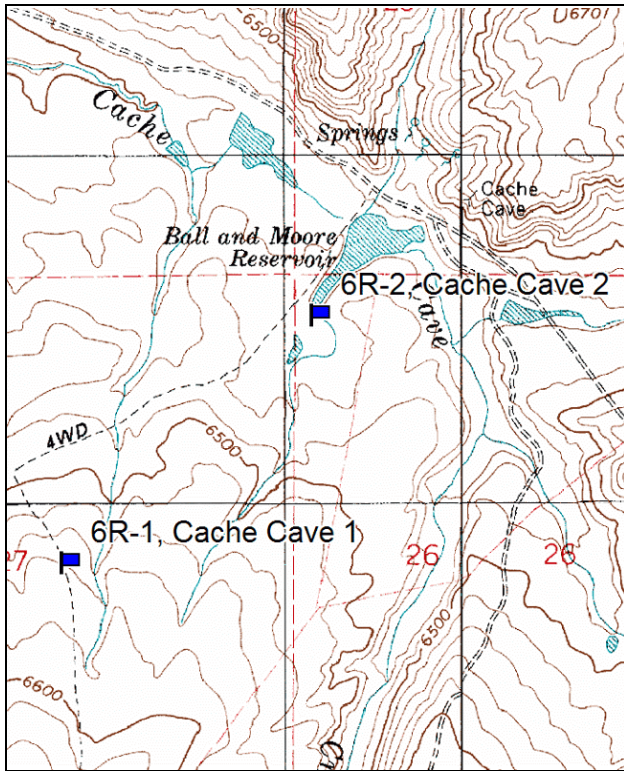
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 343 degrees magnetic.

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

LOCATION DESCRIPTION

From I-80 take exit 189. Travel 1.2 miles south to a road that comes in from the right. Turn here and travel 0.5 miles north-west through a meadow to a road. There is a witness post on the left side of the road. Continue 0.7 miles to a road on the left. Take this road and travel 0.2 miles to a witness post on the right side of the road. The 0-foot stake is 27 paces from the witness post at 270°M, and is marked with browse tag #32.



Map Name: Shearing Corral

Diagrammatic Sketch

Township 5N , Range 7E , Section 27

GPS: NAD 27, UTM 12T 4553791 N, 488358 E

## DISCUSSION

### Cache Cave 1 - 6R-1

This study was established to monitor a double drum aerator treatment of a mature basin big sagebrush community. This study was established in June of 2004 prior to treatment. The site was later treated (500 acres) in the fall of 2004 to reduce the amount of sagebrush and to enhance the herbaceous understory. Data will likely be collected again in 2007 to evaluate the treatment effects. This land in Echo Canyon is privately owned by Lorin Fawcett. This study is located at an elevation of 6,570 feet with a northern aspect and a 5% slope. Sheep ranching is the primary use on the ranch. Deer and elk also use the area. A pellet group transect along the baseline in 2004 estimated 26 sheep, 1 cow, 7 deer, and 3 elk days use/acre (64 sdu/ha, 2 cdu/ha, 18 ddu/ha, and 7 edu/ha).

This rocky soil had an effective rooting depth estimated at about 12 inches. Soil texture is loam and pH is slightly acidic (6.5). Phosphorus and potassium levels were good for wildland soils. An erosion condition class assessment rated erosion as stable in 2004. There was some slight pedestaling, but erosion was not a problem. Protective ground cover was abundant. Bare ground was only about 22% prior to treatment.

Basin big sagebrush was the most dominant species in 2004. By treating this sagebrush with an aerator a mosaic of sagebrush at different successional stages can be created. Sagebrush was very abundant in 2004. Cover was estimated at 21% with a density of 4,600 plants/acre. This population was mostly mature (59%). Decadence was moderately high at 38%, while 17% of the population were classified as dying. Recruitment is low as only 3% of the population were young. Average height was 44 inches with an average crown width of 37 inches.

Stickyleaf low rabbitbrush was the only other abundant browse species. Rabbitbrush density was 5,420 plants/acre and cover was 6% in 2004. This resprouting species may increase after the treatment.

The herbaceous understory was fair in 2004. Nine grass or grass-like species were sampled. Western wheatgrass was the most abundant species. It was sampled in 73% of the quadrats and had nearly 3% cover. This rhizomatous species likely will increase in abundance and cover after the treatment with the reduced competition from sagebrush. No other grass species was sampled in more than a quarter of the quadrats. Cheatgrass was sampled in 22% of the quadrats, but cover was very low. Competition from other species likely will keep cheatgrass from dominating the site. Forbs were diverse but no perennials were abundant. Pussytoes and longleaf phlox were the most abundant perennials, but neither of these species provide much forage for wildlife or livestock. The most abundant species were annuals. Pale alyssum and birdbeak were the most abundant species.

The seed mix (see table below) should enhance the herbaceous understory and provide more forage for wildlife and livestock. Four bunchgrass species were seeded along with four forb species and fourwing saltbush.

2004 winter range condition (DC Index) - Poor (47) Mid Potential scale



<b>Cache Cave seed mix</b>	<b>Bulk lbs/ac</b>
Sainfoin	2.0
Alalfa 'Ladak+'	1.3
Small Burnet 'Delar'	2.0
Cicer Milkvetch 'Lutana'	1.3
Great Basin Wildrye 'Trailhead'	1.0
Russian Wildrye 'Bozoisky'	1.0
Orchardgrass 'Paiute'	1.0
Bluebunch WG 'Goldar'	1.5
Fourwing Saltbush--Juab UT	0.5
<b>Total</b>	<b>11.6</b>

HERBACEOUS TRENDS --  
Management unit 06R, Study no: 1

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron smithii	248	2.59
G	Bromus tectorum (a)	58	.35
G	Carex spp.	34	.26
G	Juncus balticus	5	.03
G	Poa fendleriana	69	.61
G	Poa secunda	8	.06
G	Sitanion hystrix	29	.73
G	Stipa comata	12	.27
G	Stipa lettermani	52	.31
<b>Total for Annual Grasses</b>		<b>58</b>	<b>0.35</b>
<b>Total for Perennial Grasses</b>		<b>457</b>	<b>4.88</b>
<b>Total for Grasses</b>		<b>515</b>	<b>5.24</b>
F	Agoseris glauca	3	.01
F	Alyssum alyssoides (a)	229	.88
F	Allium spp.	3	.01
F	Antennaria rosea	43	.20
F	Astragalus beckwithii	2	.01
F	Calochortus nuttallii	4	.01
F	Chenopodium leptophyllum(a)	11	.02
F	Collinsia parviflora (a)	22	.05
F	Cordylanthus spp. (a)	157	2.50
F	Descurainia pinnata (a)	4	.01
F	Erigeron pumilus	1	.00
F	Lappula occidentalis (a)	4	.01
F	Microsteris gracilis (a)	104	.23
F	Navarretia intertexta (a)	3	.00

Type	Species	Nested Frequency	Average Cover %
		'04	'04
F	Phlox austromontana	11	.22
F	Phlox hoodii	6	.01
F	Phlox longifolia	86	.24
F	Polygonum douglasii (a)	19	.05
F	Ranunculus testiculatus (a)	40	.10
F	Taraxacum officinale	14	.19
F	Tragopogon dubius	4	.00
F	Trifolium spp.	5	.01
F	Viola spp.	7	.02
Total for Annual Forbs		593	3.86
Total for Perennial Forbs		189	0.96
Total for Forbs		782	4.83

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

#### BROWSE TRENDS --

Management unit 06R, Study no: 1

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata tridentata	90	21.10
B	Chrysothamnus viscidiflorus viscidiflorus	77	6.36
B	Gutierrezia sarothrae	0	.00
B	Tetradymia canescens	1	.00
Total for Browse		168	27.47

#### CANOPY COVER, LINE INTERCEPT --

Management unit 06R, Study no: 1

Species	Percent Cover
	'04
Artemisia tridentata tridentata	23.25
Chrysothamnus viscidiflorus viscidiflorus	7.18

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 06R, Study no: 1

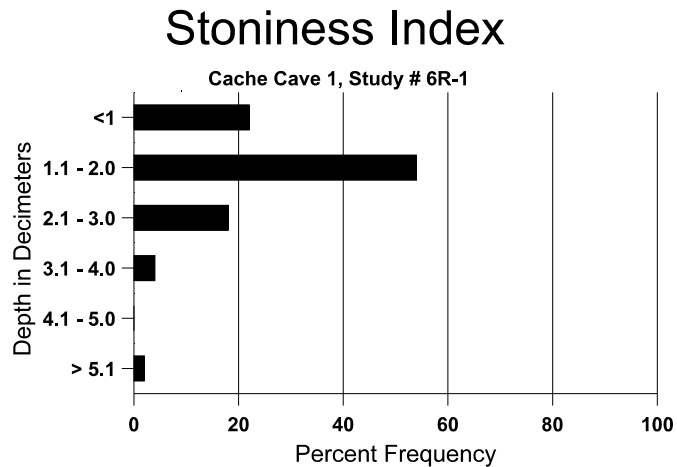
Species	Average leader growth (in)
	'04
Artemisia tridentata tridentata	1.4

BASIC COVER --  
Management unit 06R, Study no: 1

Cover Type	Average Cover %
	'04
Vegetation	42.38
Rock	.39
Pavement	.45
Litter	38.98
Cryptogams	15.86
Bare Ground	22.38

SOIL ANALYSIS DATA --  
Management unit 6R, Study no: 1, Study Name: Cache Cave 1

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.8	63.6 (13.6)	6.5	47.3	29.4	23.3	2.8	27.0	166.4	0.7



PELLET GROUP DATA --  
 Management unit 06R, Study no: 1

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Sheep	5	26 (64)
Rabbit	20	-
Elk	1	3 (7)
Deer	2	7 (18)
Cattle	-	1 (2)

BROWSE CHARACTERISTICS --  
 Management unit 06R, Study no: 1

		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 tridentata</i>												
04	<b>4600</b>	840	120	2720	1760	1600	0	.43	38	17	17	44/37
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>5420</b>	380	140	5240	40	-	0	0	1	.36	.36	9/12
<i>Tetradymia canescens</i>												
04	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-

Trend Study 6R-2-04

Study site name: Cache Cave 2.

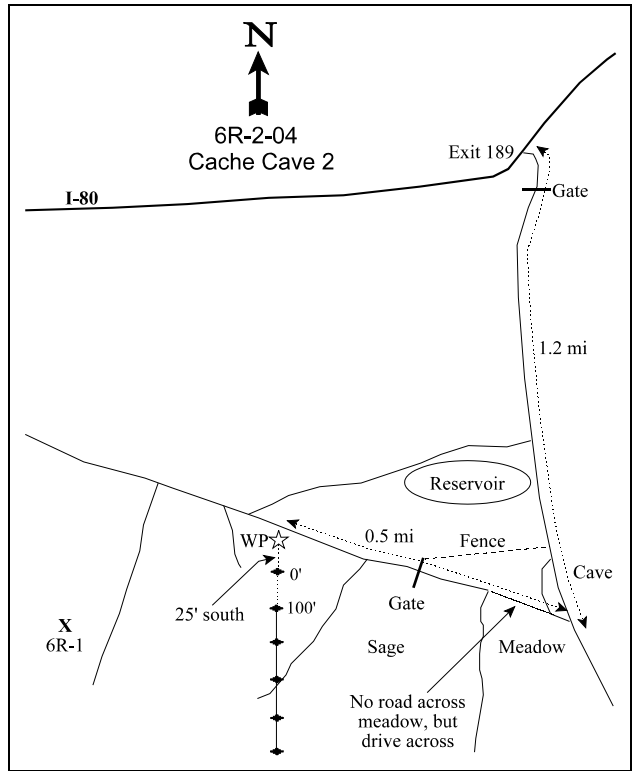
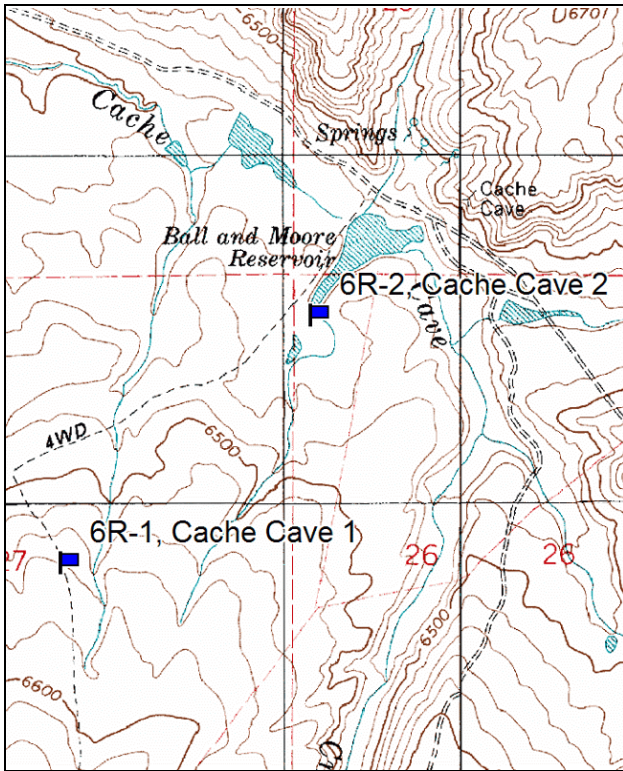
Vegetation type: Black/Basin Big Sagebrush.

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From I-80 take exit 189. Travel 1.2 miles south to a road that comes in from the right. Turn here and travel 0.5 miles north-west through a meadow to a road. There is a witness post on the left side of the road. The 0-foot stake is 25 feet south of the witness post.



Map Name: Shearing Corral

Diagrammatic Sketch

Township 5N, Range 7E, Section 26

GPS: NAD 27, UTM 12T 4554502 N, 489080 E

## DISCUSSION

### Cache Cave 2 - Trend Study No. 6R-2

This study was established to monitor a double drum aerator treatment of a mature basin big sagebrush community near Ball and Moore Reservoir in Echo Canyon. This study was established in June of 2004 prior to treatment. The site was later treated (500 acres) in the fall of 2004 to reduce the amount of sagebrush and to enhance the herbaceous understory. Data will likely be collected again in 2007 to evaluate the treatment effects. This study is located at an elevation of 6,450 feet with a slight northern aspect and slope of 2-3%. This study is located in a bottom area, which is more mesic than the upland Cache Cave 1 study. This area is dominated by large basin big sagebrush with patches of black sagebrush interspersed. This land is privately owned by Lorin Fawcett. Sheep grazing is the primary use of this ranch. Sheep were grazing the area when data was collected in 2004. A pellet group transect estimated 25 sheep, 1 cow, 1 horse, 3 deer, and 6 elk days use/acre (61 sdu/ha, 4 cdu/ha, 1 hdu/ha, 8 ddu/ha, and 15 edu/ha).

No rocks were apparent in the soil profile in this low lying area. The effective rooting depth was estimated to be 12 inches. There appears to be a restrictive clay layer below the surface where black sagebrush is located. The soil texture is clay loam with a neutral pH (7.3). Phosphorus and potassium are abundant for wildland soils. An erosion condition class assessment rated erosion as stable in 2004. Protective ground cover was abundant in 2004 and the slope is slight, which prevents erosion.

Basin big sagebrush, black sagebrush, and sickyleaf low rabbitbrush were the abundant browse species prior to treatment. Basin big sagebrush cover was estimated at 15% using the line intercept method. Density was 3,800 plants/acre. Most of the population was considered mature or decadent (91%). Decadence was moderate at 32%, while young plants made up 9% of the population. Utilization appeared to be very light. Black sagebrush was found in patches, likely in places with shallower soils. Black sagebrush cover was estimated at 10% and density was 2,960 plants/acre. This population was also nearly all mature or decadent. Rabbitbrush was very abundant, which is a sign of heavy grazing. Rabbitbrush cover was 16% with an estimated 7,400 plants/acre. The aerator treatment will reduce sagebrush cover and density which may be beneficial to the herbaceous understory, but the resprouting rabbitbrush will likely not be reduced.

The herbaceous understory was sparse, especially for site with higher potential. This also is a sign of heavy grazing. The rhizomatous, western wheatgrass was the most abundant grass. It was sampled in 68% of the quadrats, but cover was only slightly less than 2%. Letterman needlegrass was sampled in 52% of the quadrats and had about 1.5% cover. Forb composition was made up of mostly low growing, poor forage species. Pussytoes was the only species with more than 1% cover. Total forb cover was only about 3%, half of which was annual forbs. It is hoped that the seed mix applied with the aerator will enhance the herbaceous understory. Four bunchgrasses and four forb species were seeded (see table below).

#### 2004 winter range condition (DC Index) - Poor to Fair (51) Mid Potential scale

<u>Cache Cave seed mix</u>	<u>Bulk lbs/ac</u>
Sainfoin	2.0
Alalfa 'Ladak+'	1.3
Small Burnet 'Delar'	2.0
Cicer Milkvetch 'Lutana'	1.3
Great Basin Wildrye 'Trailhead'	1.0
Russian Wildrye 'Bozoisky'	1.0
Orchardgrass 'Paiute'	1.0
Bluebunch WG 'Goldar'	1.5
Fourwing Saltbush--Juab UT	0.5
<u>Total</u>	<u>11.6</u>

HERBACEOUS TRENDS --  
Management unit 06R, Study no: 2

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron smithii	200	1.64
G	Carex spp.	30	.13
G	Poa fendleriana	83	.69
G	Sitanion hystrix	8	.02
G	Stipa lettermani	153	1.50
G	Unknown grass - annual (a)	31	.08
Total for Annual Grasses		31	0.08
Total for Perennial Grasses		474	4.00
Total for Grasses		505	4.08
F	Achillea millefolium	34	.14
F	Agoseris glauca	2	.01
F	Alyssum alyssoides (a)	55	.09
F	Antennaria rosea	59	1.18
F	Arabis spp.	3	.01
F	Chenopodium spp. (a)	4	.01
F	Collinsia parviflora (a)	55	.11
F	Cordylanthus spp. (a)	92	.87
F	Cryptantha spp.	1	.00
F	Descurainia pinnata (a)	5	.01
F	Gayophytum ramosissimum(a)	4	.02
F	Lappula occidentalis (a)	2	.01
F	Microsteris gracilis (a)	57	.10
F	Phlox hoodii	5	.06
F	Phlox longifolia	45	.12
F	Polygonum douglasii (a)	70	.16
F	Ranunculus testiculatus (a)	33	.09
F	Taraxacum officinale	4	.00
F	Trifolium spp.	11	.03
F	Viola spp.	17	.05
Total for Annual Forbs		377	1.48
Total for Perennial Forbs		181	1.62
Total for Forbs		558	3.10

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

BROWSE TRENDS --

Management unit 06R, Study no: 2

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia nova	45	8.83
B	Artemisia tridentata tridentata	77	11.21
B	Chrysothamnus viscidiflorus viscidiflorus	97	11.38
B	Gutierrezia sarothrae	0	.03
Total for Browse		219	31.46

CANOPY COVER, LINE INTERCEPT --

Management unit 06R, Study no: 2

Species	Percent Cover
	'04
Artemisia nova	9.66
Artemisia tridentata tridentata	14.85
Chrysothamnus viscidiflorus viscidiflorus	16.20

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 06R, Study no: 2

Species	Average leader growth (in)
	'04
Artemisia tridentata tridentata	1.9

BASIC COVER --

Management unit 06R, Study no: 2

Cover Type	Average Cover %
	'04
Vegetation	40.45
Rock	.04
Pavement	.13
Litter	35.42
Cryptogams	5.05
Bare Ground	34.38

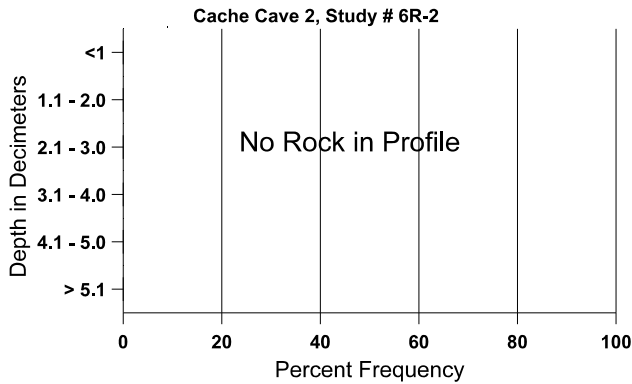


SOIL ANALYSIS DATA --

Management unit 6R, Study no: 2, Study Name: Cache Cave 2

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.6	55.6 (15.6)	7.3	33.3	36.2	30.6	2.3	34.9	268.8	0.8

### Stoniness Index



PELLET GROUP DATA --

Management unit 06R, Study no: 2

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Sheep	5	25 (61)
Rabbit	22	-
Elk	5	6 (15)
Deer	4	3 (8)
Cattle	1	1 (4)
Horse	-	1 (1)

BROWSE CHARACTERISTICS --

Management unit 06R, 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)
<b>Artemisia nova</b>												
04	<b>2960</b>	40	40	2320	600	140	7	5	20	5	5	8/15
<b>Artemisia tridentata tridentata</b>												
04	<b>3800</b>	860	340	2240	1220	640	2	.52	32	19	19	37/36
<b>Chrysothamnus viscidiflorus viscidiflorus</b>												
04	<b>7400</b>	260	340	7000	60	40	0	0	1	-	0	8/12

Trend Study 9R-3-04

Study site name: Deadman Greenstrip .

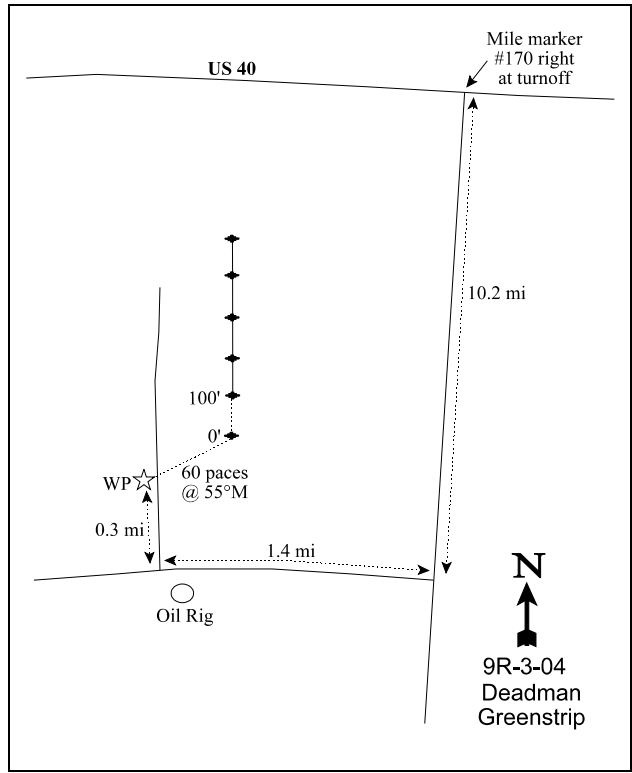
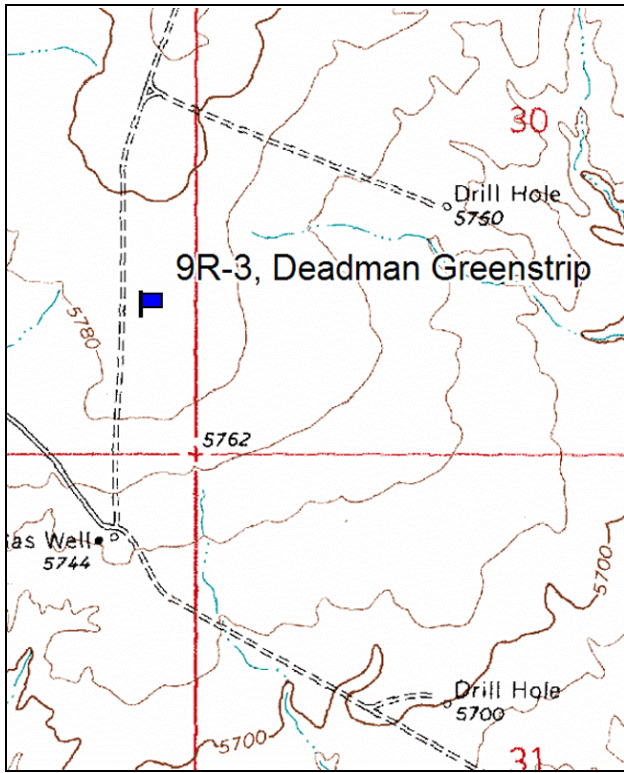
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 0 degrees magnetic.

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

LOCATION DESCRIPTION

From US 40 turn right (south) at the turnoff after mile marker 170. Drive south for 10.2 miles to a road that comes in from the right (west). Turn here and travel 1.4 miles, passing an oil rig on the left, to a road on the right. Take this road 0.3 miles to a witness post on the left side of the road. The 0-foot stake is about 60 paces from the witness post at 55°M, and is marked with browse tag #35.



Map Name: Dinosaur NW

Diagrammatic Sketch

Township 7S , Range 24E , Section 25

GPS: NAD 27, UTM 12T 4448739 N, 657175 E

## DISCUSSION

### Deadman Greenstrip - Trend Study No. 9R-3

This study was established in June of 2004 as pretreatment data for a greenstripping project on Deadman Bench about eight miles south of US Highway 40. This area is managed by the BLM. The purpose in creating greenstrips along roads is to prevent future wildfires from swelling into very large complexes that destroy large amounts of important habitat. The treatment was a disk followed by a land imprinter and took place in the fall of 2004. Post treatment data will likely be taken in 2007. The study site is located at an elevation 5,800 feet with a very slight slope of 1% to the south. This area is used by antelope and wild horses. A pellet group transect in 2004 estimated 19 antelope/deer days use/acre and 3 horse days use/acre (46 adu/ha and 7 hdu/ha).

The average soil effective rooting depth was measured at 13 inches. A clay hardpan was noted at about 12-13 inches in depth with a hard caliche layer at 15 inches. Very few rocks were found throughout the profile. Soil texture is sandy clay loam and pH is slightly alkaline (7.5). Soil phosphorus is marginal at 7 ppm, where less than 6 ppm may limit plant growth and development (Tiedemann and Lopez 2004). In 2004, soil was pedestaled around sagebrush plants. An erosion condition class assessment rated erosion as stable in 2004, due to the slight slope. Bare ground was high in 2004 at nearly 45%.

Wyoming big sagebrush was the dominant browse species prior to treatment. Sagebrush cover was 15% with a density of 5,420 plants/acre. This population of sagebrush had been negatively effected by drought conditions. Decadence was high at 59% and 30% of the population was classified as dying. Production was also very poor as average leader growth was only measured to be 0.7 inches. Some light to moderate use was noted on sagebrush. Low rabbitbrush, spiny hopsage, and prickly pear cactus were also found in low densities.

The herbaceous understory was very sparse in 2004. Cheatgrass was the most abundant species at 3% cover and was widely distributed with an 82% quadrat frequency. Although cheatgrass was not abundant enough to carry a fire in 2004, during years with normal or above average precipitation it would be expected that cheatgrass would be more abundant and could carry a fire. The purpose of greenstripping is to prevent fires from growing too large. Western wheatgrass and bottlebrush squirreltail were the two most abundant perennial species. Forbs were very sparse in 2004 and made up less than one half of one percent cover.

The species that were seeded are fire resistant, provide low amounts of fuel, competitive with cheatgrass and other invaders, remain green for a long period, and should provide a good barrier to spreading fires. They should also provide additional forage for wildlife and livestock.

2004 winter range condition (DC Index) - Fair (30) Lower Potential scale

<b>Deadman seed mix</b>	<b>Bulk lbs/ac</b>
Forage Kochia 'Immigrant'	2.0
Crested Wheatgrass 'Douglas'	0.5
Crested Wheatgrass 'Ephraim'	1.0
Crested Wheatgrass 'Hycrest'	1.5
Siberian Wheatgrass 'Vavilov'	0.5
Fourwing Saltbush--Emery UT	1.0
Western Wheatgrass 'Arriba'	1.0
Sainfoin 'Eski'	1.0
Alfalfa 'Nomad'	1.0
Alfalfa 'Ladak+'	1.0
Alfalfa 'Spredor 3'	1.0
Small Burnet 'Delar'	1.0
<b>Total Bulk lbs/acre</b>	<b>12.5</b>
<b>Total PLS lbs/acre</b>	<b>10.5</b>

HERBACEOUS TRENDS --

Management unit 09R, Study no: 3

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron smithii	163	2.07
G	Bromus tectorum (a)	276	3.11
G	Poa secunda	3	.01
G	Sitanion hystrix	92	3.23
G	Vulpia octoflora (a)	1	.00
Total for Annual Grasses		277	3.12
Total for Perennial Grasses		258	5.32
Total for Grasses		535	8.44
F	Alyssum alyssoides (a)	3	.00
F	Lappula occidentalis (a)	36	.10
F	Lupinus spp.	10	.02
F	Sphaeralcea coccinea	32	.17
F	Trifolium spp.	3	.00
Total for Annual Forbs		39	0.10
Total for Perennial Forbs		45	0.19
Total for Forbs		84	0.30

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

BROWSE TRENDS --

Management unit 09R, Study no: 3

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata wyomingensis	94	15.15
B	Chrysothamnus viscidiflorus	1	-
B	Grayia spinosa	1	.15
B	Opuntia spp.	24	.28
Total for Browse		120	15.59

CANOPY COVER, LINE INTERCEPT --

Management unit 09R, Study no: 3

Species	Percent Cover
	'04
Artemisia tridentata wyomingensis	16.04
Opuntia spp.	.21

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 09R, Study no: 3

Species	Average leader growth (in)
	'04
Artemisia tridentata wyomingensis	0.7

BASIC COVER --

Management unit 09R, Study no: 3

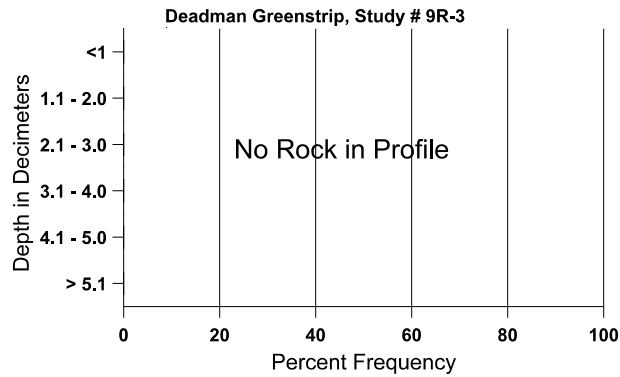
Cover Type	Average Cover %
	'04
Vegetation	26.31
Pavement	.02
Litter	29.87
Cryptogams	10.39
Bare Ground	44.65

SOIL ANALYSIS DATA --

Management unit 9R, Study no: 3, Study Name: Deadman Greenstrip

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.7	65.8 (14.0)	7.5	50.3	25.5	24.2	1.0	7.1	131.2	0.6

# Stoniness Index



PELLET GROUP DATA --  
Management unit 09R, Study no: 3

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	71	-
Antelope/Deer	19	19 (46)
Horse	-	3 (7)

BROWSE CHARACTERISTICS --  
Management unit 09R, Study no: 3

		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>												
04	<b>5420</b>	-	100	2140	3180	2580	31	1	59	30	30	24/30
<i>Chrysothamnus viscidiflorus</i>												
04	<b>20</b>	-	-	-	20	-	0	100	100	100	100	-/-
<i>Grayia spinosa</i>												
04	<b>20</b>	-	-	20	-	-	100	0	-	-	0	16/21
<i>Opuntia spp.</i>												
04	<b>740</b>	-	-	440	300	120	0	0	41	3	8	4/9

Trend Study 9R-4-04

Study site name: Diamond Mountain Bullhog .

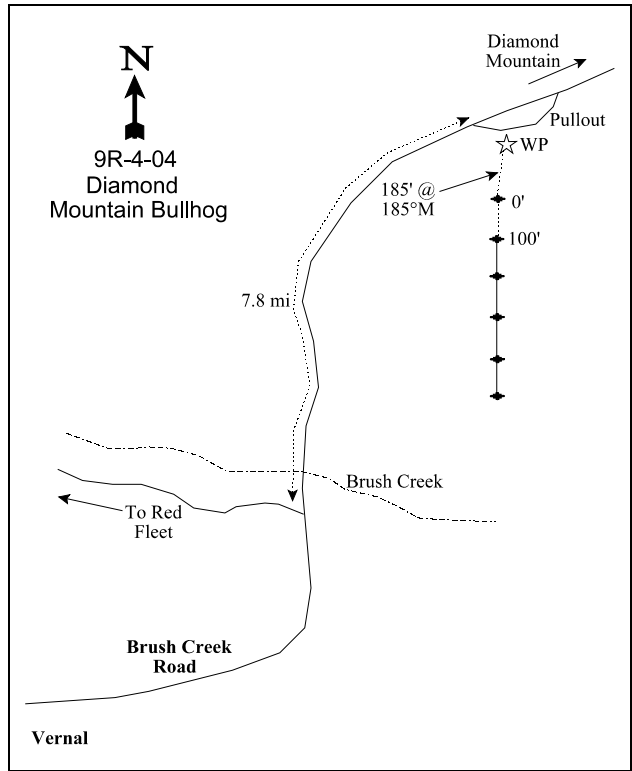
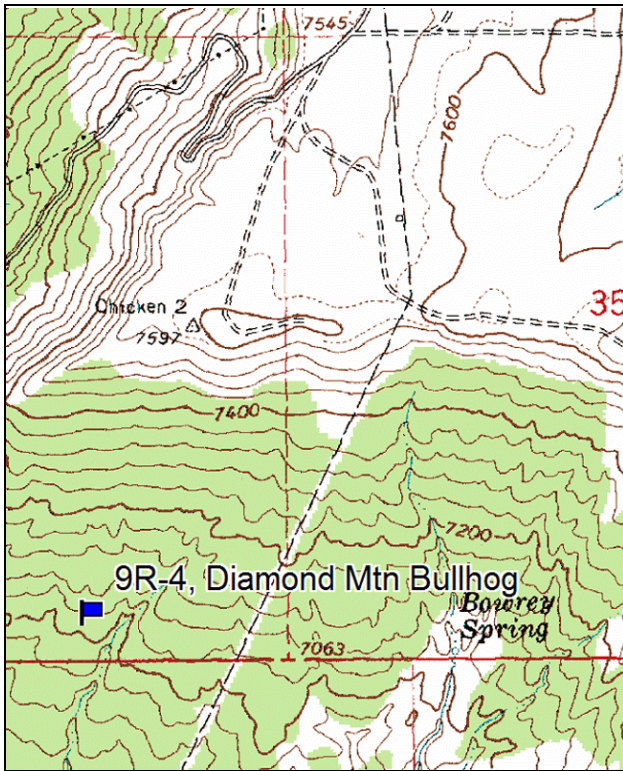
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 200 degrees magnetic.

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

LOCATION DESCRIPTION

From Vernal travel northeast on Brush Creek Road heading toward Diamond Mountain for 7.8 miles to a pull off on the right. Turn here. There is a witness post on the south side of the pull off. The 0-foot stake is 185 feet from the witness post at 185°M.



Map Name: Jensen Ridge

Diagrammatic Sketch

Township 2S , Range 23E , Section 34

GPS: NAD 27, UTM 12T 4495078 N, 642269 E

## DISCUSSION

### Diamond Mountain Bullhog - Trend Study No. 9R-4

The Diamond Mountain Bullhog study was established in June of 2004 prior to treatment later that September. The BLM treated 320 acres of a mature juniper woodland in a fuels reduction project near the Diamond Mountain rim. The DWR provided a seed mix of grasses, forbs, and shrubs for the project. Grass, forb, and fourwing saltbush seed was flown on prior to treatment. Sagebrush seed was applied (late November) following treatment. It remains to be seen if the soil disturbance created by the bullhog can sufficiently cover seed for successful establishment. Also the great amount of tree litter created by the bullhog could prevent seedlings for emerging or it may help protect seedlings and hold water within the soil profile. The study site elevation is 7,000 feet. Aspect is to the south with a 15% slope. This area is considered winter range for deer and elk. A pellet group transect in 2004 estimated 5 deer and 9 elk days/use acre (13 ddu/ha and 21 edu/ha).

The soil on this site is very rocky. The effective rooting depth was very shallow at only 8 inches. Rocks were prevalent throughout the profile. Rocks four inches below the surface were covered with calcium carbonate. The soil texture is sandy loam and the pH is neutral (6.6). Soil phosphorus is marginal at 7 ppm, where less than 6 ppm may limit plant growth and development (Tiedemann and Lopez 2004).

Utah juniper dominated the site prior to treatment with canopy cover at 39%. Juniper density was also very high at 444 trees/acre. Average diameter was about 5.3 inches. Fifty percent of the trees sampled were 12 feet tall or greater. Tausch and West (1994) found that when pinyon and juniper cover reaches such high levels that understory production is greatly diminished. This is evident at this location as understory shrubs only had about 3% cover and herbaceous species only provided about 2% cover.

Browse species were limited due to the abundance of juniper. Black sagebrush was the most abundant species with about 3% cover. Density was about 2,560 plants/acre. Decadence was moderate at 21%. Other browse species sampled include: slender buckwheat, broom snakeweed, prickly pear, and antelope bitterbrush. The seeding of fourwing saltbush and Wyoming big sagebrush should augment this area with palatable browses species.

Prior to treatment the herbaceous understory was sparse. Cheatgrass was the most abundant grass with a 49% quadrat frequency and slightly less than 1% cover. Indian ricegrass, Sandberg bluegrass, bottlebrush squirreltail, Letterman needlegrass were also sampled but were not abundant. Forbs were also sparse. Rock goldenrod had about 1% cover and was found in 21% of the quadrats. No other forbs were found in more than 12% of the quadrats. Future readings will determine if the seed mix successfully establishes.

### 2004 winter range condition (DC Index) - Very Poor (7) Lower Potential scale

<u>Diamond Rim Seedmix 1</u>	<u>Bulk lbs/ac</u>	<u>Diamond Rim Seedmix 2</u>	<u>Bulk lbs/ac</u>	<u>PLS lbs/ac</u>
Orchardgrass 'Paiute'	2.0	Sagebrush, Wyoming--Sanpete UT	2	0.3
Western Wheatgrass 'Arriba'	2.0			
Sandberg Bluegrass--Toole MT	0.5			
Yellow Sweetclover	0.9			
Alalfa 'Ladak+'	2.0			
Sainfoin	1.1			
Blue Flax 'Appar'	0.9			
Small Burnet 'Delar'	2.0			
<b>Total Bulk lbs/acre</b>	<b>11.4</b>			
<b>Total PLS lbs/acre</b>	<b>10.7</b>			



HERBACEOUS TRENDS --  
 Management unit 09R, Study no: 4

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Bromus tectorum (a)	132	.81
G	Oryzopsis hymenoides	50	.22
G	Poa secunda	27	.14
G	Sitanion hystrix	22	.16
G	Stipa lettermani	14	.10
Total for Annual Grasses		132	0.81
Total for Perennial Grasses		113	0.63
Total for Grasses		245	1.44
F	Arabis spp.	27	.06
F	Astragalus convallarius	5	.01
F	Cryptantha spp.	9	.02
F	Cymopterus spp.	1	.00
F	Penstemon humilis	3	.00
F	Petradoria pumila	56	1.01
F	Phlox austromontana	1	.00
F	Phlox longifolia	2	.01
F	Salsola iberica (a)	3	.00
F	Trifolium spp.	6	.02
Total for Annual Forbs		3	0.00
Total for Perennial Forbs		110	1.15
Total for Forbs		113	1.15

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

BROWSE TRENDS --  
 Management unit 09R, Study no: 4

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia nova	42	2.98
B	Eriogonum microthecum	2	.00
B	Gutierrezia sarothrae	1	-
B	Juniperus osteosperma	23	16.80
B	Opuntia spp.	2	.00
B	Purshia tridentata	2	-
Total for Browse		72	19.79

CANOPY COVER, LINE INTERCEPT --

Management unit 09R, Study no: 4

Species	Percent Cover
	'04
Artemisia nova	2.29
Juniperus osteosperma	39.00
Purshia tridentata	.03

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 09R, Study no: 4

Species	Average leader growth (in)
	'04
Artemisia nova	0.5

POINT-QUARTER TREE DATA --

Management unit 09R, Study no: 4

Species	Trees per Acre	Average diameter (in)
	'04	'04
Juniperus osteosperma	444	13.3

BASIC COVER --

Management unit 09R, Study no: 4

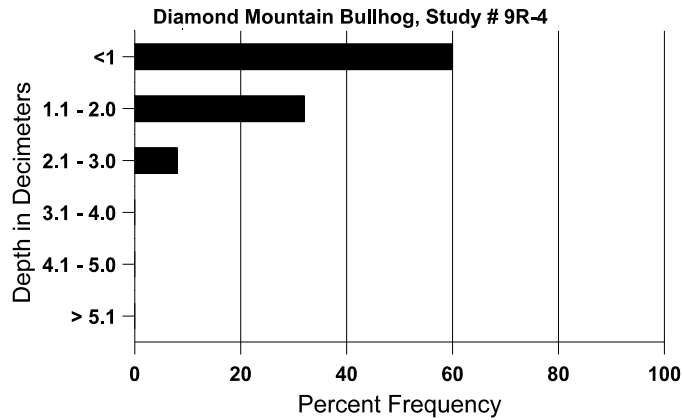
Cover Type	Average Cover %
	'04
Vegetation	21.13
Rock	23.10
Pavement	9.55
Litter	46.48
Cryptogams	2.37
Bare Ground	15.22

SOIL ANALYSIS DATA --

Management unit 9R, Study no: 4, Study Name: Diamond Mountain Bullhog

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
8.0	60.6 (8.0)	6.6	61.4	19.2	19.5	2.0	7.0	153.6	0.6

# Stoniness Index



## PELLET GROUP DATA --

Management unit 09R, Study no: 4

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	65	-
Elk	7	9 (21)
Deer	1	5 (13)

## BROWSE CHARACTERISTICS --

Management unit 09R, 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 nova</i>												
04	<b>2560</b>	180	660	1360	540	320	21	44	21	7	7	9/16
<i>Eriogonum microthecum</i>												
04	<b>60</b>	-	20	20	20	-	0	100	33	-	0	1/1
<i>Gutierrezia sarothrae</i>												
04	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
<i>Juniperus osteosperma</i>												
04	<b>500</b>	20	60	380	60	60	4	0	12	-	0	-/-
<i>Opuntia spp.</i>												
04	<b>40</b>	-	-	40	-	-	0	0	-	-	0	3/16
<i>Purshia tridentata</i>												
04	<b>60</b>	-	-	40	20	-	0	100	33	33	33	7/46

Trend Study 9R-5-04

Study site name: Little Donkey .

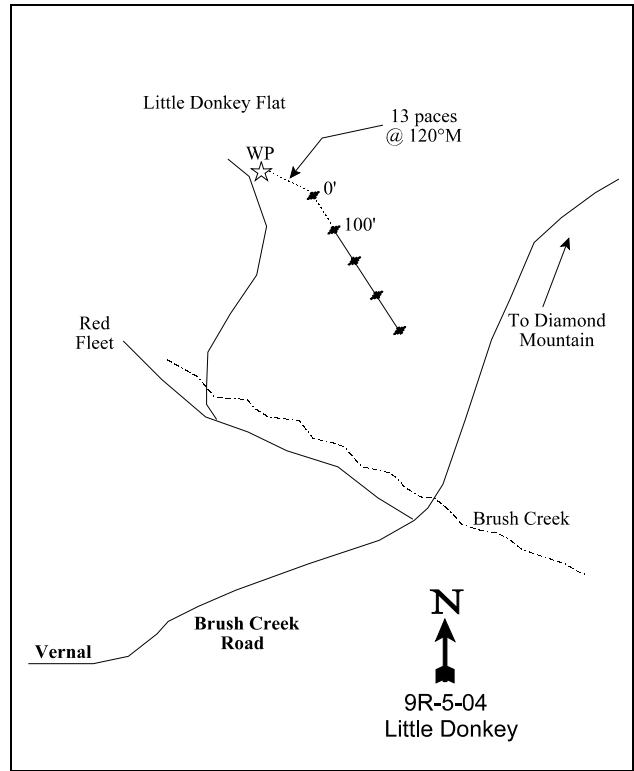
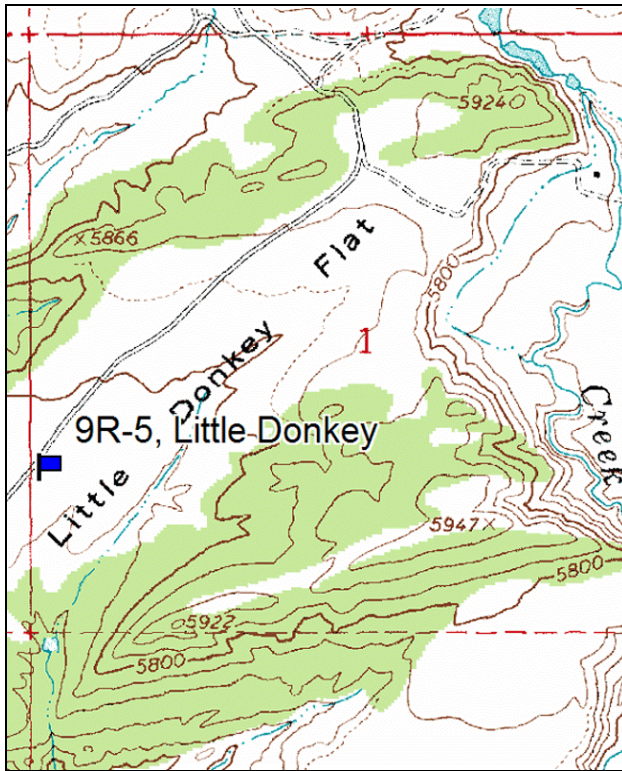
Vegetation type: Perennial Grass .

Compass bearing: frequency baseline 170 degrees magnetic.

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

LOCATION DESCRIPTION

From Vernal travel northeast on Brush Creek Road heading toward Diamond Mountain. Take a left at the Red Fleet turnoff right before Brush Creek. Follow the road as it turns north toward Little Donkey Flat. There is a witness post on the right side of the road. The 0-foot stake is 13 paces from the witness post at 120°M.



Map Name: Donkey Flat

Diagrammatic Sketch

Township 3S , Range 22E , Section 1

GPS: NAD 27, UTM 12T 4493598 N, 635134 E

## DISCUSSION

### Little Donkey - Trend Study No. 9R-5

This trend study was established in June 2004 on Little Donkey Flat about a mile northeast of the Red Fleet Reservoir Dam. This treatment is part of the Red Fleet habitat projects. This flat was dominated by a monoculture of crested wheatgrass surrounded by junipers on the slopes. A more diverse community with preferred browse species was desired. A community like this could make this area a winter range that would be beneficial for wildlife. In October of 2004 parts of the flat were sprayed with 8 ounces of GLY-4 Plus (generic Round-up) to kill the crested wheatgrass. In November those areas were then drill seeded with a mixture of grasses, forbs, and shrubs with a no till drill.

Little Donkey Flat is located at 5,800 feet in elevation. The slope is very slight at only 2-3% and the aspect at the transect location was to the southwest. A pellet group transect prior to treatment estimated 11 deer, 7 elk, and 7 cow days use/acre (26 ddu/ha, 18 edu/ha, and 16 cdu/ha).

Soil effective rooting depth was estimated to be 13 inches with a penetrometer. Compaction was noted at about 6 inches. No rock was detected in the soil profile. Soil texture is sandy loam and light red in color. Soil phosphorous was adequate at 15 ppm. Erosion was minimal due to the slight slope and good vegetation cover.

The browse component, which is very important for winter range was lacking. Wyoming big sagebrush was present before the treatment, but was very sparse with only 80 plants/acre. Cover was estimated at 0.4%. Broom snakeweed, rubber rabbitbrush, and prickly pear were also sampled on the site.

The herbaceous understory was dominated by crested wheatgrass, which was sampled in 85% of the quadrats and had 16% cover. Galleta, indian ricegrass, and sandberg bluegrass were sampled in small numbers. Sixweeks fescue was the only annual grass sampled. Scarlet globemallow was the most abundant perennial forb with about 3% cover and was sampled in 65% of the quadrats in 2004. A few annual forbs were also sampled.

2004 winter range condition (DC Index) - Fair (36) Lower Potential scale

<u>Red Fleet Seed Mix</u>	<u>Bulk lbs/ac</u>
Russian Wildrye 'Bozoisky'	1.0
Western Wheatgrass 'Arriba'	1.0
Alfalfa 'Ladak+'	1.5
Small Burnet 'Delar'	2.5
Cicer Milkvetch 'Lutana'	1.0
Sagebrush, Wyoming--Sanpete UT	0.4
Sagebrush, Wyoming	0.5
Fourwing Saltbush--Emery UT	1.0
Forage Kochia 'Immigrant'	1.1
Blue Flax 'Appar'	0.1
Western Yarrow	0.1
Sainfoin 'Eski'	1.5
<b>Total Bulk lbs/acre</b>	<b>11.7</b>
<b>Total PLS lbs/acre</b>	<b>9.3</b>

HERBACEOUS TRENDS --  
Management unit 09R, Study no: 5

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron cristatum	241	16.35
G	Hilaria jamesii	6	.19
G	Oryzopsis hymenoides	3	.03
G	Poa secunda	42	.70
G	Vulpia octoflora (a)	301	5.31
Total for Annual Grasses		301	5.31
Total for Perennial Grasses		292	17.27
Total for Grasses		593	22.58
F	Calochortus nuttallii	6	.01
F	Chenopodium leptophyllum(a)	48	.11
F	Lappula occidentalis (a)	31	.81
F	Machaeranthera canescens	1	.03
F	Plantago patagonica (a)	207	2.05
F	Sphaeralcea coccinea	170	2.61
F	Unknown forb-perennial	3	.03
Total for Annual Forbs		286	2.98
Total for Perennial Forbs		180	2.68
Total for Forbs		466	5.66

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

BROWSE TRENDS --  
Management unit 09R, Study no: 5

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia nova	1	-
B	Artemisia tridentata wyomingensis	2	.38
B	Chrysothamnus nauseosus	1	-
B	Chrysothamnus viscidiflorus	1	-
B	Gutierrezia sarothrae	58	1.16
B	Opuntia spp.	44	1.54
Total for Browse		107	3.08

CANOPY COVER, LINE INTERCEPT --  
 Management unit 09R, Study no: 5

Species	Percent Cover '04
Artemisia tridentata wyomingensis	.16
Gutierrezia sarothrae	1.18
Opuntia spp.	1.56

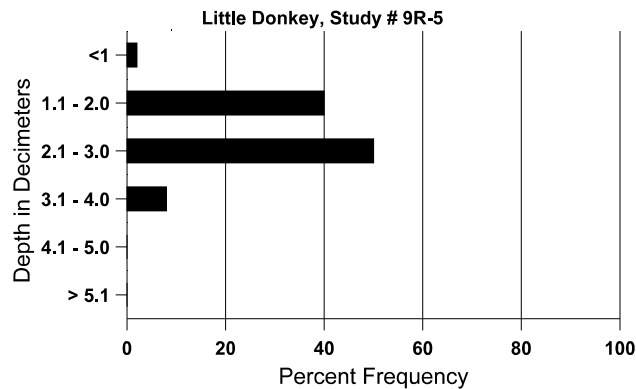
BASIC COVER --  
 Management unit 09R, Study no: 5

Cover Type	Average Cover % '04
Vegetation	38.31
Pavement	.05
Litter	17.45
Cryptogams	1.03
Bare Ground	54.10

SOIL ANALYSIS DATA --  
 Management unit 9R, Study no: 5, Study Name: Little Donkey

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.7	67.2 (13.2)	6.7	60.4	22.2	17.5	1.0	14.7	316.8	0.6

## Stoniness Index



PELLET GROUP DATA --  
 Management unit 09R, Study no: 5

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	77	-
Grouse	1	-
Elk	11	7 (18)
Deer	35	11 (26)
Cattle	16	6 (16)

BROWSE CHARACTERISTICS --  
 Management unit 09R, 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>												
04	<b>20</b>	-	-	-	20	-	0	100	100	100	100	10/15
<i>Artemisia tridentata wyomingensis</i>												
04	<b>80</b>	-	-	60	20	-	0	100	25	-	0	14/24
<i>Chrysothamnus nauseosus</i>												
04	<b>20</b>	-	-	20	-	60	0	0	-	-	0	8/13
<i>Chrysothamnus viscidiflorus</i>												
04	<b>40</b>	-	-	40	-	-	0	0	-	-	0	4/7
<i>Gutierrezia sarothrae</i>												
04	<b>4520</b>	-	1160	3320	40	100	0	0	1	.44	.44	5/6
<i>Opuntia spp.</i>												
04	<b>1260</b>	-	60	1140	60	20	0	0	5	-	0	4/18



Trend Study 9R-6-04

Study site name: North Little Donkey .

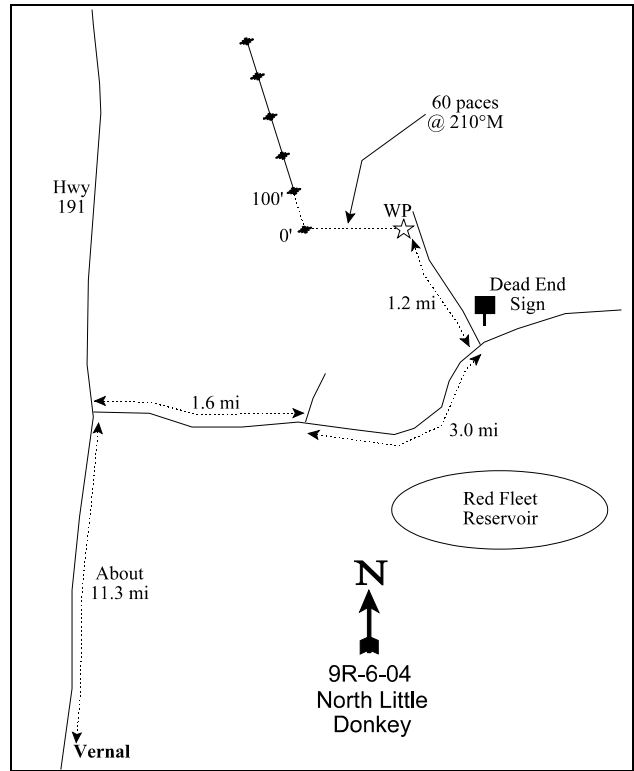
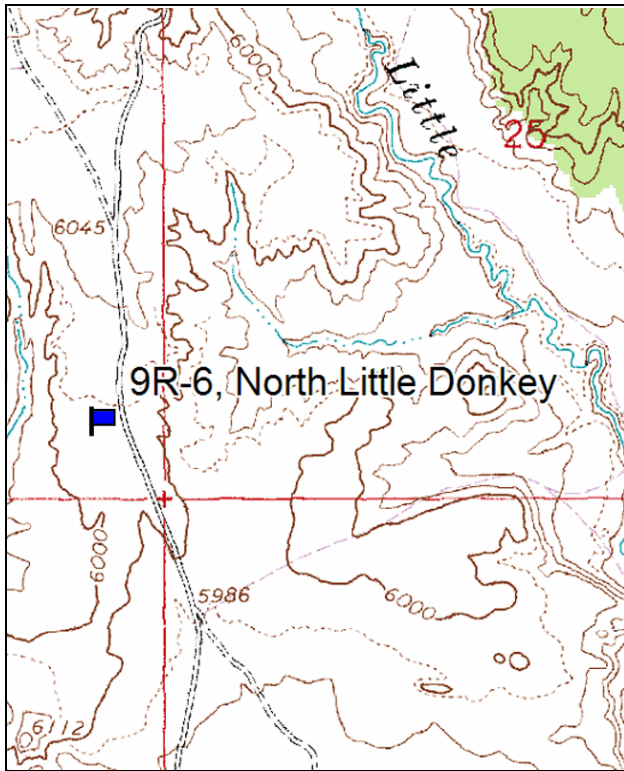
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 340 degrees magnetic.

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

LOCATION DESCRIPTION

From Vernal travel north on Highway 191 for about 11.3 miles to a road that comes in from the right. Turn here and travel 1.6 miles to a fork, stay to the right. Continue 3.0 miles, passing Red Fleet Reservoir, to another fork with a dead end sign and continue left. Drive 1.2 miles to a witness post on the left side of the road. The 0-foot stake is 60 paces from the witness post at 210°M.



Map Name: Donkey Flat

Diagrammatic Sketch

Township 2S , Range 22E , Section 26

GPS: NAD 27, UTM 12T 4496408 N, 634895 E

## DISCUSSION

### North Little Donkey - Trend Study No. 9R-6

The North Little Donkey trend study is located about 2 miles north of Little Donkey Flat. This treatment is part of the Red Fleet habitat projects. This sagebrush flat experienced sagebrush die off that was typical of many areas throughout the state in 2002 and 2003 due to drought conditions. The herbaceous understory was also sparse and lacking diversity prior to treatment in 2004. In the fall of 2004 the area was drill seeded to enhance grasses, forbs, and shrubs.

The study area is nearly flat (1-2% slope) with an aspect to the south. The elevation is 6,000 feet. This area is considered winter range. Data from a pellet group transect in 2004 estimated 21 deer, 18 elk, and 25 cow days use/acre (53 ddu/ha, 45 edu/ha, and 61 cdu/ha). Rabbit use was also high.

Soils on the site were light red in color and found to be a clay loam. Phosphorus was low at only 5 ppm, where less than 6 ppm may be limiting to plant growth and development (Tiedemann and Lopez 2004). Reactivity was neutral (pH of 7.2). The effective rooting depth was estimated to be about 13 inches, which is shallow. No rock was sampled throughout the profile. A layer of calcium carbonate was noted at about 10 inches. The soil surface was extensively cracked. Pedestaling around shrubs was 1-3 inches. An erosion condition class assessment rated erosion as stable in 2004.

Wyoming big sagebrush was the dominant browse species on this flat, but much of the sagebrush had died due to drought and/or winter injury in 2003. In 2004, sagebrush density was 1,720 plants/acre, but 73% of the populations was classified decadent and 57% was classified as dying. As evidence of the recent die off 2,820 dead sagebrush plants/acre were also sampled. A few seedlings and only 20 young plants/acre were sampled in 2004. Sagebrush cover was only about 1%. All plants showed signs of heavy use. This may be due to the very small amount of sagebrush for wildlife to utilize after the die off as the amount of deer days use/acre was light. Other browse species include: fourwing saltbush, rubber rabbitbrush, broom snakeweed, and opuntia.

The herbaceous understory was poor. Cattle utilization on grasses appeared to be heavy in 2004. Crested wheatgrass was the most abundant species with nearly 5% cover and was sampled in 71% of the quadrats. No other grass was abundant and no annual grasses were sampled. Forbs were dominated by annuals. Annual stickseed was extremely abundant with nearly 19% cover and was found in 96% of the quadrats. Scarlet globemallow was the most abundant perennial. The seed mix of grasses, forbs, and shrubs should enhance diversity and forage for wildlife and livestock.

### 2004 winter range condition (DC Index) - Poor (16) Lower Potential scale

<b>Red Fleet Seed Mix</b>	<b>Bulk lbs/ac</b>
Russian Wildrye 'Bozoisky'	1.0
Western Wheatgrass 'Arriba'	1.0
Alfalfa 'Ladak+'	1.5
Small Burnet 'Delar'	2.5
Cicer Milkvetch 'Lutana'	1.0
Sagebrush, Wyoming--Sanpete UT	0.4
Sagebrush, Wyoming	0.5
Fourwing Saltbush--Emery UT	1.0
Forage Kochia 'Immigrant'	1.1
Blue Flax 'Appar'	0.1
Western Yarrow	0.1
Sainfoin 'Eski'	1.5
<b>Total Bulk lbs/acre</b>	<b>11.7</b>
<b>Total PLS lbs/acre</b>	<b>9.3</b>

HERBACEOUS TRENDS --  
 Management unit 09R, Study no: 6

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	<i>Agropyron cristatum</i>	199	4.57
G	<i>Elymus junceus</i>	8	.33
G	<i>Oryzopsis hymenoides</i>	1	.03
G	<i>Poa secunda</i>	24	.21
Total for Annual Grasses		0	0
Total for Perennial Grasses		232	5.15
Total for Grasses		232	5.15
F	<i>Chenopodium leptophyllum(a)</i>	4	.02
F	<i>Descurainia pinnata (a)</i>	2	.01
F	<i>Halogeton glomeratus (a)</i>	2	.00
F	<i>Lappula occidentalis (a)</i>	430	18.69
F	<i>Phlox longifolia</i>	10	.02
F	<i>Salsola iberica (a)</i>	20	.47
F	<i>Sphaeralcea coccinea</i>	149	2.15
F	<i>Townsendia spp.</i>	3	.00
Total for Annual Forbs		458	19.20
Total for Perennial Forbs		162	2.18
Total for Forbs		620	21.39

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

BROWSE TRENDS --  
 Management unit 09R, Study no: 6

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia tridentata wyomingensis</i>	50	.98
B	<i>Atriplex canescens</i>	0	-
B	<i>Chrysothamnus nauseosus</i>	0	-
B	<i>Gutierrezia sarothrae</i>	4	.01
B	<i>Opuntia spp</i>	2	-
Total for Browse		56	0.99

CANOPY COVER, LINE INTERCEPT --

Management unit 09R, Study no: 6

Species	Percent Cover
	'04
Artemisia tridentata wyomingensis	1.08

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 09R, Study no: 6

Species	Average leader growth (in)
	'04
Artemisia tridentata wyomingensis	2.5

BASIC COVER --

Management unit 09R, Study no: 6

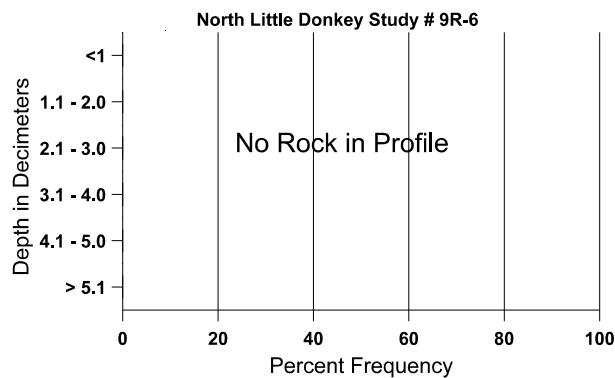
Cover Type	Average Cover %
	'04
Vegetation	28.79
Rock	.00
Pavement	.50
Litter	17.93
Cryptogams	.90
Bare Ground	62.21

SOIL ANALYSIS DATA --

Management unit 9R, Study no: 6, Study Name: North Little Donkey

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.6	65.0 (14.7)	7.2	33.0	39.5	27.5	1.3	5.0	300.8	0.6

## Stoniness Index



PELLET GROUP DATA --  
 Management unit 09R, Study no: 6

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	69	-
Elk	17	18 (45)
Deer	30	21 (53)
Cattle	9	25 (61)

BROWSE CHARACTERISTICS --  
 Management unit 09R, Study no: 6

		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>												
04	<b>1720</b>	160	20	440	1260	2820	3	97	73	57	57	11/17
<i>Atriplex canescens</i>												
04	<b>0</b>	-	-	-	-	20	0	0	-	-	0	24/27
<i>Chrysothamnus nauseosus</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	11/14
<i>Gutierrezia sarothrae</i>												
04	<b>140</b>	-	20	120	-	-	0	14	-	-	0	5/8
<i>Opuntia spp.</i>												
04	<b>60</b>	-	-	20	40	-	0	0	67	-	0	4/12

Trend Study 9R-7-04

Study site name: Red Fleet Lop and Scatter .

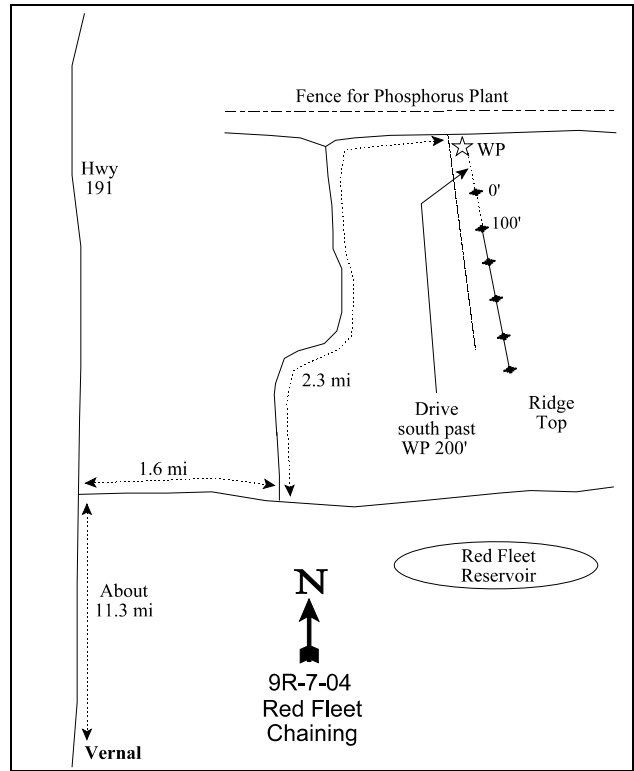
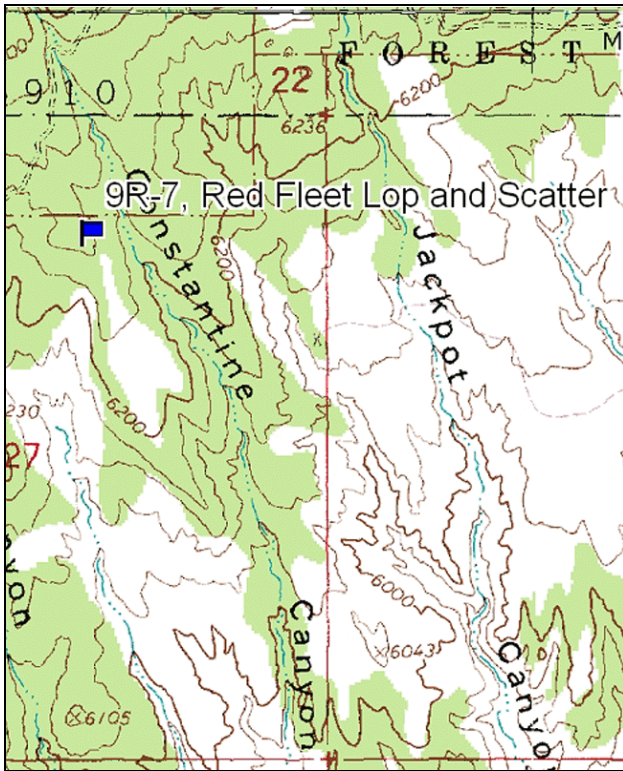
Vegetation type: Pinyon-Juniper Chaining .

Compass bearing: frequency baseline 142 degrees magnetic.

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

LOCATION DESCRIPTION

From Vernal travel north on Highway 191 for about 11.3 miles to a road that comes in from the right. Turn here. Travel 1.6 miles to a fork and turn left. Travel 2.3 miles to the witness post. At the fence for the Phosphorus Plant turn right and continue east. The witness post is on the right side. Drive south of the witness post at 155°M for about 200 feet to the 0-foot stake.



Map Name: Donkey Flat

Diagrammatic Sketch

Township 2S , Range 22E , Section 27

GPS: NAD 27, UTM 12T 4497521 N, 632806 E

## DISCUSSION

### Red Fleet Lop and Scatter - Trend Study No. 9R-7

The Red Fleet Lop and Scatter trend study monitors an old juniper chaining that was treated in the 1960's or 1970's. Due to the reinvasion or release of junipers within the chaining this area was targeted to be retreated before junipers dominated the site once again. The study was established in June of 2004 and was later treated by lopping and scattering juniper trees later that fall. No seeding was done to this area. The study area is located at 6,280 feet in elevation. The slope is about 4% with a southeastern aspect. Wildlife and livestock use appeared to be moderate in 2004 and earlier. Elk and deer appear to use the area in winter and spring. Data from a pellet group transect estimated 36 deer, 46 elk, and 21 cow days use/acre (89 ddu/ha, 114 edu/ha, and 52 cdu/ha).

Soil effective rooting depth is shallow at only 10 inches. Soil texture is a loam and reactivity is neutral (pH of 7.2). The soil is light brown in color and mixed with gravel for the first 6 inches. From 6-10 inches in depth compacted clay and rock was more prominent. A calcium carbonate covered rock layer is located at about 10 inches. An erosion condition class assessment rated erosion as stable in 2004. Bare ground was moderate at about 25% in 2004.

Prior to the lop and scatter treatment, juniper density was estimated at 66 trees/acre using the point-quarter method. Ten percent of the trees sampled were trees that had been knocked over but survived the previous chaining treatment. Mean diameter of juniper trees was 4.1 inches in 2004. Juniper cover was 9% using the line intercept method. Fifty percent of the trees sampled were 1-4 feet tall, while 45% were 4-8 feet tall. Removing junipers from this area will allow understory shrubs and herbaceous species to flourish with less competition. Tausch and West (1994) showed in southwestern Utah that as pinyon and juniper cover increase the herbaceous understory decreases. Their data showed that about 10% tree cover had about 13% herbaceous cover. At this location juniper cover was 9%, while herbaceous cover was about 16%.

Sagebrush on the site appeared to be a mix between black sagebrush and Wyoming big sagebrush. Nearly all plants that appeared to exhibit Wyoming big sagebrush characteristics were dead. No live Wyoming big sagebrush were sampled and 260 dead plants/acre were estimated. Black sagebrush cover was about 2% with a density of 1,880 plants/acre. Decadence was relatively low at 18%. Black sagebrush must have been better adapted to endure the drought conditions prior to 2004.

The herbaceous understory was typical of pinyon and juniper chainings. Crested wheatgrass was the dominant species with 13% cover and 80% quadrat frequency. Use appeared to be heavy on crested wheatgrass. Other grasses were rare and only two other species were sampled. The most abundant forbs were timber poisonvetch and scarlet globemallow. Although the understory lacks diversity it should benefit from the removal of juniper.

### 2004 winter range condition (DC Index) - Fair (37) Lower Potential scale

#### HERBACEOUS TRENDS --

Management unit 09R, Study no: 7

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron cristatum	257	13.26
G	Poa secunda	3	.03
G	Stipa comata	4	.01

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
	Total for Annual Grasses	0	0
	Total for Perennial Grasses	264	13.30
	Total for Grasses	264	13.30
F	Astragalus convallarius	35	1.04
F	Chenopodium leptophyllum(a)	19	.10
F	Cryptantha spp.	3	.00
F	Descurainia pinnata (a)	-	.00
F	Gilia spp. (a)	1	.00
F	Ipomopsis congesta	10	.09
F	Lappula occidentalis (a)	-	.00
F	Sphaeralcea coccinea	61	2.21
F	Townsendia spp.	3	.00
	Total for Annual Forbs	20	0.12
	Total for Perennial Forbs	112	3.37
	Total for Forbs	132	3.49

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

BROWSE TRENDS --

Management unit 09R, Study no: 7

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia nova	22	2.25
B	Artemisia tridentata wyomingensis	0	-
B	Chrysothamnus nauseosus	1	.15
B	Chrysothamnus viscidiflorus viscidiflorus	1	-
B	Gutierrezia sarothrae	9	.06
B	Juniperus osteosperma	7	7.62
B	Opuntia spp.	11	.48
	Total for Browse	51	10.58



CANOPY COVER, LINE INTERCEPT --

Management unit 09R, Study no: 7

Species	Percent Cover
	'04
Artemisia nova	.91
Juniperus osteosperma	9.21
Opuntia spp.	.71

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 09R, Study no: 7

Species	Average leader growth (in)
	'04
Artemisia nova	2.0

POINT-QUARTER TREE DATA --

Management unit 09R, Study no: 7

Species	Trees per Acre	Average diameter (in)
	'04	'04
Juniperus osteosperma	66	4.2

BASIC COVER --

Management unit 09R, Study no: 7

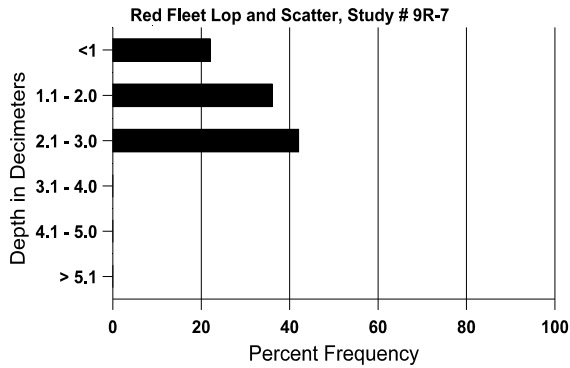
Cover Type	Average Cover %
	'04
Vegetation	26.77
Rock	2.28
Pavement	26.86
Litter	27.71
Cryptogams	3.43
Bare Ground	25.02

SOIL ANALYSIS DATA --

Management unit 9R, Study no: 7, Study Name: Red Fleet Lop and Scatter

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
10.2	63.0 (10.9)	7.2	40.6	35.9	23.5	4.2	13.3	217.6	1.3

# Stoniness Index



PELLET GROUP DATA --  
Management unit 09R, Study no: 7

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	26	-
Elk	47	46 (114)
Deer	25	36 (89)
Cattle	2	21 (52)

BROWSE CHARACTERISTICS --  
Management unit 09R, 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 nova</i>												
04	<b>1880</b>	-	220	1320	340	1000	40	1	18	12	12	5/12
<i>Artemisia tridentata wyomingensis</i>												
04	<b>0</b>	-	-	-	-	260	0	0	-	-	0	10/19
<i>Chrysothamnus nauseosus</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	9/13
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
04	<b>200</b>	20	40	160	-	-	0	0	-	-	0	7/11
<i>Juniperus osteosperma</i>												
04	<b>160</b>	-	-	160	-	-	13	0	-	-	0	-/-
<i>Opuntia spp.</i>												
04	<b>300</b>	-	-	280	20	-	0	0	7	7	7	4/17

Trend Study 14R-5-04

Study site name: Turner Water Canyon.

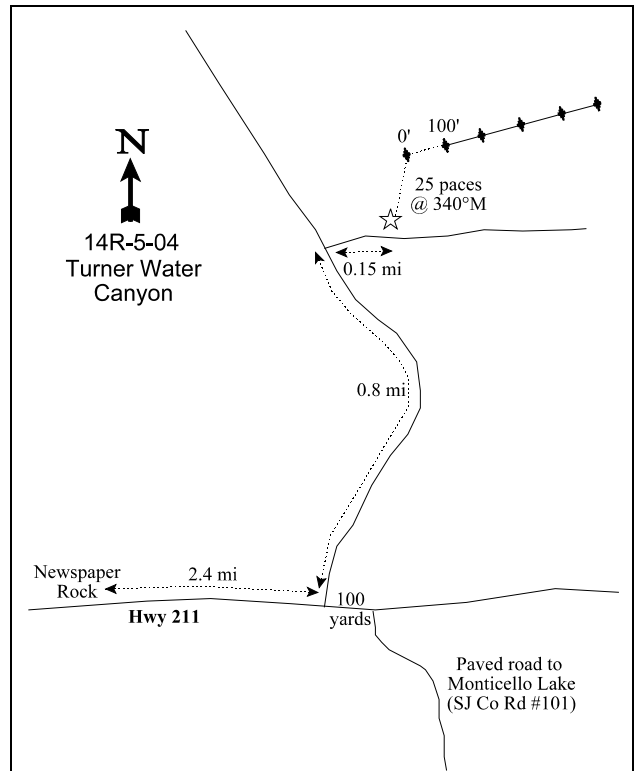
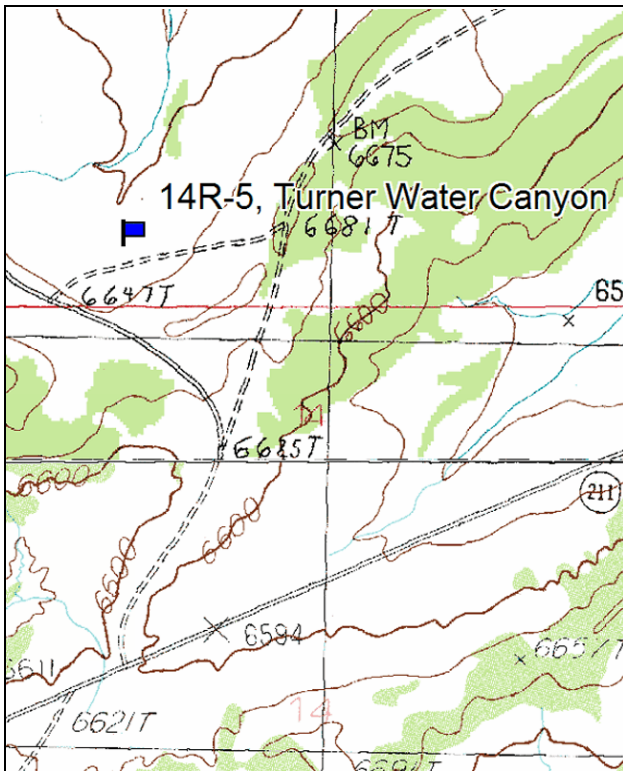
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 50 degrees magnetic.

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

LOCATION DESCRIPTION

From Highway 211, about 2.4 miles east of News Paper rock, turn north on a road that is about 100 yards west of a paved road (SJ County Road #101) that goes south toward Monticello Lake. Follow this road 0.8 miles to a road that comes in from the right. Turn here and travel 0.15 miles to a witness post on the left (north) side of the road. The 0-foot stake is 25 paces from the witness post at 340°M, and is marked with browse tag DWR #220.



Map Name: Photograph Gap

Diagrammatic Sketch

Township 32S, Range 22E, Section 11

GPS: NAD 27, UTM 12S 4207220 N, 633491 E

## DISCUSSION

### Turner Water Canyon – Trend Study No. 14R-5

The Turner Water Canyon monitoring study site was established on 1 of 10 sagebrush treatment areas in the first phase of the five-year Hart Draw Sagebrush Restoration project. Over the five years, over 3,000 acres of sagebrush steppe will be restored mainly on BLM, but also some private, land. It was intended to improve habitat for elk, mule deer, sagebrush steppe birds, and pronghorn. The treatment areas are located about 12 miles northwest of Monticello on the north and south sides of SR 211. The Hart Draw-Turner Water Canyon study is located on a Wyoming big sagebrush flat that is scheduled to be treated in 2007 during phase 2 of the project. This study is one of several sites established to monitor phase 2 of the five-year project. It was established approximately 2 miles west of the Hart Draw Flat studies treated in phase 1. It is located on a 2% slope with a west aspect at 6,600 feet on BLM land. It is located in the Hart Draw grazing allotment, which normally grazes 200-300 cattle in fall and spring, but has been suspended for 3 years until the treatment has become established. Pellet group data in 2005 were estimated at 50 deer and 18 cow days use/acre (124 ddu/ha and 45 cdu/ha).

The soil is a shallow sandy loam with an effective rooting depth of 17 inches. There is no rock in the soil profile and no hardpan in the upper 18 inches. The soil pH is neutral (6.9). In 2004, the soil erosion condition measurement was stable.

Wyoming big sagebrush is the dominant browse species. In 2004, it provided 8% cover, with a density of 2,300 plants/acre. Decadence was extremely high at 91% and plants classified as dying constituted 67% of the population. Mature individuals made up the other 9% of the population. Use on sagebrush was moderate to heavy. Average sagebrush leader growth was 4.5 inches.

Eight species of grasses were sampled in 2004, 2 of which were annuals. Blue grama provided nearly 18% cover in 2004 with a quadrat frequency of 87%. Needle-and-thread grass provided 3% cover and a quadrat frequency of 29%. Cheatgrass provided very little cover and a quadrat frequency of 3%. The other 5 grass species provided less than 1% cover combined.

Four species of forbs were also sampled in 2004, all of which were annuals. All species combined provided 1% cover.

#### 2004 Pretreatment Assessment

The monitoring site is dominated by decadent sagebrush and blue grama. The blue grama may provide some competition with the seeded species because of its high density. Cheatgrass is not abundant, but is present and may increase with the disturbance caused by the aerator and if the timing of precipitation is favorable. The Desirable Components Index score is fair due to moderate preferred browse cover and excellent perennial grass cover.

2005 winter range condition (DC Index) – fair (30) Lower potential scale

HERBACEOUS TRENDS --

Management unit 14R, Study no: 5

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	<i>Bouteloua gracilis</i>	301	17.62
G	<i>Bromus tectorum</i> (a)	5	.07
G	<i>Oryzopsis hymenoides</i>	4	.16
G	<i>Poa secunda</i>	15	.22
G	<i>Sitanion hystrix</i>	10	.22
G	<i>Sporobolus cryptandrus</i>	2	.03
G	<i>Stipa comata</i>	81	3.34
G	<i>Vulpia octoflora</i> (a)	58	.17
Total for Annual Grasses		63	0.24
Total for Perennial Grasses		413	21.62
Total for Grasses		476	21.87
F	<i>Descurainia pinnata</i> (a)	5	.01
F	<i>Gilia</i> spp. (a)	33	.13
F	<i>Lappula occidentalis</i> (a)	32	.46
F	<i>Plantago patagonica</i> (a)	139	.57
Total for Annual Forbs		209	1.18
Total for Perennial Forbs		0	0
Total for Forbs		209	1.18

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

BROWSE TRENDS --

Management unit 14R, Study no: 5

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia tridentata wyomingensis</i>	67	7.93
B	<i>Coryphantha vivipara</i>	5	.01
B	<i>Opuntia</i> spp.	11	.10
Total for Browse		83	8.04

CANOPY COVER, LINE INTERCEPT --

Management unit 14R, Study no: 5

Species	Percent Cover
	'04
<i>Artemisia tridentata wyomingensis</i>	7.88

**BASIC COVER --**

Management unit 14R, Study no: 5

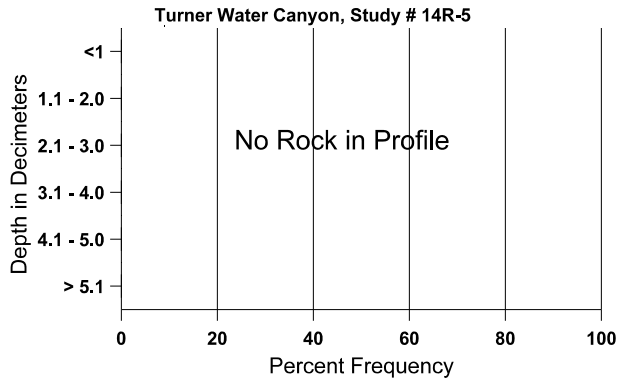
Cover Type	Average Cover % '04
Vegetation	32.08
Pavement	.01
Litter	28.75
Cryptogams	4.11
Bare Ground	49.21

**SOIL ANALYSIS DATA --**

Management unit 14R, Study no: 5, Study Name: Turner Water Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
16.6	70.2 (13.0)	6.9	61.9	21.2	16.8	0.8	9.5	96.0	0.7

### Stoniness Index



**PELLET GROUP DATA --**

Management unit 14R, Study no: 5

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	63	-
Deer	57	50 (124)
Cattle	6	18 (45)

BROWSE CHARACTERISTICS --  
 Management unit 14R, 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 wyomingensis</i>												
04	<b>2300</b>	2680	-	200	2100	1280	54	35	91	67	67	20/29
<i>Coryphantha vivipara</i>												
04	<b>120</b>	-	40	80	-	-	0	0	-	-	0	1/2
<i>Opuntia</i> spp.												
04	<b>280</b>	-	120	100	60	-	0	0	21	21	21	3/8

Trend Study 14R-6-04

Study site name: Hart Draw - Dugout .

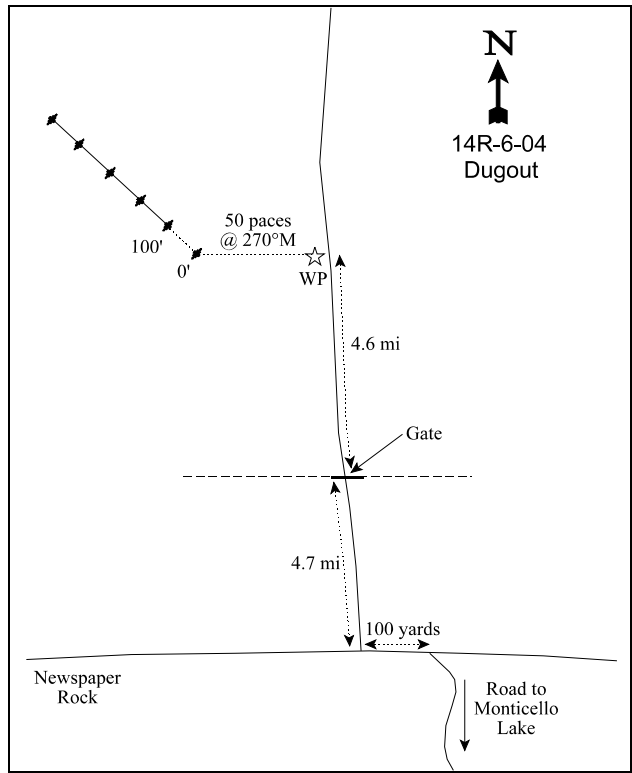
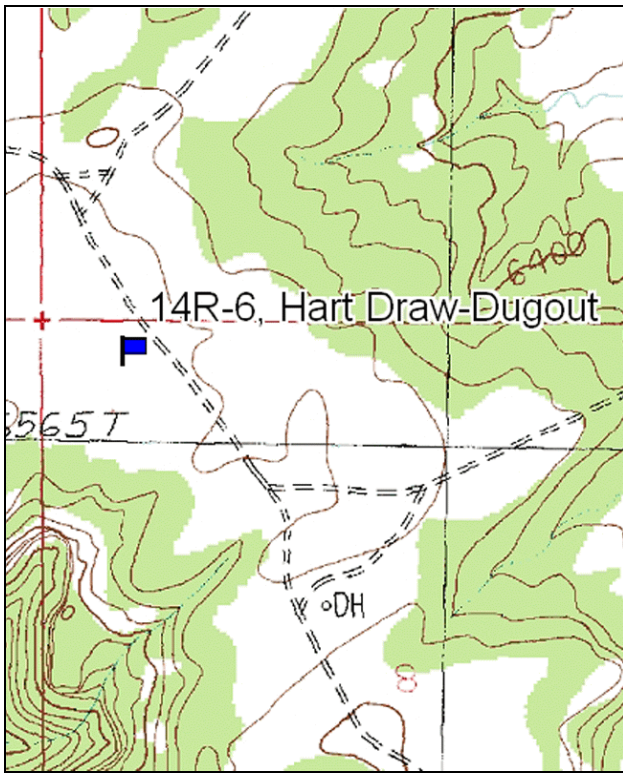
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 285 degrees magnetic.

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

LOCATION DESCRIPTION

From Highway 211, about 2.4 miles east of News Paper rock, turn north on a road that is about 100 yards west of a paved road (SJ County Road #101) that goes south toward Monticello Lake. Follow this road 4.7 miles to a gate. Passing through the gate continue 4.6 miles to a witness post on the left side of the road. The 0-foot stake is 50 paces from the witness post at 270°M, and is marked with browse tag #28.



Map Name: Harts Point South

Diagrammatic Sketch

Township 31S , Range 22E , Section 8

GPS: NAD 27, UTM 12S 4218164 N, 628300 E



## DISCUSSION

### Hart Draw-Dugout – Trend Study No. 14R-6

The Hart Draw-Dugout monitoring study site was established on 1 of 10 sagebrush treatment areas in the first phase of the five-year Hart Draw Sagebrush Restoration project. Over the five years, over 3,000 acres of sagebrush steppe will be restored mainly on BLM, but also some private, land. It was intended to improve habitat for elk, mule deer, sagebrush steppe birds, and pronghorn. The treatment areas are located about 12 miles northwest of Monticello on the north and south sides of SR 211. The Hart Draw-Dugout study is located on a Wyoming big sagebrush flat that was treated in 2005 during phase 1 of the project. This study is 1 of 5 sites established in 2004 and 2005 to monitor phase 1 of the five-year project. The area was treated with a Lawson sine drum aerator, and seeded on top of the drum, in the fall of 2005. The Harts Draw Flat 1, Harts Draw Flat 2, and Harts Windmill studies are located approximately 6 miles to the southeast. The Hart Draw-Dugout monitoring site is located on a 3-5% slope with a northwest aspect at 6,600 feet on BLM land. It is located in the Hart Point grazing allotment, but has been suspended for 3 years until the treatment has become established. Pellet group data in 2005 were estimated at 38 deer and 25 cow days use/acre (94 ddu/ha and 63 cdu/ha).

The soil is a shallow sandy loam with an effective rooting depth of 18 inches. There is no rock in the soil profile and no hardpan in the upper 18 inches. The soil pH is neutral (6.9). In 2004, the soil erosion condition measurement was stable.

Wyoming big sagebrush is the dominant browse species. In 2004, it provided 10% cover, with a density of 2,360 plants/acre. Decadence was extremely high at 94% and plants classified as dying constituted 55% of the population. Mature individuals made up the other 6% of the population. Use on sagebrush was light to moderate. Average sagebrush leader growth was 4.3 inches. A small population of winterfat was also sampled in 2004, all of which were mature and moderate to heavily used. Average winterfat leader growth was 9.1 inches.

Six species of grasses were sampled in 2004, 2 of which were annuals. Blue grama provided nearly 24% cover in 2004 with a quadrat frequency of 84%. Needle-and-thread grass provided 1% cover and a quadrat frequency of 25%. Cheatgrass provided less and one-fifth of a percent cover, but a quadrat frequency of 22%. The other 3 grass species provided less than 0.5% cover combined.

Nine species of forbs were also sampled in 2004, 5 of which were annuals. All species combined provided less than 1% cover.

#### 2004 Pretreatment Assessment

The monitoring site is dominated by decadent sagebrush and blue grama. The blue grama may provide some competition with the seeded species because of its high density. Cheatgrass is not abundant, but is present and may increase with the disturbance caused by the aerator and if the timing of precipitation is favorable. The Desirable Components Index score is fair due to moderate preferred browse cover and excellent perennial grass cover.

2005 winter range condition (DC Index) – fair (34) Lower potential scale

The following seed mix was applied to the site by the single drum aerator:

Species seeded	Bulk lbs in mix	Bulk lbs/acre
Siberian Wheatgrass 'Vavilov'	550	1.1
Western Wheatgrass	493	1.0
Orchardgrass 'Paiute'	250	0.5
Indian Ricegrass 'Rimrock'	500	1.0
Needle and Threadgrass--Beaver, UT	150	0.3
Needle and Threadgrass--Beaver, UT	100	0.2
Sand Dropseed	150	0.3
Alfalfa 'Nomad'	250	0.5
Alfalfa 'Spredor 4'	250	0.5
Sainfoin 'Eski'	1050	2.0
Small Burnet 'Delar'	1050	2.0
Blue Flax	100	0.2
Fourwing Saltbush--San Juan UT	103	0.2
Fourwing Saltbush--Juab/Tooele UT	400	0.8
Fourwing Saltbush--Wayne UT	32	0.1
<b>Total</b>	<b>5428</b>	<b>10.5</b>
PLS lbs/acre		9.2

HERBACEOUS TRENDS --

Management unit 14R, Study no: 6

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Bouteloua gracilis	329	23.93
G	Bromus tectorum (a)	40	.14
G	Oryzopsis hymenoides	7	.13
G	Sitanion hystrix	11	.25
G	Stipa comata	52	1.18
G	Vulpia octoflora (a)	7	.02
Total for Annual Grasses		47	0.15
Total for Perennial Grasses		399	25.50
Total for Grasses		446	25.65
F	Calochortus nuttallii	2	.00
F	Chenopodium spp. (a)	1	.00
F	Delphinium nuttallianum	6	.04
F	Erodium cicutarium (a)	1	.00
F	Gilia spp. (a)	75	.26
F	Lappula occidentalis (a)	1	.00
F	Plantago patagonica (a)	66	.19
F	Senecio multilobatus	3	.09
F	Sphaeralcea coccinea	30	.33

Type	Species	Nested Frequency	Average Cover %
		'04	'04
Total for Annual Forbs		144	0.47
Total for Perennial Forbs		41	0.47
Total for Forbs		185	0.94

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

#### BROWSE TRENDS --

Management unit 14R, Study no: 6

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia tridentata wyomingensis</i>	68	10.48
B	<i>Atriplex canescens</i>	0	.15
B	<i>Ceratoides lanata</i>	9	.03
B	<i>Gutierrezia sarothrae</i>	4	.18
B	<i>Opuntia</i> spp.	4	.15
B	<i>Pediocactus simpsonii</i>	1	-
Total for Browse		86	10.99

#### CANOPY COVER, LINE INTERCEPT --

Management unit 14R, Study no: 6

Species	Percent Cover
	'04
<i>Artemisia tridentata wyomingensis</i>	9.13
<i>Ceratoides lanata</i>	.46
<i>Gutierrezia sarothrae</i>	.20
<i>Opuntia</i> spp.	.28

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 14R, Study no: 6

Species	Average leader growth (in)
	'04
<i>Artemisia tridentata wyomingensis</i>	1.7
<i>Ceratoides lanata</i>	3.4

**BASIC COVER --**

Management unit 14R, Study no: 6

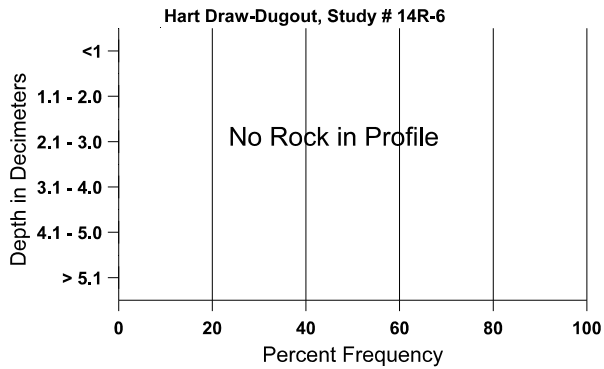
Cover Type	Average Cover % '04
Vegetation	36.74
Pavement	.00
Litter	18.75
Cryptogams	3.30
Bare Ground	49.56

**SOIL ANALYSIS DATA --**

Management unit 14R, Study no: 6, Study Name: Hart Draw - Dugout

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
18.3	60.2 (16.9)	6.9	61.3	25.4	13.3	0.6	9.0	80.0	0.7

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 14R, Study no: 6

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	11	-
Deer	29	38 (94)
Cattle	4	25 (63)

BROWSE CHARACTERISTICS --  
 Management unit 14R, Study no: 6

		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>												
04	<b>2360</b>	40	-	140	2220	280	38	6	94	55	55	20/32
<i>Ceratoides lanata</i>												
04	<b>320</b>	-	-	320	-	-	31	63	-	-	0	7/11
<i>Gutierrezia sarothrae</i>												
04	<b>220</b>	-	-	200	20	-	9	0	9	-	0	11/12
<i>Opuntia spp.</i>												
04	<b>120</b>	-	-	80	40	-	0	0	33	-	0	4/13
<i>Pediocactus simpsonii</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-

Trend Study 14R-7-04

Study site name: Adams CE Harrow .

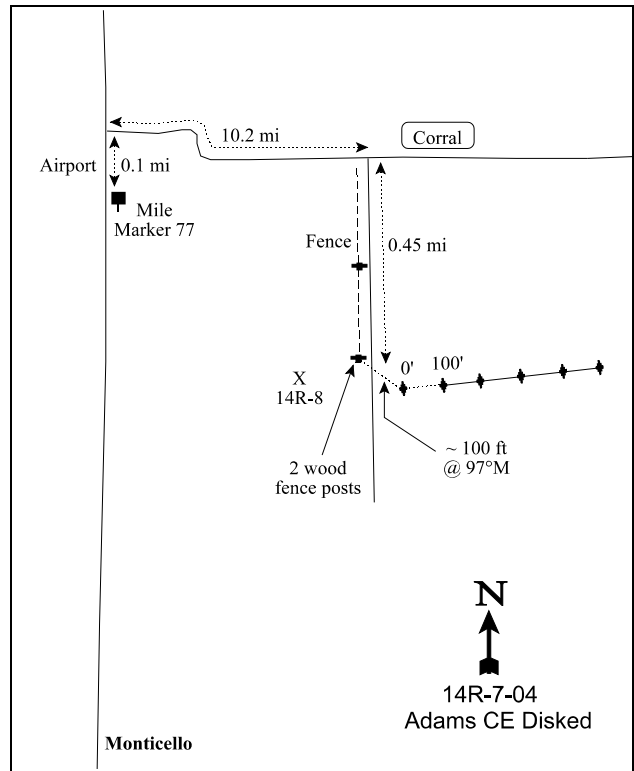
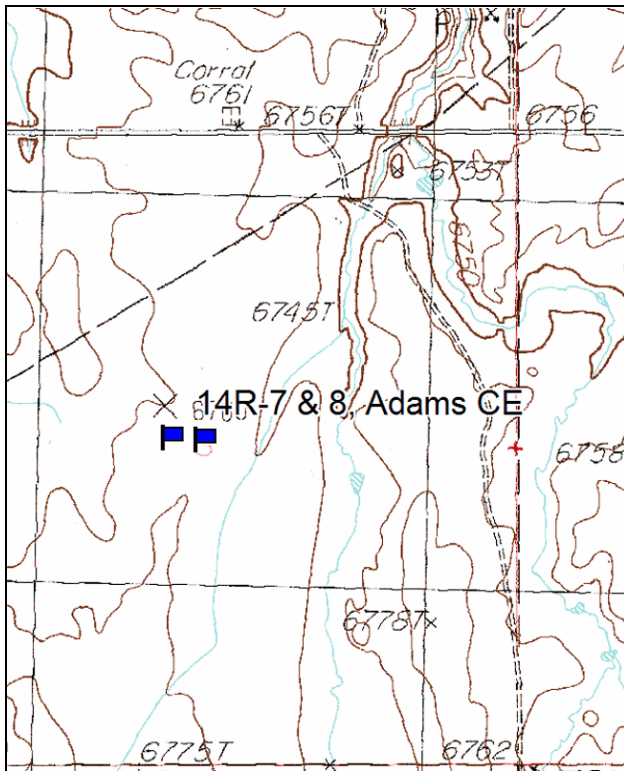
Vegetation type: Black Sagebrush .

Compass bearing: frequency baseline 80 degrees magnetic.

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

LOCATION DESCRIPTION

On US 191 travel north of Monticello for about 5.5 miles to mile marker 77. Continue 0.1 miles to a road that comes in from the right. Turn here and follow this road 10.2 miles to another road that comes in from the right. Turn here and travel south 0.45 miles to the second pair of wood fence posts on the right side of the road. The 0-foot stake is about 100 feet from these fence posts at 97°M.



Map Name: Eastland NW

Diagrammatic Sketch

Township 33S , Range 25E , Section 3

GPS: NAD 27, UTM 12S 4200334 N, 661403 E

## DISCUSSION

### Adams CE Harrow – Trend Study No. 14R-7

The Adams CE Harrow study was established within a harrow treatment on the private property of Bruce Adams. Approximately 320 acres of black sagebrush dominated land was harrowed in alternating strips in the fall of 2001. A 2-direction Dixie pipe harrow treatment, a single-direction Dixie pipe harrow treatment, and an untreated black sagebrush area left untreated were alternated in strips running east to west. Seed was applied with a broadcast seeder attached to the tractor pulling the harrow. This monitoring study was established within the harrow treatment, what appeared to the 2-direction harrow treatment, in the summer of 2004. A control study, Adams CE Control (14R-08), was established about 250 feet west of this study, outside of the treatment area. In another area of the Adams property, a moldboard plow treatment and seeding was applied in 2003.

The treatment area is located 10 miles northwest of Monticello, ½ mile south of Hickman Flat Road (CR 332). The study site was established on an eastern aspect with a 2-5% slope at an elevation of 6,700 feet. In 2004, the estimated pellet group data was 4 cow days use/acre (11 cdu/ha). Sage grouse pellets were estimated at 26 pellets/acre. The pellets sampled were in the untreated strips and cow pats were from previous years.

The soil is a shallow clay with an effective rooting depth of 14 inches. The soil profile contains very little rock and is slightly more sandy at the surface. Surface rock and pavement provided only 2% cover in 2004. The soil phosphorus concentration is only 2.6 ppm, values less than 6 ppm may limit normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil reaction is neutral (pH of 7.1). Due to the 2-direction harrow treatment, bare ground cover was very high (68%) in 2004. The 2004 soil erosion condition measurement was determined to be stable.

Black sagebrush is the key browse species. It provided 7% cover in 2004 and had a density of 4,760 plants/acre. Decadent individuals made up 57% of the population in 2004 and mature individuals made up 43%. No young plants were sampled in 2004 and plants classified as dying made up 34% of the population. Use was moderate in 2004. Average sagebrush leader growth was 2.9 inches. Winterfat is also very abundant. It provided slightly more than 3% cover and density was 2,940 plants/acre. Mature individuals made up 95% of the population and young individuals made up the other 5%. No decadent or dying plants were sampled. Use was light in 2004. Average winterfat leader growth was 9.9 inches. A small number of decadent serviceberry, 40 plants/acre, were also sampled.

Eight species of grasses were sampled in 2004, all of which were perennials. Crested wheatgrass was the dominant grass with 4% cover and a quadrat frequency of 29%. Western wheatgrass and squirreltail bottlebrush were also abundant at around 1% cover in 2004. At the control study (14R-08), crested wheatgrass was also dominant with 5% cover and a quadrat frequency of 59%. Western wheatgrass was similar between the harrowed and control sites with 2% cover at the control site. Western wheatgrass was the only grass species in the seed mix that was sampled in 2004 on the harrowed site. It had, however, been sampled on the control, so it is possible that it was on the site previous to the treatment.

Twelve species of forbs were sampled in 2004, 5 of which were annuals. Desert phlox and scarlet globemallow were the only species that provided around 1% cover. Alfalfa and small burnett were the only species seeded on the treatment in 2001 and were sampled in 2004. Both species provided very little cover and nested frequency.

### 2004 Post-treatment Assessment

The treatment did little to change the abundance of perennial grasses, but forb cover appears to have increased by 1.5% compared to the control. The density of black sagebrush on the treatment was nearly half of control site. The black sagebrush cover was less than half of that of the control. The density of winterfat on the

treatment area was approximately 10-fold more than the control area. Bare ground cover on the treatment study was the same as the control. The Desirable Components Index score was fair due to moderate browse, perennial grass, and perennial forb cover.

2005 winter range condition (DC Index) – fair (35) Lower potential scale

The following species were broadcast seeded in with the harrow treatment:

Seeded Species	Approximate Bulk lbs/acre
Western wheatgrass	1.0
Thickspike wheatgrass	2.0
Bluebunch wheatgrass	2.0
Slender wheatgrass	1.0
Pubescent wheatgrass	1.0
Crested wheatgrass	1.0
Alfalfa	2.0
Small burnett	2.0
Blue flax	0.3
<b>Total</b>	<b>12.3</b>

HERBACEOUS TRENDS --

Management unit 14R, Study no: 7

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron cristatum	76	3.99
G	Agropyron intermedium	4	.03
G	Agropyron smithii	102	1.52
G	Bouteloua gracilis	1	.03
G	Elymus junceus	4	.09
G	Hilaria jamesii	10	.22
G	Oryzopsis hymenoides	15	.25
G	Sitanion hystrix	50	1.01
Total for Annual Grasses		0	0
Total for Perennial Grasses		262	7.16
Total for Grasses		262	7.16
F	Chenopodium leptophyllum(a)	60	.15
F	Cordylanthus spp. (a)	6	.04
F	Cryptantha spp.	6	.04
F	Descurainia pinnata (a)	4	.02
F	Erigeron pumilus	2	.03
F	Lappula occidentalis (a)	5	.02
F	Lesquerella spp.	8	.16
F	Medicago sativa	12	.03



Type	Species	Nested Frequency	Average Cover %
		'04	'04
F	Phlox austromontana	132	1.10
F	Salsola iberica (a)	11	.05
F	Sanguisorba minor	8	.01
F	Sphaeralcea coccinea	71	.93
Total for Annual Forbs		86	0.28
Total for Perennial Forbs		239	2.30
Total for Forbs		325	2.59

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

#### BROWSE TRENDS --

Management unit 14R, Study no: 7

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Amelanchier utahensis	1	-
B	Artemisia nova	73	6.92
B	Ceratoides lanata	45	2.46
B	Chrysothamnus depressus	55	1.32
B	Eriogonum microthecum	15	.02
B	Gutierrezia sarothrae	9	.18
B	Tetradymia canescens	1	-
Total for Browse		199	10.92

#### CANOPY COVER, LINE INTERCEPT --

Management unit 14R, Study no: 7

Species	Percent Cover
	'04
Artemisia nova	5.98
Ceratoides lanata	3.13
Chrysothamnus depressus	3.76
Eriogonum microthecum	.05
Gutierrezia sarothrae	.08
Tetradymia canescens	.18

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 14R, Study no: 7

Species	Average leader growth (in)
	'04
Artemisia nova	1.1
Ceratoides lanata	3.9

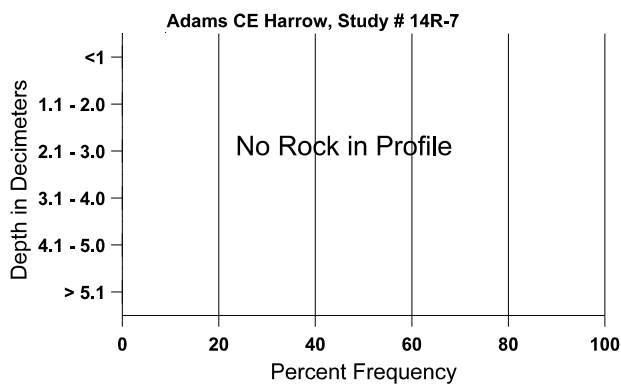
BASIC COVER --  
Management unit 14R, Study no: 7

Cover Type	Average Cover %
	'04
Vegetation	20.27
Rock	.39
Pavement	1.95
Litter	19.76
Cryptogams	.04
Bare Ground	67.80

SOIL ANALYSIS DATA --  
Management unit 14R, Study no: 7, Study Name: Adams CE Harrow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
14.3	60.8 (15.2)	7.1	31.3	28.2	40.5	1.8	2.6	182.4	0.5

## Stoniness Index



PELLET GROUP DATA --

Management unit 14R, Study no: 7

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	2	-
Cattle	-	4 (11)
Grouse	-	26/acre

BROWSE CHARACTERISTICS --

Management unit 14R, Study no: 7

		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>												
04	<b>40</b>	-	-	-	40	-	0	0	100	-	0	-/-
<i>Artemisia nova</i>												
04	<b>4760</b>	140	-	2060	2700	3780	11	18	57	34	36	9/14
<i>Ceratoides lanata</i>												
04	<b>2940</b>	2020	140	2800	-	-	15	2	-	-	0	8/11
<i>Chrysothamnus depressus</i>												
04	<b>3820</b>	120	20	3300	500	40	9	0	13	6	7	8/14
<i>Eriogonum microthecum</i>												
04	<b>480</b>	20	-	480	-	-	4	0	-	-	0	3/5
<i>Gutierrezia sarothrae</i>												
04	<b>220</b>	40	20	200	-	-	0	0	-	-	0	6/9
<i>Tetradymia canescens</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-

Trend Study 14R-8-04

Study site name: Adams CE Control.

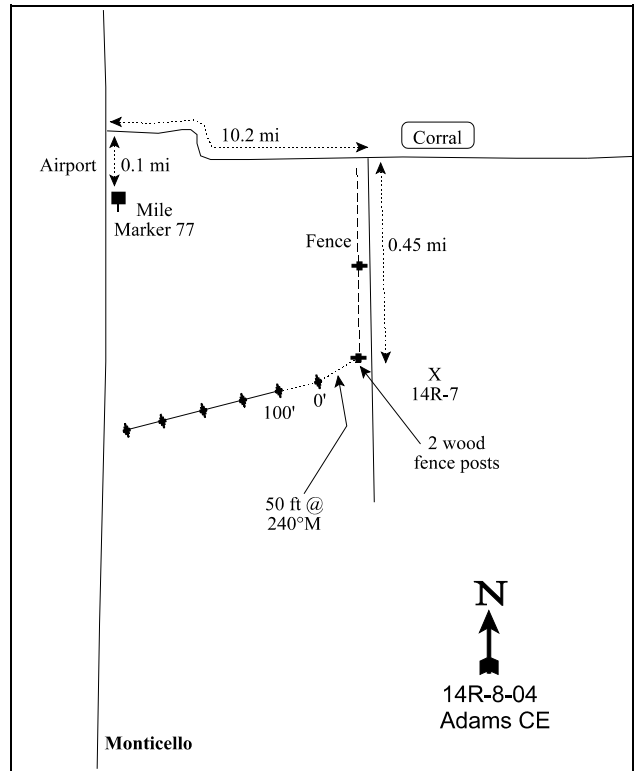
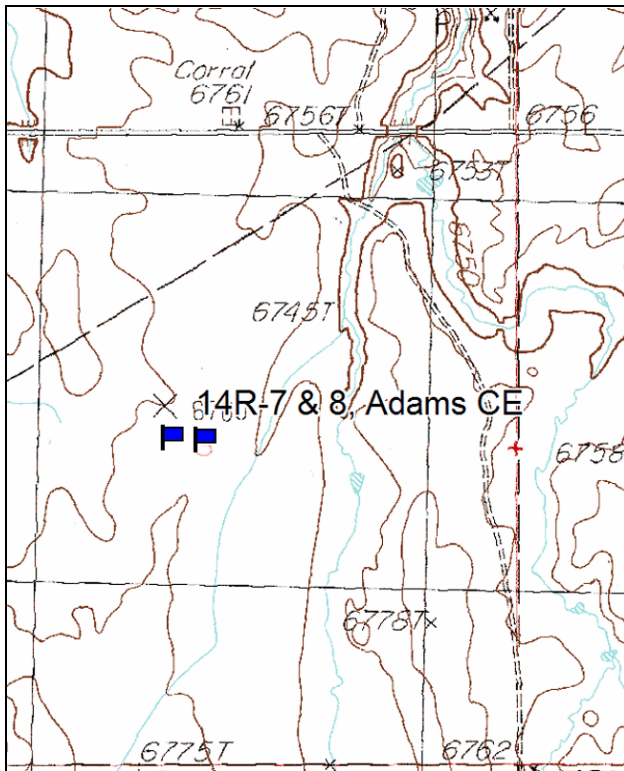
Vegetation type: Black Sagebrush.

Compass bearing: frequency baseline 255 degrees magnetic.

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

LOCATION DESCRIPTION

On US 191 travel north of Monticello for about 5.5 miles to mile marker 77. Continue 0.1 miles to a road that comes in from the right. Turn here and follow this road 10.2 miles to another road that comes in from the right. Turn here and travel south 0.45 miles to the second pair of wood fence posts on the right side of the road. The 0-foot stake is 50 feet from the fence posts at 240°M.



Map Name: Eastland NW

Diagrammatic Sketch

Township 33S, Range 25E, Section 3

GPS: NAD 27, UTM 12S 4200337 N, 661320 E

## DISCUSSION

### Adams CE Control – Trend Study No. 14R-8

The Adams CE Control study was established outside a harrow treatment on the private property of Bruce Adams to act as a control to the treatment monitoring study. Approximately 320 acres of black sagebrush dominated land was harrowed in alternating strips in the fall of 2001. A 2-direction Dixie pipe harrow treatment, a single-direction Dixie pipe harrow treatment, and an untreated black sagebrush area left untreated were alternated in strips running east to west. Seed was applied with a broadcast seeder attached to the tractor pulling the harrow. This monitoring study was established outside the harrow treatment in the summer of 2004. The study within the treatment, Adams CE Harrow (14R-07), was established about 250 feet east of this study. Although not treated with the harrow in 2001, the area where the control was established had been treated years before. In another area of the Adams property, a moldboard plow treatment and seeding was applied in 2003.

The treatment area is located 10 miles northwest of Monticello, ½ mile south of Hickman Flat Road (CR 332). The study site was established 175 feet west of the treatment area on a northeastern aspect with a 2-3% slope at an elevation of 6,700 feet. In 2004, the estimated pellet group data was 8 cow days use/acre (20 cdu/ha). Sage grouse pellets were estimated at 9 pellets/acre. Cow pats were from previous years.

The soil is a shallow clay loam with an effective rooting depth of 14 inches. The soil profile contains no rock and a hard clay layer is found at 6-8 inches deep. Surface rock and pavement provided only 1% cover in 2004. The soil reaction is neutral (pH of 7.2). Bare ground cover was high (67%) in 2004. The 2004 soil erosion condition measurement was determined to be stable.

Black sagebrush is the key browse species. It provided 17% cover in 2004 and had a density of 7,700 plants/acre. Decadent individuals made up 25% of the population in 2004 and mature individuals made up 72%. Young plants made up only 3% of the population in 2004 and plants classified as dying made up 34%. Use was light in 2004. Average sagebrush leader growth was 2.6 inches. Winterfat was also sampled, but low in densities. Average winterfat leader growth was 6.2 inches.

Six species of grasses were sampled in 2004, all of which were perennials. Crested wheatgrass was the dominant grass with 5% cover and a quadrat frequency of 59%. Western wheatgrass was also abundant at 2% cover and a quadrat frequency of 45% in 2004. At the harrowed study (14R-07), crested wheatgrass was also dominant with 4% cover and a quadrat frequency of 29%. Western wheatgrass was similar between the harrowed and control sites with 1% cover at the harrowed site. Western wheatgrass was the only grass species in the seed mix that was sampled in 2004 on the harrowed site. It had, however, been sampled on the control, so it is possible that it was on the site previous to the treatment.

Thirteen species of forbs were sampled in 2004, 3 of which were annuals. All forb species combined provided less than 1% cover in 2004. None of the species sampled were in the seed mix, it can be concluded that the seed mix forb species sampled on the harrowed site were not present prior to the treatment.

### 2004 Post-treatment Control Assessment

The black sagebrush population is mature and relatively healthy. The herbaceous understory consists of two species and could use some more diversity. The soil condition is stable. The Desirable Components Index score was good due to good browse cover and moderate perennial grass cover.

2004 winter range condition (DC Index) – good (52) Lower potential scale

HERBACEOUS TRENDS --  
Management unit 14R, Study no: 8

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron cristatum	160	5.00
G	Agropyron smithii	127	2.17
G	Hilaria jamesii	1	.03
G	Koeleria cristata	2	.03
G	Oryzopsis hymenoides	2	.06
G	Sitanion hystrix	9	.26
Total for Annual Grasses		0	0
Total for Perennial Grasses		301	7.56
Total for Grasses		301	7.56
F	Calochortus nuttallii	3	.00
F	Chenopodium leptophyllum(a)	10	.02
F	Descurainia pinnata (a)	4	.01
F	Erigeron eatonii	3	.01
F	Erigeron spp.	3	.03
F	Erigeron pumilus	2	.00
F	Lappula occidentalis (a)	7	.01
F	Lupinus spp.	3	.00
F	Phlox austromontana	61	.56
F	Sphaeralcea coccinea	29	.16
F	Tragopogon dubius	1	.00
F	Trifolium spp.	20	.07
F	Unknown forb-perennial	3	.03
Total for Annual Forbs		21	0.04
Total for Perennial Forbs		128	0.89
Total for Forbs		149	0.94

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

BROWSE TRENDS --

Management unit 14R, Study no: 8

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia nova	97	17.06
B	Ceratoides lanata	8	.09
B	Chrysothamnus depressus	5	.00
B	Chrysothamnus viscidiflorus viscidiflorus	4	-
B	Eriogonum microthecum	7	.09
B	Gutierrezia sarothrae	8	.04
B	Tetradymia canescens	0	-
Total for Browse		129	17.29

CANOPY COVER, LINE INTERCEPT --

Management unit 14R, Study no: 8

Species	Percent Cover
	'04
Artemisia nova	22.85
Ceratoides lanata	.28
Chrysothamnus depressus	.18
Eriogonum microthecum	.11
Gutierrezia sarothrae	.18

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 14R, Study no: 8

Species	Average leader growth (in)
	'04
Artemisia nova	1.0
Ceratoides lanata	2.5

**BASIC COVER --**

Management unit 14R, Study no: 8

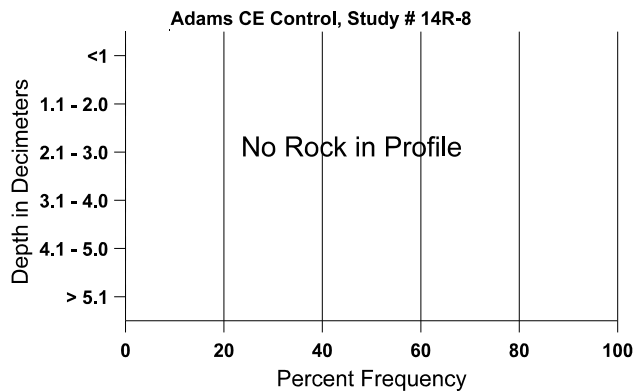
Cover Type	Average Cover % '04
Vegetation	24.42
Rock	.07
Pavement	.90
Litter	17.09
Cryptogams	.62
Bare Ground	66.58

**SOIL ANALYSIS DATA --**

Management unit 14R, Study no: 8, Study Name: Adams CE Control

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
14.0	59.8 (16.0)	7.2	33.3	31.4	35.3	1.5	12.4	160.0	0.6

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 14R, Study no: 8

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	1	-
Grouse	1	9/acre
Cattle	5	8 (20)



BROWSE CHARACTERISTICS --  
 Management unit 14R, 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 nova</i>												
04	<b>7700</b>	80	200	5540	1960	1320	4	0	25	10	10	12/21
<i>Ceratoides lanata</i>												
04	<b>220</b>	-	-	180	40	-	9	0	18	9	9	7/10
<i>Chrysothamnus depressus</i>												
04	<b>140</b>	-	-	120	20	-	0	0	14	14	14	4/7
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>80</b>	-	-	80	-	-	0	0	-	-	0	10/16
<i>Eriogonum microthecum</i>												
04	<b>220</b>	-	-	220	-	-	36	0	-	-	0	4/5
<i>Gutierrezia sarothrae</i>												
04	<b>220</b>	-	-	220	-	-	0	0	-	-	0	5/11
<i>Tetradymia canescens</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	11/22

Trend Study 16R-11-04

Study site name: Lower Cedar Bench .

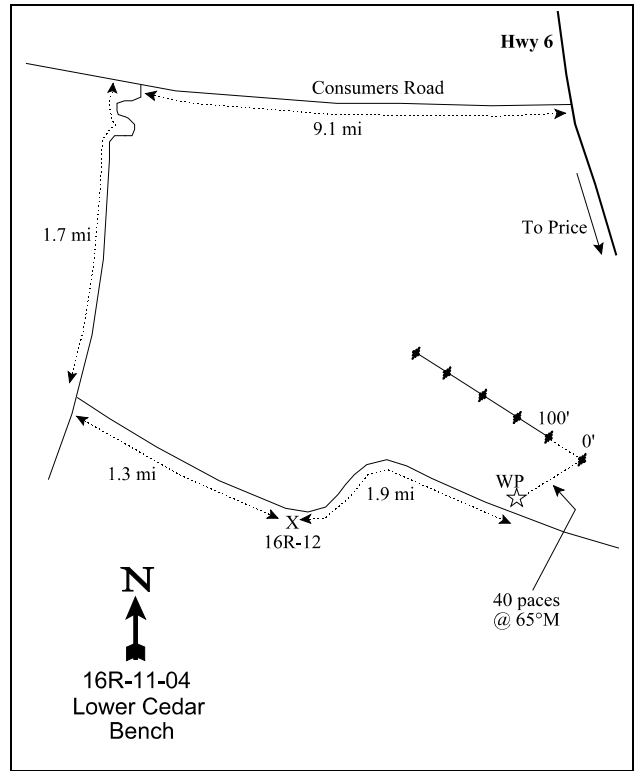
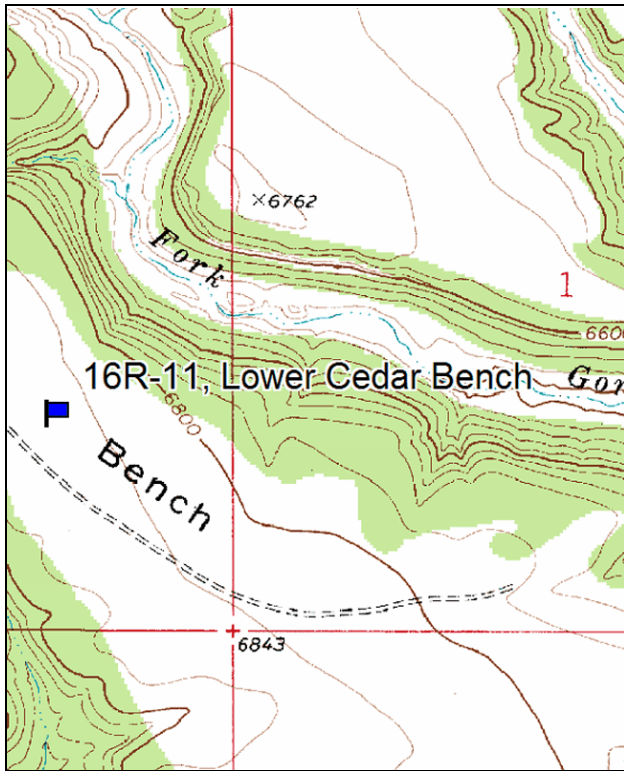
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 305 degrees magnetic.

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

LOCATION DESCRIPTION

From Highway 6 north of Price, turn west onto Consumers Road. Travel 9.1 miles to a road that comes in from the left (south). Turn here and follow this road 1.7 miles to another road that comes in from the left. Turn here and travel 1.3 miles to a witness post on the right. Continue 1.9 miles to a witness post on the left side of the road. The 0-foot stake is 40 paces from the witness post at 65°M, and is marked with browse tag #47.



Map Name: Standardville

Diagrammatic Sketch

Township 14S , Range 8E , Section 2

GPS: NAD 27, UTM 12S 4386906 N, 500973 E

## DISCUSSION

### Lower Cedar Bench – Trend Study No. 16R-11

The Lower Cedar Bench study monitors a pinyon-juniper removal on Cedar Bench approximately 10 miles west of Price. The big game winter range habitat on Cedar Bench has degraded as pinyon-juniper canopy cover has increased. The purpose of the treatment was to open up the canopy establish desirable forage and browse species in the area. Seed was hand broadcast on the treatment area and was then pinyon and juniper trees were removed by pushing with D-6 CAT bulldozers. The treatment area is located about 1 mile south of Consumers Road (SSR 139). Another study, Upper Cedar Bench Push (16R-12), was established 1.6 miles to the west, on the same treatment area. The monitoring site is located on an eastern aspect with a slope of 3% at an elevation of 6,800 feet. It is located within the Gordon Creek Withdrawl grazing allotment. In 2004, the estimated pellet group data was 12 elk and 119 deer days use/acre (30 edu/ha and 294 ddu/ha). Most pellets were from winter use.

The soil is a shallow sandy clay loam with an effective rooting depth of 11 inches. No rock is in the soil profile and less than 2% of the soil surface is covered with rock and pavement. The soil pH is neutral (6.8). In 2004, the soil erosion condition measurement was slight due to pedestals over 1 inch tall, as well as a moderate number of rills and flow patterns.

A mixture of Wyoming and mountain big sagebrush are the key browse species, the Wyoming appears dominant, however. It provided 3% cover in 2004 with a density of 2,200 plants/acre. Mature individuals made up 28% of the population in 2004 and decadent individuals made up 66%. Young plants made up 6% of the population and plants classified as dying made up 48%. Use was moderate to heavy and the average browse leader growth for sagebrush was 10 inches.

Combined pinyon and juniper canopy cover was 27% in 2004. 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. Estimated pinyon density was 285 trees/acre with an average trunk diameter of 4.2 inches. Estimated juniper density was 82 trees/acre with an average trunk diameter of 3.3 inches.

Ten species of grasses were sampled in 2004, 1 of which was an annual. Salina wildrye and needle-and-thread were the dominant grass species with 1% cover each. Perennial grasses provided 5% cover combined. Cheatgrass provided very little cover and was only sampled in 16% of quadrats.

Eighteen species of forbs were sampled in 2004, 6 of which were annuals. Forbs provided only 2% cover, half of which were annuals. The high pinyon-juniper canopy cover was suppressing the forb growth previous to the treatment.

### 2004 Pre-treatment Assessment

The pinyon canopy cover is extremely high and is suppressing sagebrush and understory growth. Removal of the pinyon-juniper trees will only improve this heavily-used winter range. There is some threat of cheatgrass increase because it is present on the study, but it is minimal and may not expand much. The Desirable Components Index score rated this site as poor due to a lack of browse cover, low perennial grass cover, and low perennial forb cover.

2004 winter range condition (DC Index) – poor (17) Lower potential scale

The following is the seed mix was applied to the treatment area:

Seed Species	Bulk lbs in mix	Bulk lbs/acre
Great Basin Wildrye 'Trailhead'	80	0.5
Alfalfa 'Spredor 3'	175	1.2
Blue Flax 'Appar'	33	0.2
Bitterbrush--Ada/Boise ID	54	0.4
Fourwing Saltbush--Emery UT	100	0.7
Sagebrush, Wyoming--Sanpete UT	100	0.7
<b>Total</b>	<b>542</b>	<b>3.6</b>
<b>Total PLS/acre</b>		<b>2.5</b>
<b>Live Seeds/sq. ft.</b>		<b>10.5</b>

HERBACEOUS TRENDS --

Management unit 16R, Study no: 11

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron smithii	9	.18
G	Agropyron spicatum	-	.00
G	Bouteloua gracilis	31	.91
G	Bromus tectorum (a)	9	.16
G	Elymus salina	26	1.20
G	Oryzopsis hymenoides	10	.31
G	Poa fendleriana	8	.06
G	Poa secunda	6	.09
G	Sitanion hystrix	60	.86
G	Stipa comata	71	1.44
<b>Total for Annual Grasses</b>		<b>9</b>	<b>0.15</b>
<b>Total for Perennial Grasses</b>		<b>221</b>	<b>5.07</b>
<b>Total for Grasses</b>		<b>230</b>	<b>5.23</b>
F	Arabis spp.	10	.03
F	Astragalus convallarius	8	.36
F	Astragalus spp.	2	.00
F	Calochortus nuttallii	3	.00
F	Chaenactis douglasii	-	.00
F	Chenopodium spp. (a)	55	.16
F	Collinsia parviflora (a)	-	.00
F	Descurainia pinnata (a)	13	.06
F	Gayophytum ramosissimum(a)	38	.21
F	Lappula occidentalis (a)	11	.07
F	Lesquerella spp.	7	.01
F	Machaeranthera canescens	8	.06

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
F	Penstemon comarrhenus	3	.01
F	Penstemon pachyphyllus	10	.13
F	Phlox longifolia	4	.03
F	Polygonum douglasii (a)	151	.48
F	Schoenocrambe linifolia	3	.00
F	Sphaeralcea coccinea	16	.28
Total for Annual Forbs		268	1.01
Total for Perennial Forbs		74	0.95
Total for Forbs		342	1.96

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

#### BROWSE TRENDS --

Management unit 16R, Study no: 11

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata vaseyana	54	3.32
B	Chrysothamnus viscidiflorus viscidiflorus	40	1.93
B	Gutierrezia sarothrae	1	-
B	Juniperus osteosperma	10	3.88
B	Opuntia spp.	19	.90
B	Pediocactus simpsonii	4	.00
B	Pinus edulis	17	16.00
Total for Browse		145	26.05

#### CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 11

Species	Percent Cover
	'04
Artemisia tridentata vaseyana	4.21
Chrysothamnus viscidiflorus viscidiflorus	2.81
Juniperus osteosperma	5.80
Opuntia spp.	.13
Pediocactus simpsonii	.06
Pinus edulis	20.95

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 16R, Study no: 11

Species	Average leader growth (in)
	'04
Artemisia tridentata vaseyana	3.8

POINT-QUARTER TREE DATA --  
Management unit 16R, Study no: 11

Species	Trees per Acre	Average diameter (in)
	'04	'04
Juniperus osteosperma	82	3.3
Pinus edulis	285	4.2

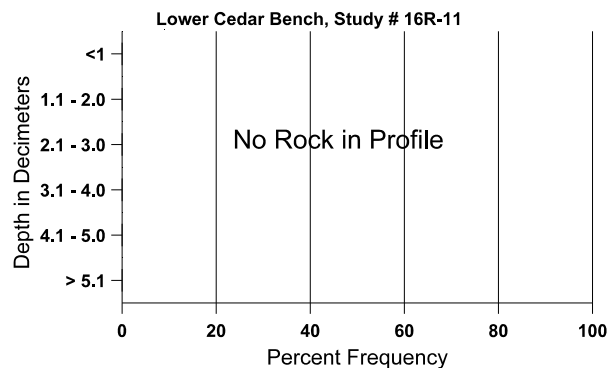
BASIC COVER --  
Management unit 16R, Study no: 11

Cover Type	Average Cover %
	'04
Vegetation	33.28
Rock	1.36
Pavement	.33
Litter	49.95
Cryptogams	5.03
Bare Ground	32.87

SOIL ANALYSIS DATA --  
Management unit 16R, Study no: 11, Study Name: Lower Cedar Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.3	62.8 (11.9)	6.8	45.6	27.1	27.2	1.4	15.0	105.6	0.6

## Stoniness Index



PELLET GROUP DATA --

Management unit 16R, Study no: 11

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	20	-
Elk	3	12 (30)
Deer	33	119 (294)

BROWSE CHARACTERISTICS --

Management unit 16R, Study no: 11

		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 vaseyana</i>												
04	<b>2200</b>	100	120	620	1460	2480	44	34	66	48	49	19/23
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>2040</b>	-	80	1940	20	80	0	0	1	-	.98	9/13
<i>Gutierrezia sarothrae</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	9/11
<i>Juniperus osteosperma</i>												
04	<b>220</b>	-	80	140	-	-	0	0	-	-	0	-/-
<i>Opuntia spp.</i>												
04	<b>520</b>	-	80	440	-	40	0	0	-	-	0	4/12
<i>Pediocactus simpsonii</i>												
04	<b>80</b>	-	40	40	-	-	0	0	-	-	0	2/4
<i>Pinus edulis</i>												
04	<b>340</b>	-	160	160	20	20	0	0	6	-	6	-/-

Trend Study 16R-12-04

Study site name: Upper Cedar Bench .

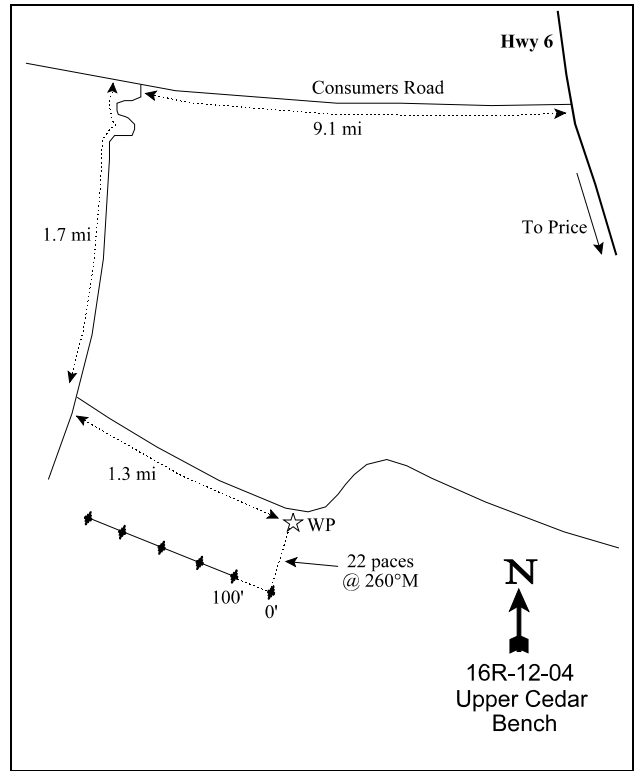
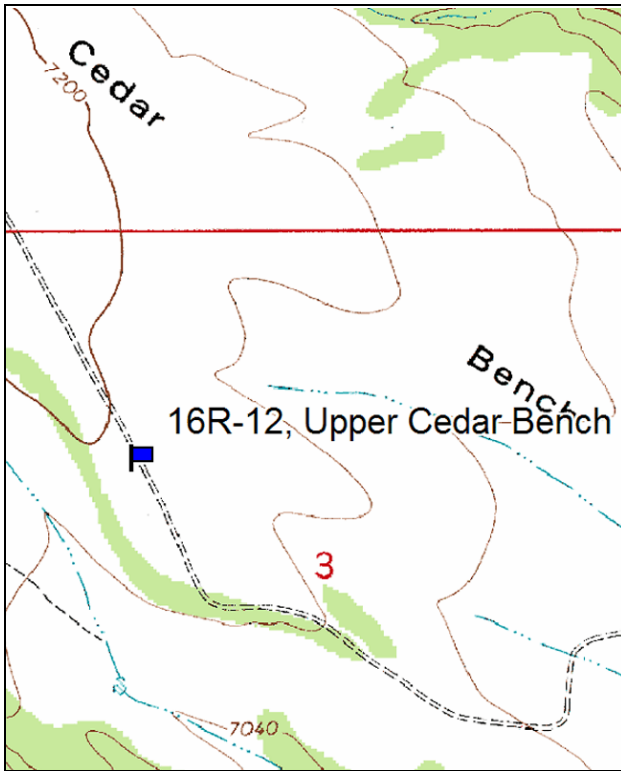
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 320 degrees magnetic.

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

LOCATION DESCRIPTION

From Highway 6 north of Price, turn west onto Consumers Road. Travel 9.1 miles to a road that comes in from the left (south). Turn here and follow this road 1.7 miles to another road that comes in from the left. Turn here and travel 1.3 miles to a witness post on the right. The 0-foot stake is 22 paces from the witness post at 260°M, and is marked with browse tag #48.



Map Name: Jump Creek

Diagrammatic Sketch

Township 14S , Range 8E , Section 3

GPS: NAD 27, UTM 12S 4387517 N, 498466 E



## DISCUSSION

### Upper Cedar Bench – Trend Study No. 16R-12

The Upper Cedar Bench study monitors a pinyon-juniper removal on Cedar Bench approximately 10 miles west of Price. The big game winter range habitat on Cedar Bench has degraded as pinyon-juniper canopy cover has increased. The purpose of the treatment was to open up the canopy establish desirable forage and browse species in the area. Seed was hand broadcast on the treatment area and was then pinyon and juniper trees were removed by pushing with D-6 CAT bulldozers. The treatment area is located about 1 mile south of Consumers Road (SSR 139). Another study, Lower Cedar Bench Push (16R-11), was established 1.6 miles to the east, on the same treatment area. The monitoring site is located on a southwestern aspect with a slope of 3% at an elevation of 7,200 feet. It is located within the Gordon Creek Withdrawal grazing allotment. In 2004, the estimated pellet group data was 53 elk and 52 deer days use/acre (131 edu/ha and 127 ddu/ha). Most pellets were from winter use.

The soil is a shallow clay loam with an effective rooting depth of 10 inches. No rock is in the soil profile and less than 2% of the soil surface is covered with rock and pavement. The soil pH is neutral (7.1). In 2004, the soil erosion condition measurement was stable.

Black sagebrush and Wyoming big sagebrush are the key browse species. Black sagebrush provided 6% cover in 2004 with a density of 2,820 plants/acre. The mature individuals made up 54% of the population, decadent individuals made up 31%, and young made up 15%. Plants classified as dying made up 18% of the population. Use was light and average leader growth was 3.5 inches. Wyoming big sagebrush provided 2% cover in 2004 with a density of 800 plants/acre. Mature individuals made up 37% of the population, decadent individuals made up 53%, and young made up 10%. Plants classified as dying made up 48% of the population. Use was light to moderate and the average leader growth was 5.6 inches. Utah serviceberry was also sampled in 2004, but is sparse.

Combined pinyon and juniper canopy cover was 8% in 2004. 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. Estimated pinyon density was 78 trees/acre with an average trunk diameter of 3.7 inches. Estimated juniper density was 75 trees/acre with an average trunk diameter of 4.0 inches. The tree densities of this site are much lower than those of the Lower Cedar Bench Push study, which is reflected in the higher browse and herbaceous understory cover at this site.

Nine species of grasses were sampled in 2004, all of which were perennials. Salina wildrye, mutton bluegrass, and needle-and-thread were the dominant grass species. Salina wildrye provided 7% cover and 70% quadrat frequency. Mutton bluegrass provided 4% cover and a 51% quadrat frequency. Needle-and-thread provided 1% cover and 13% quadrat frequency. Perennial grasses provided 14% combined cover. Grass cover on this site was 3-fold that of the Lower Cedar Bench Push study.

Eighteen species of forbs were sampled in 2004, 3 of which were annuals. Forbs provided 3% cover, very little of which were annual species.

### 2004 Pre-treatment Assessment

The pinyon canopy cover is present and is suppressing sagebrush and understory growth some. Removal of the pinyon-juniper trees will likely improve this heavily-used winter range, although the changes will not be nearly as drastic as those on the Lower Cedar Bench Push study. Because cheatgrass was not sampled in the study does not mean that it is not present in the area. There is a possibility that cheatgrass could become more of a problem following the disturbance of the treatment and the spread of seed by equipment to this study area. The Desirable Components Index score rated this site as good due to moderate browse cover, excellent perennial grass cover, and good perennial forb cover.

2004 winter range condition (DC Index) – good (58) Lower potential scale

The following is the seed mix applied to the treatment area:

Seed Species	Bulk lbs in mix	Bulk lbs/acre
Great Basin Wildrye 'Trailhead'	80	0.5
Alfalfa 'Spredor 3'	175	1.2
Blue Flax 'Appar'	33	0.2
Bitterbrush--Ada/Boise ID	54	0.4
Fourwing Saltbush--Emery UT	100	0.7
Sagebrush, Wyoming--Sanpete UT	100	0.7
<b>Total</b>	<b>542</b>	<b>3.6</b>
<b>Total PLS/acre</b>		<b>2.5</b>
<b>Live Seeds/sq. ft.</b>		<b>10.5</b>

HERBACEOUS TRENDS --

Management unit 16R, Study no: 12

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron smithii	28	.23
G	Agropyron spicatum	17	.45
G	Bouteloua gracilis	11	.36
G	Elymus salina	222	7.00
G	Oryzopsis hymenoides	6	.30
G	Poa fendleriana	147	4.06
G	Poa secunda	11	.05
G	Sitanion hystrix	6	.09
G	Stipa comata	39	1.11
<b>Total for Annual Grasses</b>		<b>0</b>	<b>0</b>
<b>Total for Perennial Grasses</b>		<b>487</b>	<b>13.67</b>
<b>Total for Grasses</b>		<b>487</b>	<b>13.67</b>
F	Arabis spp.	2	.00
F	Astragalus convallarius	60	1.36
F	Astragalus spp.	8	.21
F	Calochortus nuttallii	2	.00
F	Comandra pallida	64	.80
F	Cymopterus spp.	1	.00
F	Eriogonum racemosum	2	.04
F	Gayophytum ramosissimum(a)	1	.00
F	Lappula occidentalis (a)	7	.01
F	Machaeranthera canescens	1	.00
F	Penstemon pachyphyllus	9	.08

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
F	Phlox longifolia	41	.10
F	Polygonum douglasii (a)	40	.10
F	Schoenocrambe linifolia	1	.00
F	Senecio multilobatus	43	.21
F	Sphaeralcea coccinea	8	.03
F	Tragopogon dubius	1	.00
F	Trifolium spp.	23	.32
Total for Annual Forbs		48	0.12
Total for Perennial Forbs		266	3.20
Total for Forbs		314	3.33

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

#### BROWSE TRENDS --

Management unit 16R, Study no: 12

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	Amelanchier utahensis	2	.15
B	Artemisia nova	62	6.45
B	Artemisia tridentata vaseyana	28	2.30
B	Chrysothamnus viscidiflorus viscidiflorus	34	1.44
B	Gutierrezia sarothrae	30	1.02
B	Juniperus osteosperma	1	-
B	Opuntia spp.	5	-
B	Pediocactus simpsonii	1	-
B	Pinus edulis	6	7.55
Total for Browse		169	18.94

CANOPY COVER, LINE INTERCEPT --  
 Management unit 16R, Study no: 12

Species	Percent Cover '04
Artemisia nova	5.18
Artemisia tridentata vaseyana	1.25
Chrysothamnus viscidiflorus viscidiflorus	1.45
Gutierrezia sarothrae	1.68
Juniperus osteosperma	.61
Pinus edulis	7.26

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 16R, Study no: 12

Species	Average leader growth (in) '04
Amelanchier utahensis	4.6
Artemisia tridentata vaseyana	2.2

POINT-QUARTER TREE DATA --  
 Management unit 16R, Study no: 12

Species	Trees per Acre '04	Average diameter (in) '04
Juniperus osteosperma	75	4.0
Pinus edulis	78	3.7

BASIC COVER --  
 Management unit 16R, Study no: 12

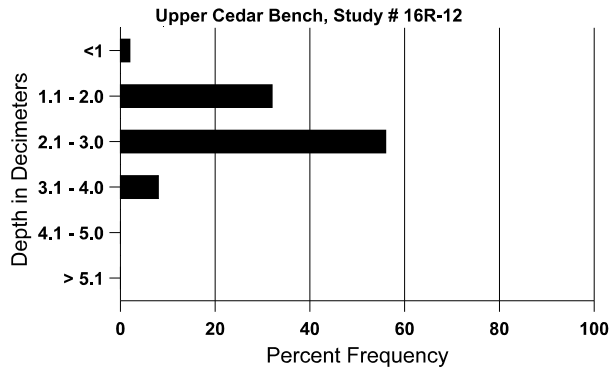
Cover Type	Average Cover % '04
Vegetation	36.40
Rock	.16
Pavement	1.38
Litter	41.90
Cryptogams	3.92
Bare Ground	33.15

SOIL ANALYSIS DATA --

Management unit 16R, Study no: 12, Study Name: Upper Cedar Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.5	62.8 (10.9)	7.1	39.6	29.1	31.3	2.1	11.2	70.4	0.6

### Stoniness Index



PELLET GROUP DATA --

Management unit 16R, Study no: 12

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	12	-
Elk	28	53 (131)
Deer	32	52 (127)

BROWSE CHARACTERISTICS --

Management unit 16R, 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)
<b>Amelanchier utahensis</b>												
04	<b>40</b>	-	-	40	-	-	0	100	-	-	0	25/31
<b>Artemisia nova</b>												
04	<b>2820</b>	2020	420	1520	880	1380	16	.70	31	18	21	12/21
<b>Artemisia tridentata vaseyana</b>												
04	<b>800</b>	220	80	300	420	1200	28	20	53	48	48	19/24
<b>Chrysothamnus viscidiflorus viscidiflorus</b>												
04	<b>1320</b>	-	60	1260	-	-	0	0	-	-	0	7/12
<b>Gutierrezia sarothrae</b>												
04	<b>1980</b>	-	100	1880	-	20	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>Juniperus osteosperma</i>												
04	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
<i>Opuntia</i> spp.												
04	<b>100</b>	-	-	100	-	-	0	0	-	-	0	3/9
<i>Pediocactus simpsonii</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	2/2
<i>Pinus edulis</i>												
04	<b>120</b>	-	80	40	-	-	0	0	-	-	0	-/-

Trend Study 16R-13-04

Study site name: Upper Porphyry Bench.

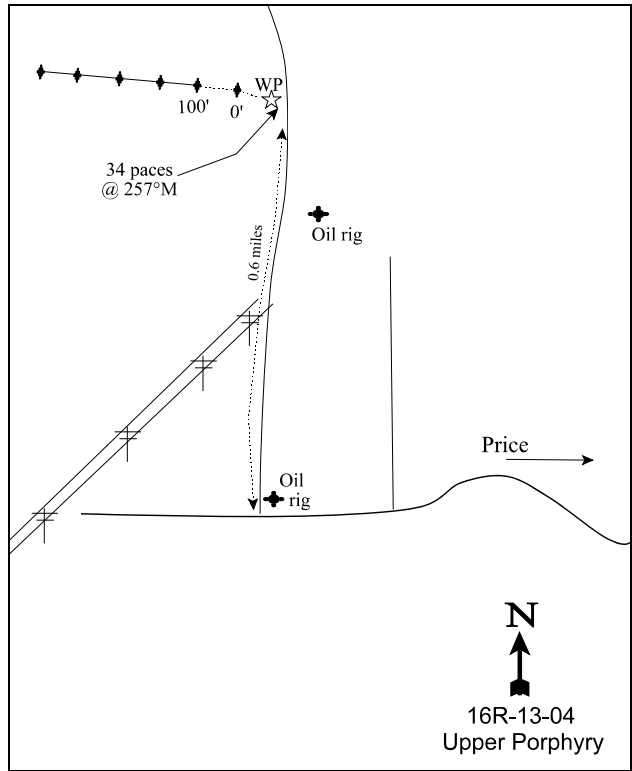
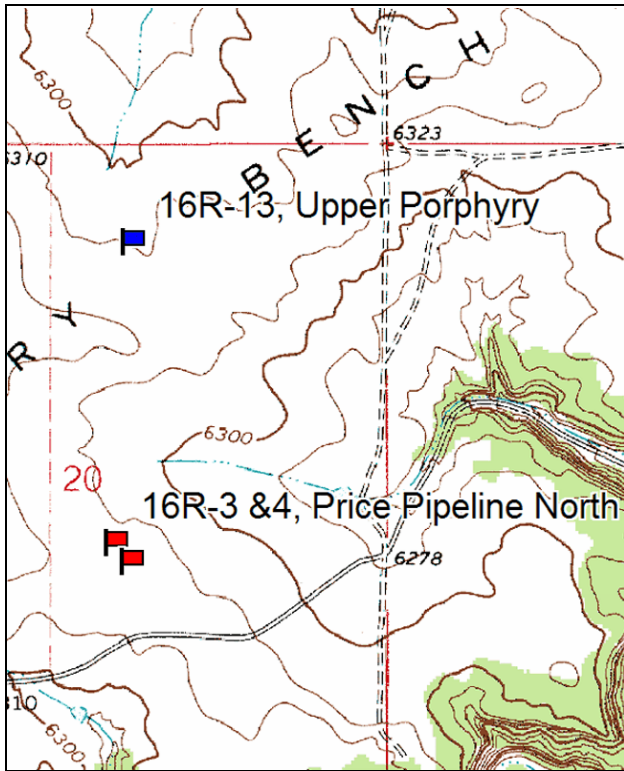
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 255 degrees magnetic.

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

LOCATION DESCRIPTION

Take Westwood Blvd (1550 W) northwest out of Price 2.35 miles to a major intersection. Turn left onto Gordon Creek Road and travel 0.45 miles to a fork. Bear left away from Gordon Creek, going 0.1 miles to a gravel pit. Continue 5.5 miles on the Pinnacle Peak Road to a 3-way fork at the top of the bench. An oil rig is near this intersection. Drive 0.6 miles to the north past another oil rig, to a witness post on the left side of the road. The 0-foot post is 34 paces from the witness post at 257°M, and is marked with browse tag #51.



Map Name: Pinnacle Peak

Diagrammatic Sketch

Township 14S , Range 9E , Section 20

GPS: NAD 27, UTM 12S 4382951 N, 505546 E

## DISCUSSION

### Upper Porphyry Bench – Trend Study No. 16R-13

The Upper Porphyry Bench monitoring study was established within the Porphyry Bench treatment area. In the spring of 2003, approximately 19,000 acres of sagebrush suffered severe die-off and 24,000 acres suffered moderate die-off within a 50-mile radius of Price, Utah. This project was the first of several phases designed to replace this loss of sagebrush. Wyoming big sagebrush showed the largest amount of die-off, compared with other sagebrush species and subspecies. The project was designed to rehabilitate a 1,160-acre area of dying Wyoming big sagebrush west of Price. The treatment area is within critical winter range and greater sage grouse habitat on private and UDWR land. In December 2004, the entire 1,160-acre treatment area was aerially seeded with the “Porphyry Bench A” seed mix of winterfat and forage kochia. The entire treatment was treated with a Lawson double drum aerator in strips that disturbed between ½ to 1/3 of the area. A D-6 CAT pulled the aerator and for all parcels, with the exception of parcel 6 on UDWR land, a supplemental seed mix was applied from a seed mix mounted above the second drum of the aerator. The treatment area was divided into 27 parcels (see below). Parcels 1 through 13 were treated in October and November 2004. Parcel 6, on UDWR property, was drill seeded with seed mixes B2 and C1 at the end of November 2004. Parcels 15 through 27 were treated in April and May of 2005. Parcels 1, 2, and 3 are on the Mautz property and native seed (seed mixes B1 and C2) was applied on this property. The other parcels are on the Telonis property and a mix of native and non-native species (seed mixes B2 and C1) were applied to this property.

Besides the Upper Porphyry Bench Aerator study, three Range Trend study sites were treated by this project. Porphyry Bench (16B-18) was in parcel 7, Price Pipeline Native North (16R-3) was in parcel 13, and Price Pipeline North (16R-4) was in parcel 15. All three of these other studies were aerially seeded, aerated, and seeded with the C1 and B2 mixes. The Price Pipeline North study was the only monitoring study that was treated in the spring of 2005, as opposed to the fall of 2004. The Upper Porphyry Bench Aerator study is located in parcel 12, which was seeded with the aerial, C1, and B2 mixes.

The treatment is located approximately 5 miles west of Price. The monitoring study is located on a northeast aspect with a 2% slope at 6,300 feet. The 2004 pellet group data estimates were 96 deer, 1 cow, and 1 horse days use/acre (236 ddu/ha, 2 cdu/ha, and 1 hdu/ha).

The soil is a shallow clay loam with an effective rooting depth of 12 inches. There was no rock or pavement on the soil surface or in the profile in 2004. Soil phosphorus is adequate and the pH is neutral (7.1). Bare ground cover was 60% in 2004. In 2004, the soil erosion condition measurement was stable.

Wyoming big sagebrush is the key browse species. It provided 4% cover and 6% line intercept cover in 2004. Sagebrush density was 2,380 plants/acre, and 96% of the population was decadent. Four percent of the population was made up of mature individuals and plants classified as dying made up 68% of the population. Use was mostly light in 2004 and the average leader growth was 9.0 inches. Other browse species include stickleaf low rabbitbrush, slender eriogonum, and prickly pear cactus.

Six species of grasses were sampled in 2004, all of which were perennials. All six species provided a combined cover of 1% in 2004. These species include: Crested wheatgrass, western wheatgrass, blue grama, Indian ricegrass, squirreltail bottlebrush, and needle-and-thread grass.

Seventeen species of forbs were sampled in 2004, 10 of which were annuals. Slimleaf goosefoot was the dominant forb species in 2004 with 4% cover and a quadrat frequency of 69%. Scarlet globemallow was also abundant with nearly 2% cover and a quadrat frequency of 24%. Groundsmoke and annual stickseed also provided 1% cover each.



## 2004 Pretreatment Assessment

The sagebrush is highly decadent and dying. The aerator treatment will help to thin it out and the seeding should provide a new population of young individuals. The grass and forb seeding should also improve the sparse herbaceous understory. Cheatgrass is not present to compete with seeded species. The Desirable Components Index score rated this site as poor due to low browse cover, very high browse decadence, very poor perennial grass cover, and very poor perennial forb cover.

### 2004 winter range condition (DC Index) – poor (13) Lower potential scale

The following area the 5 seed mixes applied to the treatment. The aerial seed mix was applied to entire treatment in December 2004. The C2 and B1 seed mixes were applied to parcels 1, 2, and 3 in the fall of 2004. The C1 and B2 mixes were applied to the other parcels in the fall of 2004 (parcels 4-13) and spring of 2005 (parcels 15-27).

Aerial (A) seed mix:

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Forage Kochia 'Immigrant'	865	0.7
Winterfat--Duchesne/Uintah UT	75	0.1
Total	940	0.8
PLS lbs/acre		0.5
Live seeds/sq. ft.		3.1

Browse mix 1 (B1):

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Sagebrush, Wyoming--Sanpete UT	75	0.9
Total	75	0.9
PLS lbs/acre		0.3
Live seeds/sq. ft.		4.0

Browse mix 2 (B2):

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Sagebrush, Wyoming--Sanpete UT	440	0.9
Fourwing Saltbush--Emery UT	128	0.3
Total	568	1.1
PLS lbs/acre		0.3
Live seeds/sq. ft.		4.1

Grass/forb mix 1 (C1):

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Russian Wildrye 'Bozoisky'	880	2.1
Crested Wheatgrass 'Douglas'	500	1.2
Siberian Wheatgrass 'Vavilov'	450	1.1
Small Burnet 'Delar'	215	0.5
Yellow Sweetclover	225	0.5
Fourwing Saltbush--Emery UT	615	1.5
<b>Total</b>	<b>2885</b>	<b>7.0</b>
PLS lbs/acre		5.7

Grass/forb mix 2 (C2):

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Great Basin Wildrye 'Trailhead'	90	1.1
Sheep Fescue	95	1.1
Indian Ricegrass 'Rimrock'	85	1.0
Western Wheatgrass 'Arriba'	100	1.2
Blue Flax 'Appar'	9	0.1
Rocky Mountain Beeplant--Sanpete UT	17	0.2
Fourwing Saltbush--Emery UT	126	1.5
<b>Total</b>	<b>522</b>	<b>6.1</b>
PLS lbs/acre		4.9

HERBACEOUS TRENDS --

Management unit 16R, Study no: 13

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron cristatum	1	.03
G	Agropyron smithii	9	.16
G	Bouteloua gracilis	1	.03
G	Oryzopsis hymenoides	45	.15
G	Sitanion hystrix	59	.70
G	Stipa comata	32	.16
Total for Annual Grasses		0	0
Total for Perennial Grasses		147	1.24
Total for Grasses		147	1.24
F	Arabis spp.	2	.03
F	Astragalus convallarius	5	.09
F	Castilleja spp.	4	.00
F	Chenopodium fremontii (a)	3	.21
F	Chenopodium leptophyllum(a)	184	4.44
F	Cordylanthus spp. (a)	44	.64

Type	Species	Nested Frequency	Average Cover %
		'04	'04
F	Descurainia pinnata (a)	53	.46
F	Eriogonum cernuum (a)	15	.16
F	Gayophytum ramosissimum(a)	50	1.25
F	Gilia spp. (a)	2	.00
F	Lappula occidentalis (a)	42	1.02
F	Penstemon spp.	1	.03
F	Penstemon spp.	6	.07
F	Phlox longifolia	20	.09
F	Plantago patagonica (a)	26	.47
F	Salsola iberica (a)	8	.31
F	Sphaeralcea coccinea	49	1.67
Total for Annual Forbs		427	9.01
Total for Perennial Forbs		87	1.98
Total for Forbs		514	11.00

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

#### BROWSE TRENDS --

Management unit 16R, Study no: 13

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata wyomingensis	74	4.24
B	Chrysothamnus viscidiflorus viscidiflorus	45	1.58
B	Eriogonum microthecum	30	.36
B	Opuntia spp.	7	.00
Total for Browse		156	6.19

#### CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 13

Species	Percent Cover
	'04
Artemisia tridentata wyomingensis	5.78
Chrysothamnus viscidiflorus viscidiflorus	1.61
Eriogonum microthecum	.55

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 16R, Study no: 13

Species	Average leader growth (in)
	'04
Artemisia tridentata wyomingensis	3.5

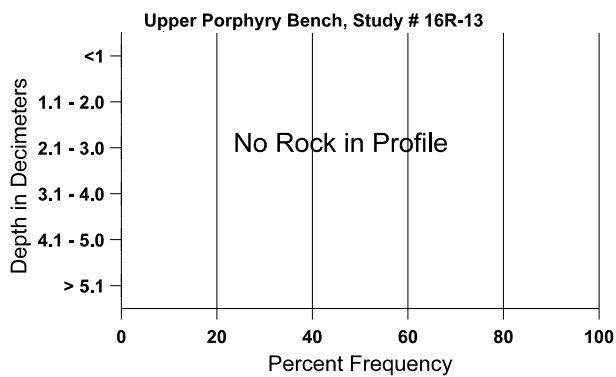
BASIC COVER --  
Management unit 16R, Study no: 13

Cover Type	Average Cover %
	'04
Vegetation	19.82
Litter	26.92
Cryptogams	4.80
Bare Ground	60.34

SOIL ANALYSIS DATA --  
Management unit 16R, Study no: 13, Study Name: Upper Porphyry Bench

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.8	62.2 (12.9)	7.1	43.6	28.9	27.5	1.7	8.9	80.0	0.5

### Stoniness Index



PELLET GROUP DATA --  
Management unit 16R, Study no: 13

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	56	-
Elk	1	-
Deer	47	96 (236)
Cattle	3	1 (2)

BROWSE CHARACTERISTICS --  
 Management unit 16R, 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>												
04	<b>2380</b>	-	-	100	2280	2980	13	29	96	68	69	20/30
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>2080</b>	1580	-	2080	-	80	0	0	-	-	0	9/13
<i>Eriogonum microthecum</i>												
04	<b>2020</b>	-	380	1640	-	-	0	0	-	-	0	6/7
<i>Opuntia spp.</i>												
04	<b>140</b>	-	-	140	-	-	0	0	-	-	0	2/8

Trend Study 17R-10-04

Study site name: Santaquin Draw .

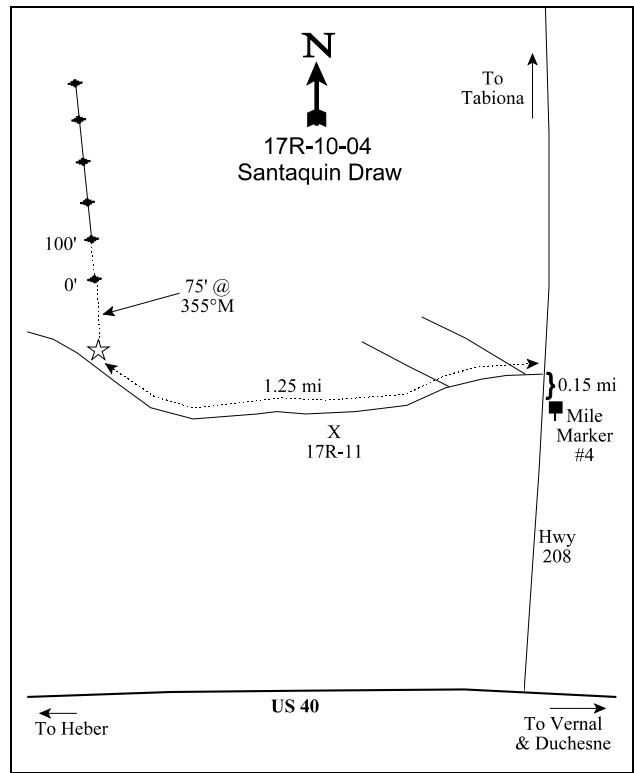
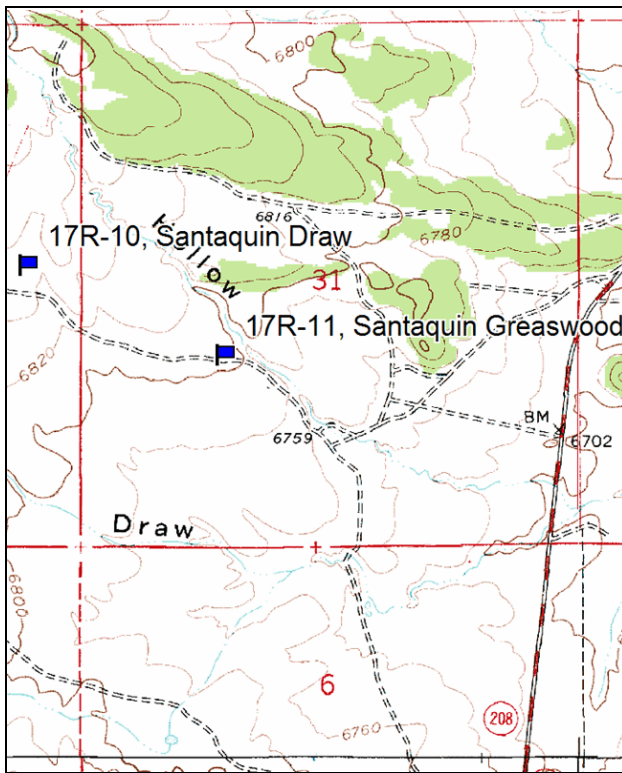
Vegetation type: Basin Big Sagebrush .

Compass bearing: frequency baseline 353 degrees magnetic.

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

LOCATION DESCRIPTION

From US 40 turn north on Highway 208. Travel 0.15 miles north of mile marker 4 to a road that comes in from the left (west). Turn here and drive 1.25 miles to a witness post on the right side of the road. The 0-foot stake is 75 feet from the witness post at 355°M, and is marked with browse tag #38.



Map Name: Tabiona

Diagrammatic Sketch

Township 2S , Range 8W , Section 36

GPS: NAD 27, UTM 12T 4456796 N, 523096 E

## DISCUSSION

### Santaquin Draw - Trend Study No. 17R-10

Santaquin Draw is located between Fruitland and Tabiona. This area is part of the Tabby Mountain WMA where many restoration projects have taken place. Areas within the WMA dominated by sagebrush, greasewood, and pinyon-juniper were chained in 2004. Sagebrush stands within Santaquin draw experienced die off in 2002 and 2003 due to the extremely dry conditions. The goal of the chaining treatment was to open up the site and establish grasses, forbs, and browse. The Santaquin Draw trend study was established in July of 2004 to monitor the treatment effects in a sagebrush dominated area. About 1,000 acres of sagebrush rangeland were chained with a smooth chain. The chaining treatment took place later that fall, but unfortunately the trend study was not treated, but may be able to serve as a control. The treatment area was first seeded, then chained, then another seed mix including sagebrush and forage kochia was flown onto the treatment.

The study area is located at 6,860 feet in elevation. The study site slope is 2-3% and aspect is to the southeast. This winter range experiences heavy deer use and moderate elk use. Pinyon and juniper surround the area and provide good thermal and escape cover. A pellet group transect in 2004 estimated 93 deer and 29 elk days use/acre (230 ddu/ha and 73 edu/ha).

Soil texture is sandy loam and the pH was slightly alkaline (pH = 7.6). The effective rooting depth was estimated to be about 14 inches. There was very little rock in the soil profile until a layer of cobble sized rocks at 14 inches. From 0-6 inches the soil is light brown. A reddish brown layer is found from 6-9 inches which is sandier. The layer from 9-14 inches is more compacted and contains more clay. Soil phosphorus was marginal at only 6 ppm (Tiedemann and Lopez 2004). An erosion condition class assessment rated erosion as stable in 2004.

Basin big sagebrush is the dominant species. This population has experienced a high amount of die off. In 2004, sagebrush density was 1,680 plants/acre and an additional 5,980 dead plants/acre were sampled. Decadence for the remaining live plants was 86% and 50% of the live plants were classified as dying. Sagebrush cover was only about 4% in 2004. Young and seedlings plants to replace those that have died were rare in 2004. Wyoming big sagebrush, fourwing saltbush, forage kochia, and winterfat were all seeded in the seed mix.

The herbaceous understory was healthy and abundant in 2004. Five perennial grasses and one sedge provided about 19% cover. They have likely benefitted from reduced competition from sagebrush. Bottlebrush squirreltail and Indian ricegrass were the most abundant. Unfortunately, cheatgrass was also abundant with almost 8% cover and 63% quadrat frequency. Forbs were diverse, but most were annual species. The seed mix should augment the forb production with in the treated areas.

2004 winter range condition (DC Index) - Fair (35) Lower Potential scale

<b>Santaquin Sagebrush Seedmix</b>	<b>Bulk lbs/acre</b>
Alfalfa 'Nomad'	0.8
Alalfa 'Ladak+'	0.8
Small Burnet 'Delar'	2.0
Sainfoin	0.3
Blue Flax 'Appar'	0.5
Western Wheatgrass 'Arriba'	0.5
Fourwing Saltbush--Juab/Millard UT	0.9
Thickspike Wheatgrass 'Critana'	0.6
Cicer Milkvetch 'Lutana'	0.5
Sainfoin	0.6
<b>Total Bulk lbs/acre</b>	<b>7.4</b>
<b>Total PLS lbs/acre</b>	<b>6.45</b>

<b>Santaquin Sagebrush Seedmix 2</b>	<b>Bulk lbs/acre</b>
Sagebrush, Wyoming--Sanpete UT	0.8
Forage Kochia 'Immigrant'	0.5
Winterfat--Duchesne/Uintah UT	0.2
Sainfoin 'Eski'	0.6
Alfalfa 'Ladak+'	0.6
Sagebrush, Wyoming	0.1
<b>Total Bulk lbs/acre</b>	<b>2.6</b>
<b>Total PLS lbs/acre</b>	<b>1.7</b>

<b>Santaquin Post Treatment Seedmix</b>	<b>Bulk lbs/acre</b>
Sagebrush, Wyoming--Sanpete UT	0.8
Forage Kochia 'Immigrant'	0.5
Winterfat--Duchesne/Uintah UT	0.2
Sainfoin 'Eski'	0.6
Alfalfa 'Ladak+'	0.6
Sagebrush, Wyoming	0.1
<b>Total Bulk lbs/acre</b>	<b>2.6</b>
<b>Total PLS lbs/acre</b>	<b>1.7</b>

HERBACEOUS TRENDS --

Management unit 17R, Study no: 10

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron cristatum	34	2.75
G	Agropyron smithii	36	1.26
G	Bromus tectorum (a)	228	7.90
G	Carex spp.	71	1.87
G	Oryzopsis hymenoides	74	4.34
G	Poa secunda	6	.07
G	Sitanion hystrix	130	8.44
Total for Annual Grasses		228	7.90
Total for Perennial Grasses		351	18.75
Total for Grasses		579	26.65
F	Astragalus convallarius	6	.01
F	Chenopodium album (a)	70	.91
F	Chenopodium leptophyllum(a)	13	.09
F	Collinsia parviflora (a)	1	.00
F	Cordylanthus spp. (a)	18	.19
F	Descurainia pinnata (a)	39	.14
F	Eriogonum cernuum (a)	20	.46



Type	Species	Nested Frequency	Average Cover %
		'04	'04
F	Lappula occidentalis (a)	13	.11
F	Lepidium spp. (a)	6	.19
F	Machaeranthera canescens	12	.08
F	Phlox longifolia	1	.00
F	Senecio multilobatus	14	.26
F	Sphaeralcea coccinea	51	1.71
F	Trifolium spp.	4	.03
Total for Annual Forbs		180	2.10
Total for Perennial Forbs		88	2.10
Total for Forbs		268	4.21

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 10

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata tridentata	40	4.42
B	Chrysothamnus viscidiflorus	0	-
B	Chrysothamnus viscidiflorus viscidiflorus	3	.06
B	Gutierrezia sarothrae	0	-
B	Opuntia spp.	9	.01
Total for Browse		52	4.50

#### CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 10

Species	Percent Cover
	'04
Artemisia tridentata tridentata	3.13
Opuntia spp.	.15

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17R, Study no: 10

Species	Average leader growth (in)
	'04
Artemisia tridentata tridentata	2.7

BASIC COVER --

Management unit 17R, Study no: 10

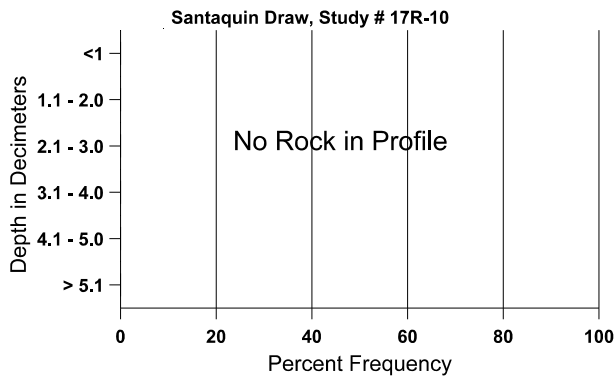
Cover Type	Average Cover % '04
Vegetation	35.55
Rock	.03
Pavement	.03
Litter	35.54
Cryptogams	9.50
Bare Ground	33.15

SOIL ANALYSIS DATA --

Management unit 17R, Study no: 10, Study Name: Santaquin Draw

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.5	51.6 (14.9)	7.6	54.3	25.8	19.9	1.2	6.4	112.0	0.5

### Stoniness Index



PELLET GROUP DATA --

Management unit 17R, Study no: 10

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	35	-
Elk	23	29 (73)
Deer	16	93 (230)

BROWSE CHARACTERISTICS --  
 Management unit 17R, 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 tridentata</i>												
04	<b>1680</b>	20	40	200	1440	5980	45	13	86	50	50	29/34
<i>Chrysothamnus viscidiflorus</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	7/8
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>120</b>	-	-	120	-	-	0	0	-	-	0	6/4
<i>Gutierrezia sarothrae</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	8/9
<i>Opuntia spp.</i>												
04	<b>240</b>	-	20	200	20	-	0	0	8	8	8	6/16

Trend Study 17R-11-04

Study site name: Santaquin Greasewood .

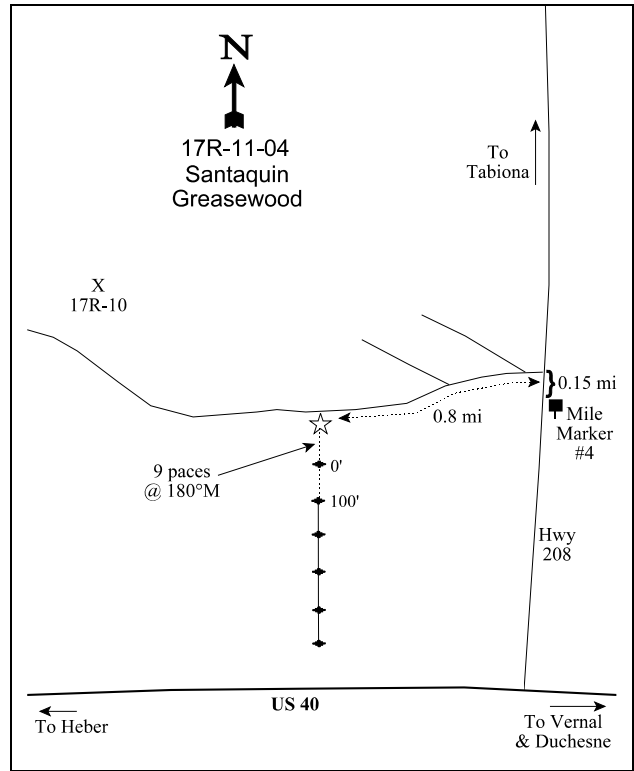
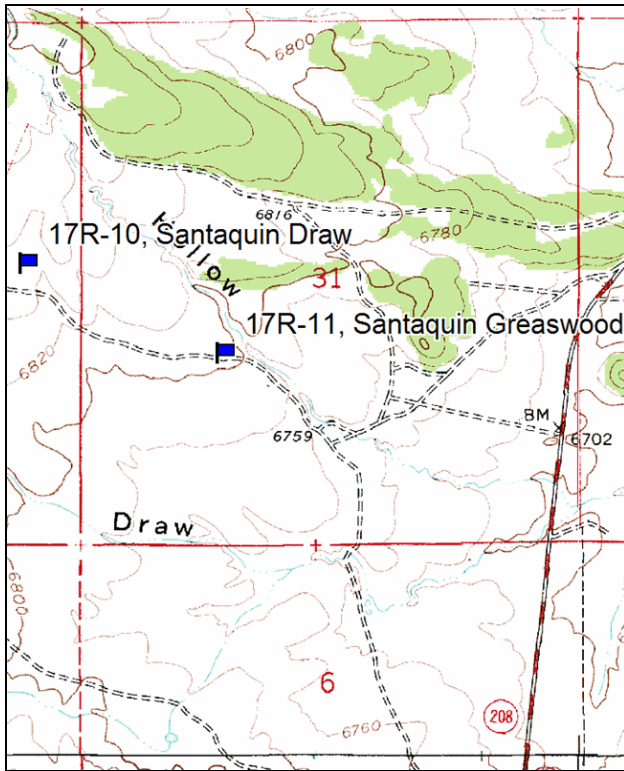
Vegetation type: Basin Big Sagebrush .

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From US 40 turn north on Highway 208. Travel 0.15 miles north of mile marker 4 to a road that comes in from the left (west). Turn here and drive 0.8 miles to a witness post on the left side of the road. The 0-foot stake is 9 paces from the witness post at 180°M, and is marked with browse tag #40.



Map Name: Tabiona

Diagrammatic Sketch

Township 2S , Range 7W , Section 31

GPS: NAD 27, UTM 12T 4456524 N, 523699 E

## DISCUSSION

### Santaquin Greasewood - Trend Study No. 17R-11

The Santaquin Greasewood trend study monitors the chaining treatment of a greasewood/sagebrush flat on the Tabby Mountain WMA. Areas within the WMA dominated by sagebrush, greasewood, and pinyon-juniper were chained with a smooth chain in 2004. Sagebrush stands within Santaquin draw experienced die off in 2002 and 2003 due to the extremely dry conditions. The goal of the chaining treatment was to remove greasewood and to open up the site to establish grasses, forbs, and preferred browse for wildlife winter range. The study site was established in July of 2004 and was chained later that fall. The treatment area was first seeded, then chained, then another seed mix including sagebrush and forage kochia was flown onto the treatment.

Elevation is 6,800 feet. The slope is 2-3% with an aspect to the south. This area is very important winter range for deer and elk. Deer use has been extremely high. Pellet group data from 2004 estimated 236 deer and 27 elk days use/acre (584 ddu/ha and 68 edu/ha). One cow day use/acre (2 cdu/ha) was also estimated.

Soil texture is loam. Effective rooting depth was estimated at 12 inches. No rock was found in the profile. Phosphorus was low at only 4 ppm, where less than 6 ppm may be limiting to plant growth and development (Tiedemann and Lopez 2004). Soil reactivity was neutral (pH of 7.2). An erosion condition class assessment rated erosion as slight in 2004. Pedestaling was evident around shrubs.

Black greasewood provided the most cover prior to treatment. Greasewood cover was 11% and density was 1,340 plants/acre. Young and seedling plants were also abundant. The treatment may allow many of these plants to dominate the site. Greasewood survived the drought much better than sagebrush. The mix of basin and Wyoming big sagebrush was greatly effected by the dry years of 2002 and 2003. Dead sagebrush plants were very abundant in 2004 (6,560 plants/acre). Live sagebrush density was only 2,640 plants/acre. Decadency was very high at 85% and 64% of the population was classified as dying. Sagebrush cover was about 7% in 2004. This Shadscale density was 160 plants/acre. This area is a harsh site for sagebrush as evidenced by the presence of greasewood and shadscale. Sagebrush and fourwing saltbush was seeded onto the site.

The herbaceous understory was very sparse. Perennial grass cover was only about 2%. Western wheatgrass was the species with the highest cover at about 1%. Cheatgrass was sampled, but only in 1% of the quadrats. Forbs were nearly entirely annuals including tansy mustard and slimleaf goosefoot. The seeded grasses and forbs will hopefully supplement the herbaceous understory.

### 2004 winter range condition (DC Index) - Very poor to poor (9) Lower Potential scale

<u>Santaquin Greasewood Seed Mix</u>	<u>Bulk lbs/ac</u>	<u>Santaquin Greasewood Shrub Mix</u>	<u>Bulk lbs/ac</u>
Great Basin Wildrye 'Trailhead'	2.0	Sagebrush, Wyoming--Sanpete UT	1.0
Alalfa 'Ladak+'	0.5	Sainfoin	1.0
Thickspike Wheatgrass 'Critana'	2.0	Alalfa 'Ladak+'	0.5
Sainfoin	1.1	<b>Total Bulk lbs/acre</b>	<b>2.5</b>
Russian Wildrye 'Bozoisky'	2.0	<b>Total PLS lbs/acre</b>	<b>1.7</b>
Fourwing Saltbush--Juab UT	0.8		
Siberian Wheatgrass 'Vavilov'	1.1		
<b>Total Bulk lbs/acre</b>	<b>9.3</b>		
<b>Total PLS lbs/acre</b>	<b>8.4</b>		

<b>Santaquin Post Treatment Seedmix</b>	<b>Bulk lbs/acre</b>
Sagebrush, Wyoming--Sanpete UT	0.8
Forage Kochia 'Immigrant'	0.5
Winterfat--Duchesne/Uintah UT	0.2
Sainfoin 'Eski'	0.6
Alfalfa 'Ladak+'	0.6
Sagebrush, Wyoming	0.1
<b>Total Bulk lbs/acre</b>	<b>2.6</b>
<b>Total PLS lbs/acre</b>	<b>1.7</b>

HERBACEOUS TRENDS --

Management unit 17R, Study no: 11

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron smithii	31	1.12
G	Bromus tectorum (a)	2	.00
G	Poa secunda	35	.46
G	Sitanion hystrix	1	.03
Total for Annual Grasses		2	0.00
Total for Perennial Grasses		67	1.63
Total for Grasses		69	1.63
F	Chenopodium album (a)	27	.17
F	Chenopodium leptophyllum(a)	111	1.00
F	Collinsia parviflora (a)	5	.03
F	Descurainia pinnata (a)	199	1.87
F	Erigeron spp.	8	.04
F	Gilia spp. (a)	3	.01
F	Lappula occidentalis (a)	13	.08
F	Phlox longifolia	1	.00
Total for Annual Forbs		358	3.18
Total for Perennial Forbs		9	0.05
Total for Forbs		367	3.23

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

BROWSE TRENDS --

Management unit 17R, Study no: 11

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata tridentata	56	6.69
B	Artemisia tridentata wyomingensis	0	.33
B	Atriplex confertifolia	7	.51
B	Opuntia spp.	34	.46
B	Sarcobatus vermiculatus	41	11.46
Total for Browse		138	19.47

CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 11

Species	Percent Cover
	'04
Artemisia tridentata tridentata	4.41
Atriplex confertifolia	.30
Opuntia spp.	.38
Sarcobatus vermiculatus	13.98

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17R, Study no: 11

Species	Average leader growth (in)
	'04
Artemisia tridentata tridentata	2.2

BASIC COVER --

Management unit 17R, Study no: 11

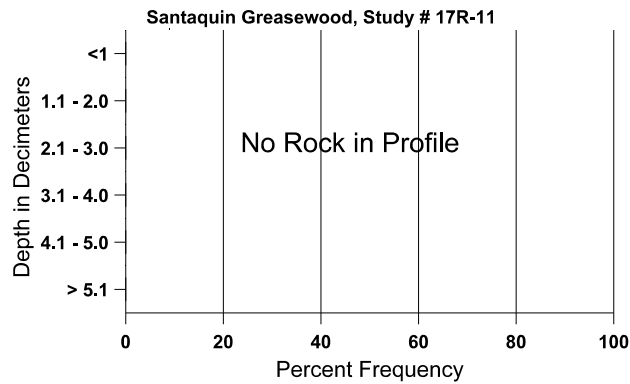
Cover Type	Average Cover %
	'04
Vegetation	25.38
Rock	.38
Pavement	.16
Litter	44.01
Cryptogams	10.02
Bare Ground	35.42

SOIL ANALYSIS DATA --

Management unit 17R, Study no: 11, Study Name: Santaquin Greasewood

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.1	61.6 (15.4)	7.2	49.6	32.9	17.5	1.1	4.5	137.6	1.0

### Stoniness Index



PELLET GROUP DATA --

Management unit 17R, Study no: 11

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	13	-
Elk	7	27 (68)
Deer	49	236 (584)
Cattle	-	1 (2)

BROWSE CHARACTERISTICS --

Management unit 17R, Study no: 11

		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 tridentata												
04	<b>2640</b>	2260	100	300	2240	6480	25	7	85	64	64	27/29
Artemisia tridentata wyomingensis												
04	<b>0</b>	-	-	-	-	80	0	0	-	-	0	18/37
Atriplex confertifolia												
04	<b>160</b>	200	20	120	20	60	0	13	13	-	0	13/19
Opuntia spp.												
04	<b>1120</b>	-	80	660	380	180	0	0	34	16	16	5/12
Sarcobatus vermiculatus												
04	<b>1340</b>	2140	220	1060	60	100	3	0	4	-	1	32/50



Trend Study 17R-12-04

Study site name: Santaquin PJ Chaining .

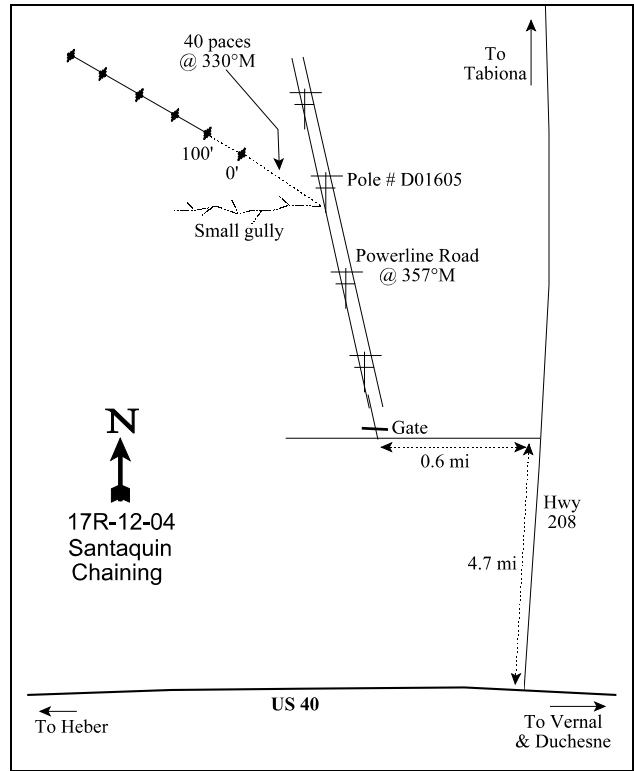
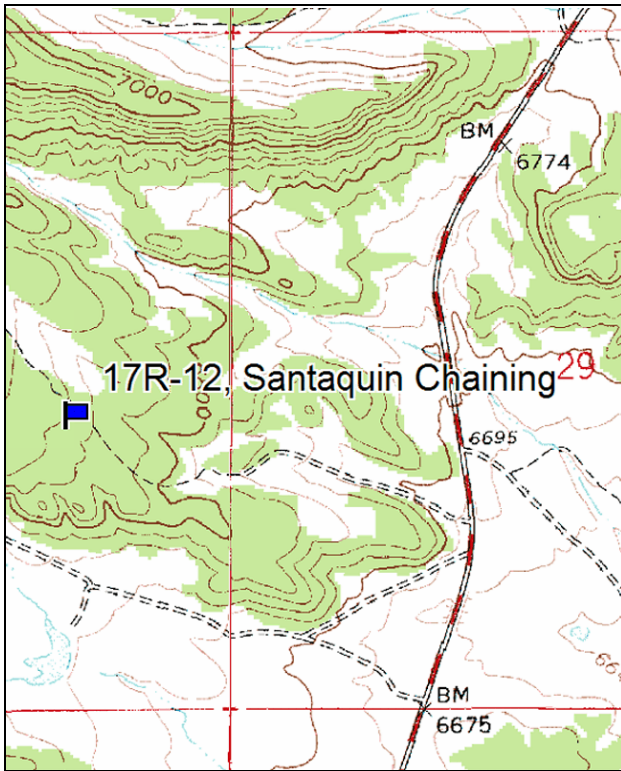
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 294 degrees magnetic.

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

LOCATION DESCRIPTION

From US 40 turn north on Highway 208. Travel 4.7 miles north to a road that comes in from the left (west). Turn here and drive 0.6 miles to the powerline road that comes in from the right. Turn here, pass through the gate and travel on this road at 357°M to pole #D01605. The 0-foot stake is 40 paces from this pole at 330°M, and is marked with browse tag DWR #145.



Map Name: Tabiona

Diagrammatic Sketch

Township 2S , Range 7W , Section 30

GPS: NAD 27, UTM 12T 4458236 N, 524413 E

## DISCUSSION

### Santaquin PJ Chaining - Trend Study No. 17R-12

This trend study monitors a pinyon juniper chaining treatment north of Santaquin Draw on the Tabby Mountain Wildlife Management Area. This land is owned by the DWR. The trend study was established in September 2004. The chaining treatment took place about a month later in October 2004. This area is typified by sagebrush and greasewood covered parks and ridges dominated by pinyon and juniper woodlands. This chaining treated about 300 acres of a pinyon-juniper covered ridge. The treatment area was first seeded, then 2-way chained with a 60 lb link Ely chain, then another seed mix including sagebrush and forage kochia was flown onto the treatment.

The elevation of the study site is 6,860 feet. The aspect is to the east and the top of the ridge only has a slope of 2-3%. This area has served as thermal and escape cover for deer and elk. A pellet group transect in 2004 estimated 26 deer and 17 elk days use/acre (64 ddu/ha and 41 edu/ha).

Soil texture is sandy loam. The effective rooting depth was very shallow at only about 7 inches. Rocks are prevalent in the upper 8 inches of the soil profile. Below 5 inches calcium carbonate has accumulated on rocks. Soil reactivity was neutral (pH of 7.0). Phosphorus and potassium levels were adequate for wildland soils. An erosion condition class assessment rated erosion as stable as there was plenty of soil protection.

Mature pinyon and Utah juniper dominated the site prior to treatment. Point-quarter density estimated juniper density at 235 trees/acre and pinyon at 209 trees/acre. Average trunk diameter was 9.6 for juniper and 4.7 for pinyon. Cover was estimated with the line intercept method. Juniper cover was nearly 19% and pinyon cover was 27%. Thirty percent of the pinyon trees were taller than 12 feet, while the rest were less than 4 feet tall. Forty percent of the juniper trees were taller than 12 feet, 20% were 8-12 feet tall, 15% were 4-8 feet tall, and 25% were 1-4 feet tall. Tausch and West (1994) showed in southwestern Utah that as pinyon and juniper cover increase the herbaceous understory decreases.

Black sagebrush was the most abundant and only preferred browse species with about 2% cover and 3,440 plants/acre. Decadence was 48%. The dominant overstory of pinyon and juniper has prevented browse species from being more numerous.

The herbaceous understory was sparse due to the overstory of trees. Grass cover was only about 2%. Seven perennial species were sampled prior to treatment. Forb cover was also about only 2%. Most species were low growing that do not provide much forage. The seed mix applied with the treatment should enhance the herbaceous understory.

2004 winter range condition (DC Index) - Very poor to poor (11) Lower Potential scale

<b>Santaquin PJ Chaining Seed Mix</b>	<b>Bulk lbs/ac</b>
Alfalfa 'Nomad'	1.0
Alalfa 'Ladak+'	1.0
Small Burnet 'Delar'	1.5
Sainfoin	2.5
Blue Flax 'Appar'	1.0
Thickspike Wheatgrass 'Critana'	0.4
Crested Wheatgrass 'Ephraim'	0.5
Russian Wildrye 'Bozoisky'	1.0
Orchardgrass 'Paiute'	1.1
Fourwing Saltbush--Juab UT	0.1
<b>Total Bulk lbs/acre</b>	<b>10.1</b>
<b>Total PLS lbs/acre</b>	<b>8.6</b>

<b>Santaquin PJ Chaining Shrub Seed Mix</b>	<b>Bulk lbs/ac</b>
Sagebrush, Wyoming--Sanpete UT	0.5
Sainfoin	1.0
Whitstem Rubber Rabbitbrush	0.5
Alalfa 'Ladak+'	0.5
<b>Total Bulk lbs/acre</b>	<b>2.5</b>
<b>Total PLS lbs/acre</b>	<b>1.7</b>

<b>Santaquin Post Treatment Seedmix</b>	<b>Bulk lbs/acre</b>
Sagebrush, Wyoming--Sanpete UT	0.8
Forage Kochia 'Immigrant'	0.5
Winterfat--Duchesne/Uintah UT	0.2
Sainfoin 'Eski'	0.6
Alfalfa 'Ladak+'	0.6
Sagebrush, Wyoming	0.1
<b>Total Bulk lbs/acre</b>	<b>2.6</b>
<b>Total PLS lbs/acre</b>	<b>1.7</b>

#### HERBACEOUS TRENDS --

Management unit 17R, Study no: 12

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron smithii	45	.21
G	Bouteloua gracilis	7	.03
G	Bromus tectorum (a)	1	.00
G	Carex spp.	9	.08
G	Oryzopsis hymenoides	52	.66
G	Poa secunda	19	.39
G	Sitanion hystrix	33	.24
G	Stipa comata	9	.48
<b>Total for Annual Grasses</b>		<b>1</b>	<b>0.00</b>
<b>Total for Perennial Grasses</b>		<b>174</b>	<b>2.11</b>
<b>Total for Grasses</b>		<b>175</b>	<b>2.12</b>
F	Arabis spp.	21	.06
F	Astragalus convallarius	10	.04
F	Chenopodium spp. (a)	2	.00
F	Cryptantha spp.	1	.00
F	Cymopterus spp.	11	.02
F	Descurainia pinnata (a)	4	.00

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
F	<i>Erigeron eatonii</i>	1	.00
F	<i>Ipomopsis aggregata</i>	4	.01
F	<i>Machaeranthera canescens</i>	3	.00
F	<i>Penstemon humilis</i>	20	.48
F	<i>Phlox hoodii</i>	19	.57
F	<i>Polygonum douglasii</i> (a)	5	.01
F	<i>Schoenocrambe linifolia</i>	4	.00
F	<i>Senecio multilobatus</i>	87	.53
F	<i>Trifolium</i> spp.	11	.04
Total for Annual Forbs		11	0.02
Total for Perennial Forbs		192	1.79
Total for Forbs		203	1.81

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 12

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia nova</i>	66	1.89
B	<i>Artemisia tridentata wyomingensis</i>	1	-
B	<i>Gutierrezia sarothrae</i>	6	.03
B	<i>Juniperus osteosperma</i>	12	1.06
B	<i>Leptodactylon pungens</i>	12	.25
B	<i>Opuntia</i> spp.	12	.06
B	<i>Pediocactus simpsonii</i>	1	-
B	<i>Pinus edulis</i>	16	6.82
Total for Browse		126	10.12

CANOPY COVER, LINE INTERCEPT --  
 Management unit 17R, Study no: 12

Species	Percent Cover '04
Artemisia nova	2.98
Juniperus osteosperma	18.50
Leptodactylon pungens	.23
Opuntia spp.	.13
Pinus edulis	27.33

POINT-QUARTER TREE DATA --  
 Management unit 17R, Study no: 12

Species	Trees per Acre '04	Average diameter (in) '04
Juniperus osteosperma	235	9.6
Pinus edulis	209	4.7

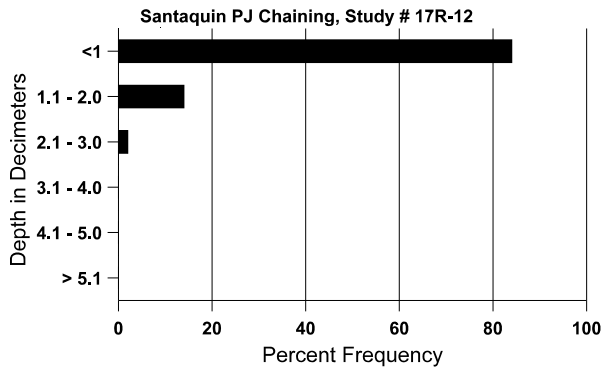
BASIC COVER --  
 Management unit 17R, Study no: 12

Cover Type	Average Cover % '04
Vegetation	13.21
Rock	2.91
Pavement	6.34
Litter	61.73
Cryptogams	7.78
Bare Ground	17.40

SOIL ANALYSIS DATA --  
 Management unit 17R, Study no: 12, Study Name: Santaquin PJ Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
6.9	47.0 (8.0)	7.0	65.4	15.2	19.5	3.5	16.3	128.0	0.9

# Stoniness Index



## PELLET GROUP DATA --

Management unit 17R, Study no: 12

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	19	-
Elk	11	17 (41)
Deer	33	26 (64)

## BROWSE CHARACTERISTICS --

Management unit 17R, Study no: 12

		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>												
04	<b>3440</b>	80	680	1120	1640	1920	4	0	48	25	25	8/15
<i>Artemisia tridentata wyomingensis</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
04	<b>200</b>	-	-	200	-	20	0	0	-	-	30	7/7
<i>Juniperus osteosperma</i>												
04	<b>260</b>	-	80	140	40	-	8	0	15	15	23	-/-
<i>Leptodactylon pungens</i>												
04	<b>440</b>	-	-	300	140	80	0	0	32	-	14	5/7
<i>Opuntia spp.</i>												
04	<b>640</b>	-	60	400	180	20	0	0	28	-	9	3/12
<i>Pediocactus simpsonii</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	1/3
<i>Pinus edulis</i>												
04	<b>400</b>	80	260	140	-	20	0	0	-	-	0	-/-

Trend Study 18R-1-04

Study site name: East Onaqui .

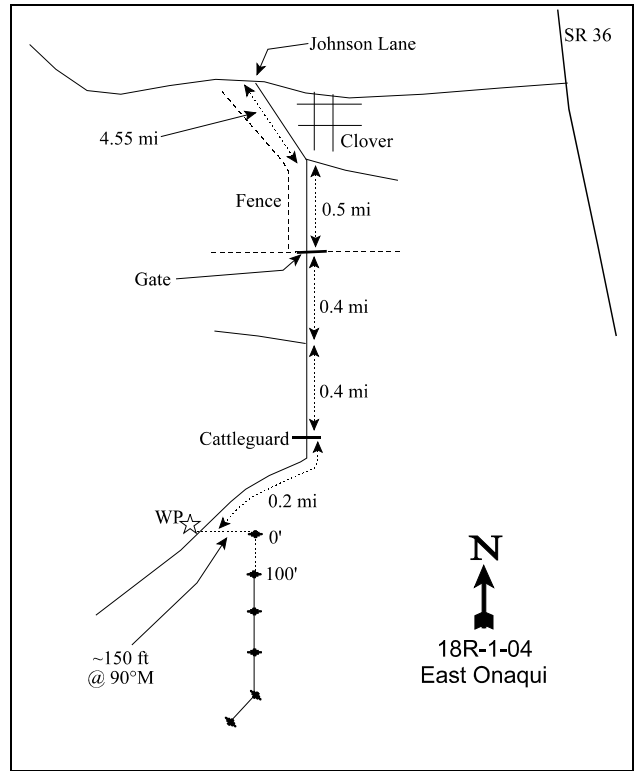
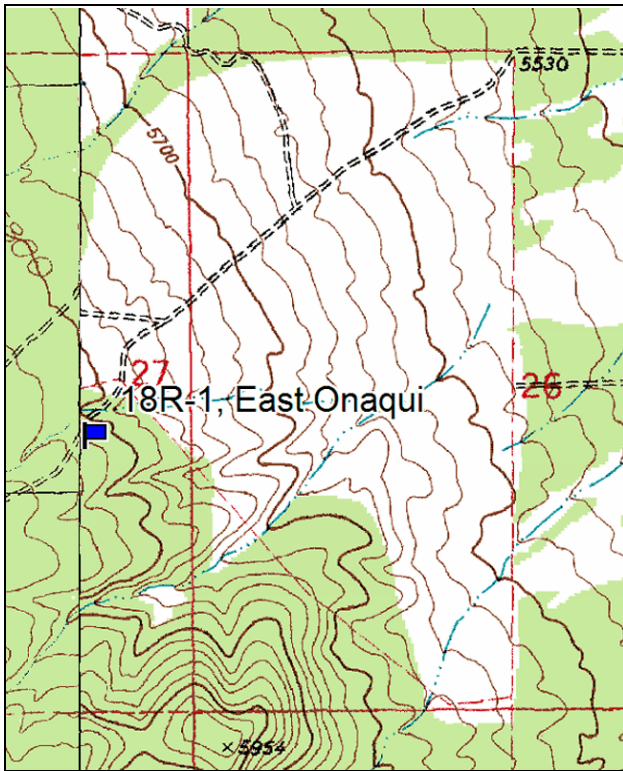
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 180 degrees magnetic.

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

LOCATION DESCRIPTION

From State Route 36 turn west onto State Route 199 heading toward Clover. Turn south on Johnson Lane in Clover. Travel 4.55 miles to a fork and stay right. Drive 0.5 miles to a gate and continue 0.8 miles to a cattleguard. Continue 0.2 miles to a witness post on the right side of the road. The 0-foot stake is about 150 feet from the witness post at 90°M, and is marked with browse tag #148.



Map Name: Saint John

Diagrammatic Sketch

Township 6S , Range 6W , Section 27

GPS: NAD 27, UTM 12T 4458100 N, 372465 E

## DISCUSSION

### East Onaqui - Trend Study No. 18R-1

The East Onaqui study is located on the northeast foothills of the Onaqui Mountains. The area is dominated by a dense stand of Utah juniper located on land managed by the Bureau of Land Management. The area is part of the Onaqui Mountain East grazing allotment. The elevation is 5,820 feet with a northeast aspect and a 5% slope. A proposed bullhog treatment was scheduled for the fall of 2004, but never was completed. Wildlife use was minimal in 2004 with only 3 deer days use/acre (8 ddu/ha).

The soil is a loam with a very shallow effective rooting depth of 9.5 inches. The soil reaction is neutral with a pH of 7.1. Soil surface is highly covered with pavement (small rocks) with a cover value of 33 %. Cryptogram are common with 6% of the soil surface covered. Rocks below 15 cm are heavily coated with CaCO<sub>3</sub> and many have been cemented together. A well developed hard pan is located about 28 cm in the profile and is slightly over 3 cm thick. The erosion condition class determined soil movement as stable in 2005.

Key browse species are very scattered and only a few Mexican cliffrose are on the study. Cover of Mexican cliffrose was estimated at less than 1% and density was estimated at 60 plants/acre. Annual leader averaged 4.7 inches even with moderate to heavily use. Plants are large and some were partially unavailable to wildlife due to height. Plants averaged 5.6 feet tall with a crown of 6.4 feet. The only other key browse species was Wyoming big sagebrush. Density was estimated at only 20 plants/acre and all were classified as dying. Utah juniper was very abundant and density was estimated at 568 plants/acre with a average diameter of 16 inches.

The understory vegetation between junipers was very sparse. Perennial grass cover was 6% and all other vegetation combined was less than 1%. Sandberg bluegrass and squirreltail bottlebrush were the two most abundant grasses. A total of 4 grass species and 4 forbs species were sampled. All the forbs were low growing and two were annual species. The Desirable Components Index rated this site as poor with a score of 13 due to low browse cover and only moderate perennial grass cover.

#### 2004 winter range condition (DC Index) - poor (13) Lower Potential scale

#### HERBACEOUS TRENDS --

Management unit 18R, Study no: 1

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Bromus tectorum (a)	11	.02
G	Oryzopsis hymenoides	8	.20
G	Poa secunda	259	4.52
G	Sitanion hystrix	78	1.11
Total for Annual Grasses		11	0.02
Total for Perennial Grasses		345	5.84
Total for Grasses		356	5.86
F	Alyssum alyssoides (a)	95	.18
F	Cryptantha spp.	2	.01
F	Phlox austromontana	28	.42
F	Ranunculus testiculatus (a)	37	.07



Type	Species	Nested Frequency	Average Cover %
		'04	'04
	Total for Annual Forbs	132	0.25
	Total for Perennial Forbs	30	0.43
	Total for Forbs	162	0.68

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

#### BROWSE TRENDS --

Management unit 18R, Study no: 1

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia tridentata wyomingensis</i>	1	-
B	<i>Cowania mexicana stansburiana</i>	3	.18
B	<i>Gutierrezia sarothrae</i>	1	-
B	<i>Juniperus osteosperma</i>	28	25.61
	Total for Browse	33	25.79

#### CANOPY COVER, LINE INTERCEPT --

Management unit 18R, Study no: 1

Species	Percent Cover
	'04
<i>Cowania mexicana stansburiana</i>	1.00
<i>Juniperus osteosperma</i>	38.51

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 18R, Study no: 1

Species	Average leader growth (in)
	'04
<i>Cowania mexicana stansburiana</i>	4.7

POINT-QUARTER TREE DATA --  
 Management unit 18R, Study no: 1

Species	Trees per Acre	Average diameter (in)
	'04	'04
Juniperus osteosperma	568	16.0

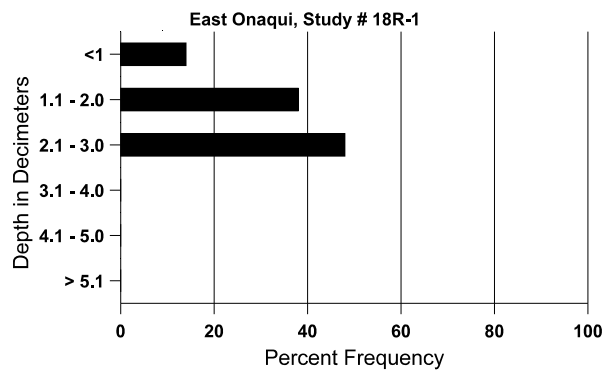
BASIC COVER --  
 Management unit 18R, Study no: 1

Cover Type	Average Cover %
	'04
Vegetation	28.87
Rock	3.47
Pavement	32.87
Litter	43.48
Cryptogams	5.64
Bare Ground	9.41

SOIL ANALYSIS DATA --  
 Management unit 18R, Study no: 1, Study Name: East Onaqui

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.5	58.6 (9.9)	7.1	36.4	41.2	22.5	3.7	8.2	182.4	0.7

### Stoniness Index



PELLET GROUP DATA --

Management unit 18R, Study no: 1

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	52	-
Deer	-	3 (8)
Horse	-	1 (1)

BROWSE CHARACTERISTICS --

Management unit 18R, Study no: 1

		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>												
04	<b>20</b>	-	-	-	20	-	0	100	100	100	100	22/41
<i>Cowania mexicana stansburiana</i>												
04	<b>60</b>	-	-	60	-	-	0	67	-	-	0	68/77
<i>Gutierrezia sarothrae</i>												
04	<b>60</b>	-	-	-	60	20	0	0	100	-	0	7/8
<i>Juniperus osteosperma</i>												
04	<b>620</b>	-	-	460	160	40	0	0	26	3	6	-/-

Trend Study 18-23-04

Study site name: South Palmer Point .

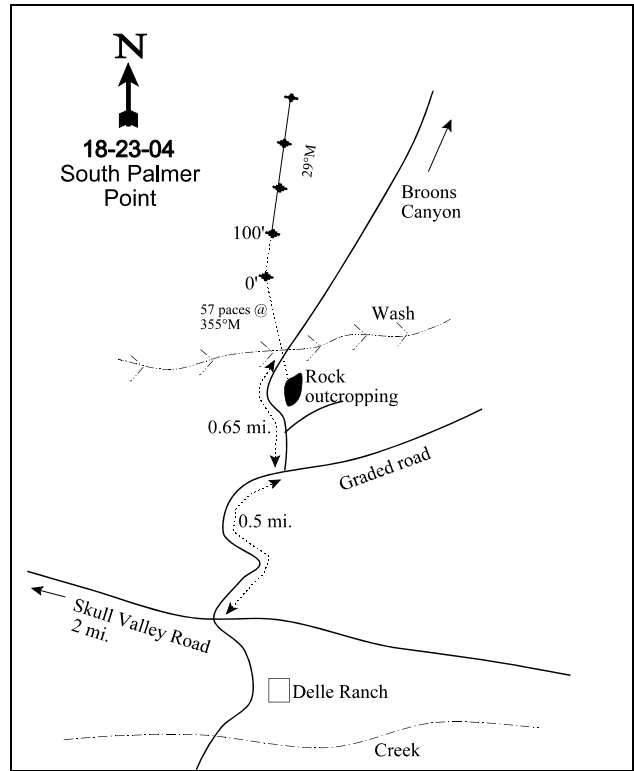
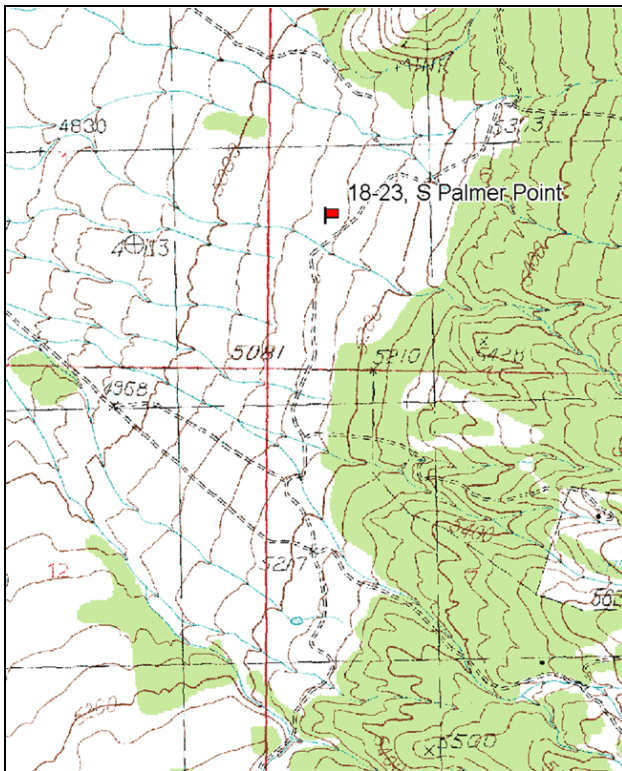
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 14 degrees magnetic.

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

LOCATION DESCRIPTION

From the site where the creek crosses the road at Delle Ranch, proceed north towards Broons Canyon for 0.05 miles to an intersection. Turn left, and go 0.65 miles until you reach a rock outcropping on the right hand side of the road. From the base of the rock outcropping, walk 57 paces at an azimuth of 355 degrees magnetic (across the road and a dry wash), to the 0-foot baseline stake. The baseline runs at an azimuth of 29 degrees magnetic, and is marked by green steel "T" fenceposts approximately 12 to 19 inches high. The 0-foot baseline stake has a red browse tag, number 3984, attached.



Map Name: Salt Mountain

Diagrammatic Sketch

Township 3S , Range 7W , Section 5

GPS: NAD 27, UTM 12T 4493694 N 357589 E

## DISCUSSION

### South Palmer Point - Trend Study No. 18-23

The South Palmer Point study samples a Wyoming big sagebrush-juniper deer winter range. The study is on a west aspect with only a slight slope (0-3%) and an elevation 5,100 feet. The land is managed by the Bureau of Land Management. In November of 2004, 780 acres surrounding the study were aerially seeded with perennial grasses and forbs. After the seeding, bullhogs were used to remove the junipers. Deer use was judged to be light to moderate in 1997, with some light cattle use also evident. Pellet data from 2002 was estimated at 23 deer days use/acre (57 ddu/ha). No cattle sign was noted. In 2004, pellet group data was estimated at 13 deer days use/acre (31 ddu/ha).

Soils are derived from fine textured alluvial deposits with many large rocks on the soil surface. Effective rooting depth is estimated at 14 inches. Parent material consists of a combination of quartzite, limestone, and some conglomerate rock which were alluvially deposited from the canyon to the east. Soil textural analysis indicates it to be a loam with a moderately alkaline reaction (pH 7.9). The high temperature and pH could be limiting to the establishment of some species. The amount of phosphorus in the soil is low at only 3.4 ppm and values below 6 ppm may limit normal plant growth and development (Tiedemann and Lopez 2004). Cover of bare ground has declined from 30% in 1983 to 19% in 2004. Cryptogams are abundant with its cover increasing from less than 1% in 1983 to 12% in 2002 and slightly declined to 7 % in 2004. Protective ground cover is abundant enough to prevent most erosion. The erosion condition class was determined as stable in 2004.

Browse cover comes primarily from two species, Wyoming big sagebrush and Utah juniper. Wyoming big sagebrush is the key browse species and has fluctuated over the years. Density in 1983 was estimated at 2,399 plants/acre and declined to 966 plants/acre in 1989. Decadence was high at 47% in 1983 and increased to 83% in 1989. Utilization was heavy both years and young recruitment was minimal. In 1997, density was estimated at 2,540 plants/acre, which increased slightly in 2002 to 3,820 plants/acre, but decreased back to 2,640 in 2004. Use has been light since 1997 and decadence has remained between 19% to 28%. Young recruitment was good in 1997 and 2002 and averaged 31% of the population, but decreased to 7% in 2004. Dead plants, which were first sampled in 1997, have been abundant since 1997 indicating that a die-off occurred in the past. Vigor was normal on most plants in 2004 and average leader growth was excellent in 2002 and 2004.

Broom snakeweed and Utah juniper are both increasers with heavy grazing. Total canopy cover of juniper averaged 11% in 2002 and 13% in 2004. Point quarter data in 1997 was estimated at 72 trees/acre with an average diameter of 7 inches. In 2004, density was estimated at 73 trees/acre with an averaged diameter of 12.3 inches. The broom snakeweed population has remained stable around 2,600 plants/acre since 1997, but in 2004 decreased to 460 plants/acre..

The most common grasses are Sandberg bluegrass and cheatgrass brome. However, neither provides much forage. Other grasses occur infrequently. Cheatgrass is dense enough in most places to create a fire hazard at 12% cover. If a wildfire occurred, it would mean the immediate loss of the sagebrush population. Where the cheatgrass is dense, competition from this winter annual is suppressing the establishment and growth of succulent forbs. The forbs that are present are mostly low growing species of rather poor forage value.

### 1983 APPARENT TREND ASSESSMENT

Although some sheet and gully erosion is occurring, overall the soil appears basically stable. The dense cheatgrass cover isn't especially effective at preventing runoff, but at least it provides some litter cover. The slope is also gentle which lessens erosion potential. Vegetatively, there are distinct problems. The key browse species, Wyoming big sagebrush, is over-utilized and appears to be in a state of decline. Increasing populations of Utah juniper and broom snakeweed, along with a high fire potential are unfavorable trends.

## 1989 TREND ASSESSMENT

Trend for soil is stable. Cover of bare soil has declined from 30% to 20%. Herbaceous cover and the lack of any significant slope help mitigate the effects of erosion. The trend for browse, primarily the preferred Wyoming big sagebrush, is down. This is indicated by the increase in the percentage of plants rated with poor vigor, from 47% to 72%. Percent decadence is also increasing from 47% to 83%. The herbaceous understory is slightly up for the perennial component, although there is still too many weedy species in the composition.

### TREND ASSESSMENT

soil - stable (0)

browse - down (-2)

herbaceous understory - slightly up (+1)

## 1997 TREND ASSESSMENT

The trend for soil is slightly improving, with a decrease in percent bare soil (20% to 10%), a significant increase in cryptogamic cover (4% to 10%), and a decrease in percent rock and pavement cover. The trend for the key browse, Wyoming big sagebrush, is up with moderate use declining from 83% to 13%, those plants classified as having poor vigor declining from 72% to 11%, and percent decadence decreasing from 83% to 24%. Also of great importance is that seedling recruitment for sagebrush has increased to 37% and the percentage of young plants in the population has increased to 38%. All measured parameters have improved. The trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses and forbs has declined slightly but not enough to warrant a downward trend. However, most of the grass and forb cover for this site is derived from annuals and weedy species. Cheatgrass accounts for 50% of the total grass cover and 41% of the total herbaceous cover.

### TREND ASSESSMENT

soil - slightly up (+1)

browse - up (+2)

herbaceous understory - stable (0)

winter range condition (DC Index) - Good (56) Lower Potential scale

## 2002 TREND ASSESSMENT

Trend for soil is stable. Cover of bare ground has increased slightly and litter cover has declined, but total herbaceous cover has increased slightly and total vegetation cover has remained stable. There is little active erosion occurring on site and the erosion condition class was determined to be stable in 2002. Trend for Wyoming big sagebrush is up. Density has increased 34% since 1997, average vigor has improved, percent decadence has declined to 19%, and young plants remain abundant. Utilization remains light and it appears that deer have not used this area heavily since 1989. Juniper trees appear to be slowly increasing and may warrant treatment in the future. The herbaceous understory is poor and continues to be dominated by cheatgrass, a winter annual. It now provides 58% of the total grass cover and 55% of the total herbaceous cover. Average cover of cheatgrass is estimated at about 13%. The only abundant perennial grass is Sandberg bluegrass which accounts for 36% of the total grass cover. However, it provides little forage. Forbs are fairly diverse but produce less than 2% total cover. The most common species is the annual bur buttercup. Trend for the herbaceous understory is considered stable. Grasses, which account for the majority of the herbaceous cover, have remained at similar frequencies compared to 1997 estimates.

### TREND ASSESSMENT

soil - stable (0)

browse - up (+2)

herbaceous understory - stable (0)

winter range condition (DC Index) - Good (46) Lower Potential scale

## 2004 TREND ASSESSMENT

Trend for soil is stable. Cover and nested frequency for bare ground, litter, and vegetation have all remained relatively the same. The ratio of protective cover to bare ground also remained at 3.5:1. Trend for Wyoming big sagebrush is slightly down. Density has decreased by 31% since 2002 and decadence has increased from 19% in 2002 to 28% in 2004. Young recruitment was high in 1997 and 2002, but decreased in 2004.

Utilization has remained light and annual leader growth was fair in 2004. The herbaceous understory is slightly down. Cheatgrass cover and nested frequency remain abundant and has not change much since 2002. The dominant perennial grass, Sandberg bluegrass, decreased its sum of nested frequency by 17%. Forb cover remained less than 2% and provides very little forage. The Desirable Components Index rated this site as fair with a score of 30 due to lots of cheatgrass and very moderate browse species.

### TREND ASSESSMENT

soil - stable (0)

browse - slightly down (-1)

herbaceous understory - slightly down (-1)

winter range condition (DC Index) - Fair (30) Lower Potential scale

### HERBACEOUS TRENDS --

Management unit 18 , Study no: 23

T y p e	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'04	'97	'02	'04
G	Agropyron spicatum	12	6	11	21	19	.61	.93	1.27
G	Aristida purpurea	-	-	-	3	-	-	.03	-
G	Bromus tectorum (a)	-	-	308	301	308	8.61	12.80	12.14
G	Poa secunda	160	244	224	236	195	7.65	7.92	4.84
G	Sitanion hystrix	9	31	21	10	21	.29	.39	.75
Total for Annual Grasses		0	0	308	301	308	8.61	12.80	12.14
Total for Perennial Grasses		181	281	256	270	235	8.56	9.28	6.86
Total for Grasses		181	281	564	571	543	17.17	22.09	19.01
F	Agoseris glauca	-	-	-	1	-	-	.00	-
F	Antennaria rosea	12	18	5	6	-	.06	.19	-
F	Astragalus cibarius	9	12	36	-	5	1.39	-	.01
F	Astragalus utahensis	7	13	15	1	1	.23	.00	.00
F	Castilleja chromosa	3	-	-	-	-	-	-	-
F	Calochortus nuttallii	11	19	10	4	6	.03	.01	.01
F	Chaenactis douglasii	1	4	8	-	-	.02	-	-
F	Cirsium undulatum	5	2	10	-	-	.13	-	-
F	Comandra pallida	-	-	3	6	4	.01	.03	.03
F	Collinsia parviflora (a)	-	-	4	3	-	.01	.00	-
F	Cryptantha spp.	-	3	-	-	-	-	-	-
F	Delphinium nuttallianum	-	-	-	-	1	-	-	.00
F	Draba spp. (a)	-	-	-	4	-	-	.00	-
F	Erodium cicutarium (a)	-	-	1	11	28	.03	.25	.39

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'04	'97	'02	'04
F	Holosteum umbellatum (a)	-	-	34	18	5	.31	.09	.01
F	Lathyrus brachycalyx	10	24	-	-	-	-	-	-
F	Lactuca serriola	-	7	8	-	-	.04	-	-
F	Lygodesmia spp.	-	-	3	-	-	.01	-	-
F	Microsteris gracilis (a)	-	-	1	4	1	.00	.01	.00
F	Phlox longifolia	10	32	24	29	21	.25	.16	.17
F	Ranunculus testiculatus (a)	-	-	154	122	148	1.09	.44	1.28
F	Tragopogon dubius	-	-	7	-	-	.04	-	-
F	Zigadenus paniculatus	-	-	1	2	-	.03	.06	.00
Total for Annual Forbs		0	0	194	162	182	1.45	0.80	1.69
Total for Perennial Forbs		68	134	130	49	38	2.28	0.47	0.25
Total for Forbs		68	134	324	211	220	3.73	1.27	1.94

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

#### BROWSE TRENDS --

Management unit 18 , Study no: 23

Type	Species	Strip Frequency					Average Cover %		
		'83	'89	'97	'02	'04	'97	'02	'04
B	Artemisia tridentata wyomingensis	0	0	66	77	65	11.78	9.55	9.73
B	Chrysothamnus nauseosus albicaulis	0	0	1	0	0	.03	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	0	0	1	0	0	.00	-	-
B	Gutierrezia sarothrae	0	0	38	45	12	.34	2.18	.36
B	Juniperus osteosperma	0	0	6	9	9	7.68	8.89	8.79
Total for Browse		0	0	112	131	86	19.85	20.63	18.88

#### CANOPY COVER, LINE INTERCEPT --

Management unit 18 , Study no: 23

Species	Percent Cover				
	'83	'89	'97	'02	'04
Artemisia tridentata wyomingensis	-	-	-	9.63	10.21
Gutierrezia sarothrae	-	-	-	1.43	.48
Juniperus osteosperma	-	-	5.19	10.93	13.10



**KEY BROWSE ANNUAL LEADER GROWTH --**

Management unit 18 , Study no: 23

Species	Average leader growth (in)	
	'02	'04
Artemisia tridentata wyomingensis	3.4	1.6

**POINT-QUARTER TREE DATA --**

Management unit 18 , Study no: 23

Species	Trees per Acre		Average diameter (in)	
	'02	'04	'02	'04
Juniperus osteosperma	72	73	7.1	12.3

**BASIC COVER --**

Management unit 18 , Study no: 23

Cover Type	Average Cover %				
	'83	'89	'97	'02	'04
Vegetation	1.50	6.00	39.91	42.34	40.34
Rock	3.25	6.25	2.59	2.93	2.64
Pavement	1.25	10.00	5.13	5.51	5.60
Litter	63.50	53.75	43.77	37.09	42.76
Cryptogams	.25	3.75	10.16	12.06	6.88
Bare Ground	30.25	20.25	10.21	16.87	19.49

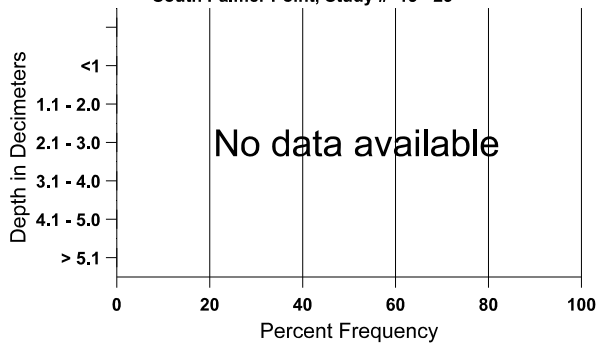
**SOIL ANALYSIS DATA --**

Management unit 18R, Study no: 23, Study Name: South Palmer Point

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
n/a	n/a	7.9	42.0	33.1	24.9	2.1	3.4	259.2	0.5

**Stoniness Index**

South Palmer Point, Study # 18 - 23



PELLET GROUP DATA --

Management unit 18 , Study no: 23

Type	Quadrat Frequency				
	'83	'89	'97	'02	'04
Rabbit	-	-	18	3	8
Deer	-	-	16	5	8
Cattle	-	-	2	-	-

Days use per acre (ha)	
'02	'04
-	-
23 (56)	13 (31)
-	-

BROWSE CHARACTERISTICS --

Management unit 18 , Study no: 23

		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>												
83	<b>2399</b>	66	33	1233	1133	-	29	69	47	-	47	19/26
89	<b>966</b>	-	66	100	800	-	83	0	83	-	72	39/29
97	<b>2540</b>	940	960	980	600	2080	13	0	24	9	11	28/45
02	<b>3820</b>	-	900	2200	720	1560	5	0	19	7	7	21/31
04	<b>2640</b>	-	180	1720	740	1360	13	0	28	11	11	20/27
<i>Chrysothamnus nauseosus albicaulis</i>												
83	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>20</b>	-	-	20	-	-	0	0	-	-	0	15/18
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
83	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>20</b>	-	20	-	-	-	0	0	-	-	0	6/5
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
83	<b>3199</b>	1966	1266	1933	-	-	0	0	0	-	0	9/11
89	<b>3732</b>	33	766	2933	33	-	0	0	1	-	3	13/14
97	<b>2520</b>	60	760	1760	-	60	3	0	0	-	0	7/6
02	<b>2600</b>	-	20	1840	740	800	0	0	28	6	6	8/11
04	<b>460</b>	-	-	380	80	480	0	0	17	13	13	8/11

		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)
Juniperus osteosperma												
83	<b>166</b>	66	33	133	-	-	0	0	-	-	0	62/44
89	<b>266</b>	-	200	66	-	-	0	0	-	-	0	335/118
97	<b>120</b>	40	20	100	-	-	0	0	-	-	0	-/-
02	<b>200</b>	20	60	140	-	-	0	0	-	-	0	-/-
04	<b>200</b>	-	80	120	-	-	0	0	-	-	0	-/-

Trend Study 19R-1-04

Study site name: West Lee's Creek.

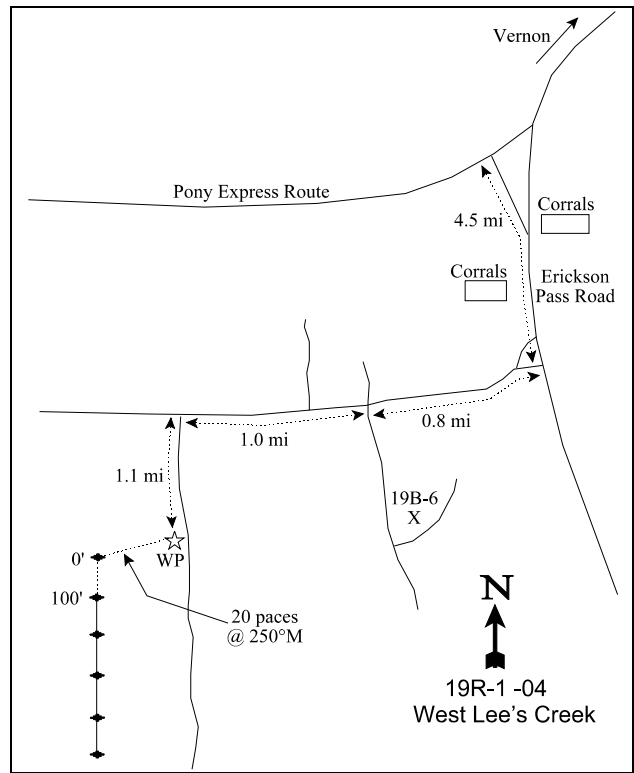
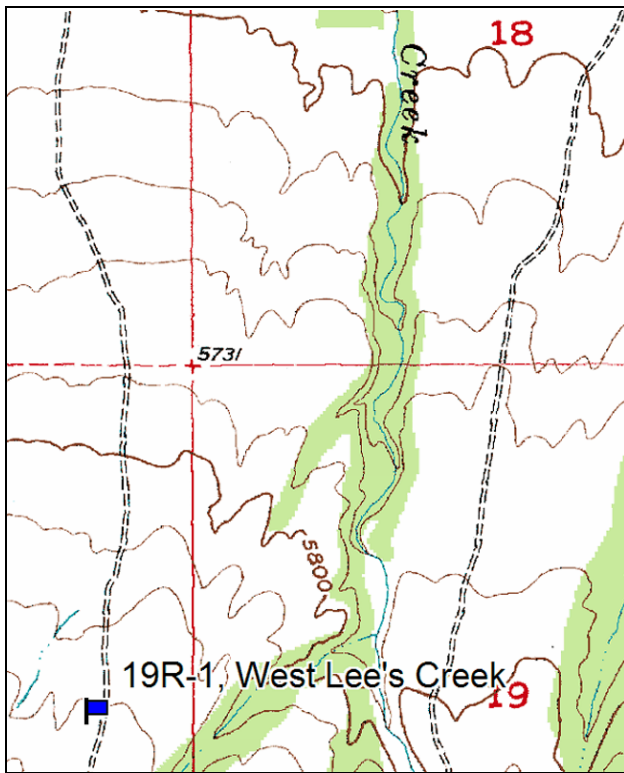
Vegetation type: Chained Pinyon-Juniper.

Compass bearing: frequency baseline 198 degrees magnetic.

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

LOCATION DESCRIPTION

Starting at the intersection of the Erickson Pass and Pony Express Roads, proceed south on the Erickson Pass Road for 4.5 miles to a road that comes in from the right (west). Turn here and proceed west for 1.8 miles to a road that comes in from the left. Turn here and proceed south for 1.1 miles to a witness post on the right side of the road. The 0-foot stake is 20 paces from the witness post at 250°M, and is marked with browse tag #39.



Map Name: Indian Peaks

Diagrammatic Sketch

Township 9S, Range 8W, Section 24

GPS: NAD 27, UTM 12T 4431000 N, 356006 E

## DISCUSSION

### West Lee's Creek - Trend Study No. 19R-1

The West Lee's Creek study is located on the northeast foothills of the Simpson Mountains. The area is managed by the Bureau of Land Management and is part of the Government Creek livestock allotment. The old chaining is dominated by mature Utah junipers and Wyoming big sagebrush. The elevation is 5,960 ft on a northern exposure with a 6-8% slope. This study was placed to monitor a bullhog and seeding project done in the fall of 2004 and the spring of 2005. The seed was aurally distributed in the fall of 2004 using two different seed mixes. The northern 350 acres were seeded using the Round Canyon mix and the southern 350 acres were seeded using the Lee Canyon mix. After the seeding, the bullhog thinned the junipers in the spring of 2005. Pellet group data was estimated at 10 deer and 4 cow days use/acre (25 ddu/ha and 9 cdu/ha).

The soil is a loam with a very shallow effective rooting depth of 7.2 inches. The profile is rocky throughout and rock/pavement cover estimated 17%. The soil reaction is neutral with a pH of 6.9. The erosion condition class determined soil movement as stable in 2005.

The key browse species are Wyoming big sagebrush and antelope bitterbrush. Wyoming big sagebrush averaged 5% cover and 760 plants/acre in 2004. Eighteen percent of the population was classified as decadent and 8% were classified as dying. Use was moderate and annual leader growth averaged only 1.4 inches. Antelope bitterbrush averaged 3% cover and 180 plants/acre. Decadence was high at 56% and 11% were classified as dying. Use is heavy and annual leader growth only averaged 3.6 inches.

Utah juniper is the dominant species and averaged 25% canopy cover. Density was estimated at 276 trees/acre and the average diameter was 5.6 inches. Most trees are large and averaged 8-12 ft tall.

Perennial grasses averaged 12.8% cover and perennial forbs averaged less than 1%. No annual species were sampled in 2004. The species diversity is low with only 5 forbs and 4 grass species. The three species that were most abundant were crested wheatgrass, bluebunch wheatgrass, and Sandberg bluegrass. All other species were less than 1% cover.

2004 winter range condition (DC Index) - good (52) Lower Potential scale

**Lee Canyon Seed Mix**

Seeded Species	Approximate Bulk lbs/acre
Siberian Wheatgrass 'Vavilov'	1.00
Crested Wheatgrass 'Hycrest'	1.00
Western Wheatgrass 'Arriba'	1.00
Snake River Wheatgrass 'Secar'	0.43
Bluebunch WG 'Goldar'	0.57
Canby Bluegrass	0.43
Bottlebrush Squirreltail	0.14
Western Yarrow	0.10
Blue Flax 'Appar'	0.57
Alalfa 'Ladak+'	1.00
Sainfoin 'Eski'	2.43
Small Burnet 'Delar'	2.00
Forage Kochia	0.57
Sagebrush, Wyoming	0.57
<b>Total</b>	<b>11.81</b>

**Round Canyon Seed Mix**

Seeded Species	Approximate Bulk lbs/acre
Siberian Wheatgrass (vavilov)	2.00
Russian Wildrye (bozoski)	2.00
Wester Wheatgrass (arriba)	2.00
Lewis flax	1.00
Western Yarrow	0.25
Ladak Alfalfa	0.50
<b>Total</b>	<b>7.75</b>

**HERBACEOUS TRENDS --**

Management unit 19R, Study no: 1

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron cristatum	171	5.62
G	Agropyron spicatum	104	5.00
G	Poa secunda	183	2.13
G	Sitanion hystrix	3	.03
Total for Annual Grasses		0	0
Total for Perennial Grasses		461	12.80
Total for Grasses		461	12.80
F	Astragalus spp.	4	.03
F	Petradoria pumila	16	.37
F	Phlox hoodii	17	.15
F	Phlox longifolia	2	.00
F	Vicia americana	4	.03
Total for Annual Forbs		0	0
Total for Perennial Forbs		43	0.59
Total for Forbs		43	0.59

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

BROWSE TRENDS --

Management unit 19R, Study no: 1

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata wyomingensis	30	4.87
B	Chrysothamnus nauseosus	0	-
B	Gutierrezia sarothrae	4	-
B	Juniperus osteosperma	18	18.88
B	Opuntia spp.	0	-
B	Purshia tridentata	7	2.95
Total for Browse		59	26.71

CANOPY COVER, LINE INTERCEPT --

Management unit 19R, Study no: 1

Species	Percent Cover
	'04
Artemisia tridentata wyomingensis	4.38
Gutierrezia sarothrae	.15
Juniperus osteosperma	24.95
Purshia tridentata	1.93

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 19R, Study no: 1

Species	Average leader growth (in)
	'04
Artemisia tridentata wyomingensis	1.4
Purshia tridentata	3.6

POINT-QUARTER TREE DATA --

Management unit 19R, Study no: 1

Species	Trees per Acre	Average diameter (in)
	'04	'04
Juniperus osteosperma	276	5.6

**BASIC COVER --**

Management unit 19R, Study no: 1

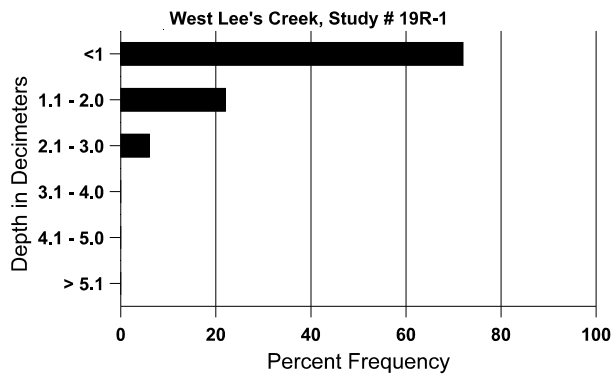
Cover Type	Average Cover % '04
Vegetation	38.44
Rock	5.34
Pavement	11.49
Litter	38.15
Cryptogams	.43
Bare Ground	25.10

**SOIL ANALYSIS DATA --**

Management unit 19R, Study no: 1, Study Name: West Lee's Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
7.2	72.6 (8.6)	6.9	39.3	33.2	27.5	3.3	5.8	217.6	0.8

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 19R, Study no: 1

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	31	-
Deer	13	10 (25)
Cattle	1	4 (9)



BROWSE CHARACTERISTICS --  
 Management unit 19R, Study no: 1

		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>												
04	<b>760</b>	-	160	460	140	40	18	21	18	8	8	24/36
<i>Chrysothamnus nauseosus</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	25/24
<i>Gutierrezia sarothrae</i>												
04	<b>120</b>	-	-	120	-	-	0	0	-	-	0	7/11
<i>Juniperus osteosperma</i>												
04	<b>380</b>	-	-	380	-	-	11	0	-	-	0	-/-
<i>Opuntia spp.</i>												
04	<b>0</b>	-	-	-	-	20	0	0	-	-	0	9/19
<i>Purshia tridentata</i>												
04	<b>180</b>	-	20	60	100	-	0	89	56	11	11	26/61

Trend Study 21R-2-04

Study site name: Fillmore WMA Bullhog .

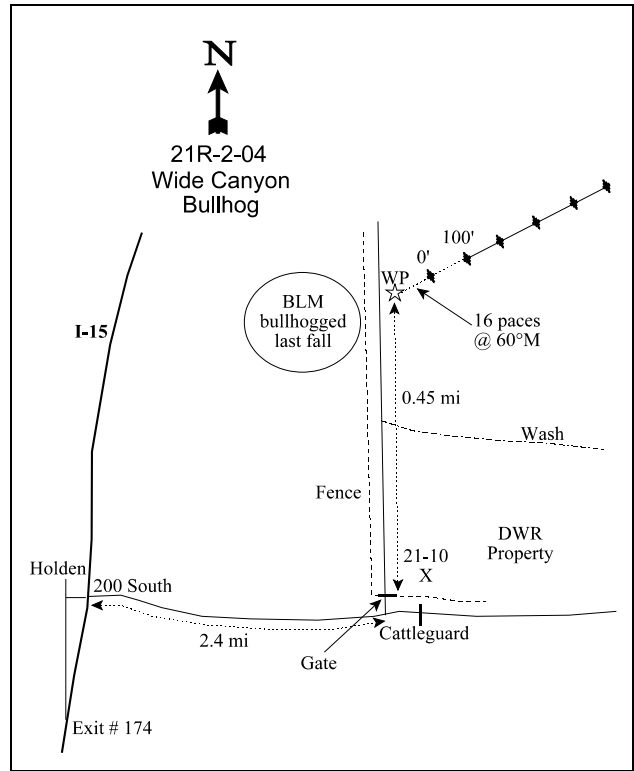
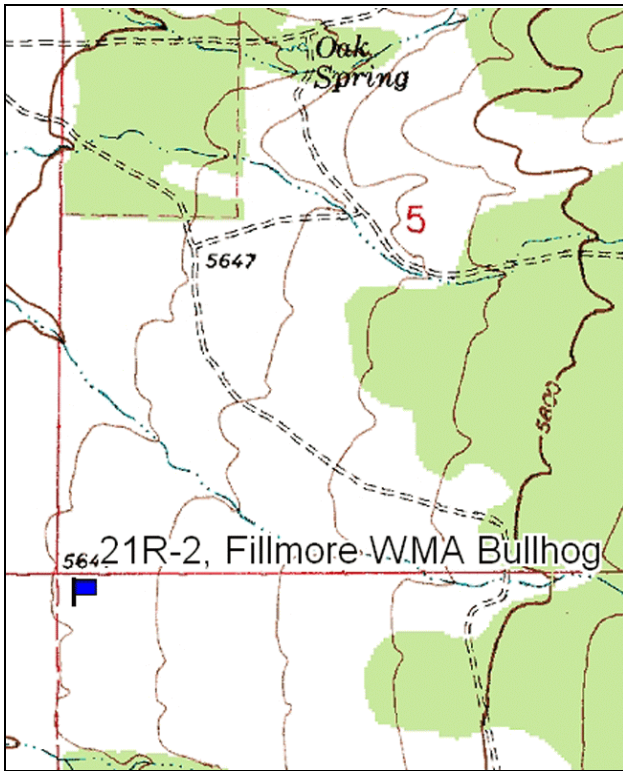
Vegetation type: Pinyon-Juniper/Cliffrose .

Compass bearing: frequency baseline 51 degrees magnetic.

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

LOCATION DESCRIPTION

From the south Holden exit off I-15 (#174), go north into town and turn right at 200 South. Follow the road 1 block east, then north a few yards, then immediately east again up the hill to an overpass. From the overpass go 2.4 miles east to the fence corner of DWR property. Turn left passing through the gate and travel 0.45 miles to a witness post on the right side of the road. The 0-foot stake is 16 paces from the witness post at 60°M.



Map Name: Coffee Peak

Diagrammatic Sketch

Township 20S , Range 3W , Section 8

GPS: NAD 27, UTM 12S 4327862 N, 394414 E

## DISCUSSION

### Fillmore WMA Bullhog - Trend Study No. 21R-2

The Fillmore WMA Bullhog study, like much of the area along the west side of the Pahvant Range, was cabled, chained and/or hula dozed in the late 1950's. The study is located on land managed by the Utah Division of Wildlife for wintering mule deer and elk. The range type is an association of Utah juniper, Wyoming big sagebrush, cliffrose, and a perennial grass understory. The elevation is 5,680 ft with a west aspect and a 3-5% slope. Over the years, juniper encroachment has reached a point that it is beginning to crowd out important forage species for wintering mule deer. The study was established to monitor the effects of a 650 acre bullhog treatment completed in April of 2005. The land to the west is managed by the Bureau of Land Management and was bullhogged during the fall of 2003. Pellet group data was estimated at 5 elk, 190 deer, and 11 cow days use/acre (12 edu/ha, 469 ddu/ha, and 27 cdu/ha).

The soil texture is a sandy clay loam with a shallow effective rooting depth. Gravel is present throughout the soil profile and cover of rock and pavement was estimated at 4.7%. CaCO<sub>3</sub> was found on rock at a depth of 6 inches. The soil reaction is neutral with a pH of 7.2. The erosion condition class determined soil movement as stable in 2005.

The key browse species include Wyoming big sagebrush, Mexican cliffrose, and antelope bitterbrush. Wyoming big sagebrush cover was estimated at 3.3% with 1,060 plants/acre. Decadence was high at 40% and the percentage of plants dying was 32%. Use was moderate to heavy with annual leader growth measuring 1.5 inches. Mexican cliffrose cover was estimated just under 3% with 220 plants/acre. Use was heavy, but annual leader growth still averaged 3.8 inches. The plants are large and some were only partially available to wildlife. Only a few plants of antelope bitterbrush were observed and they were heavily used.

Utah juniper is abundant and averaged 14% canopy cover. Density was estimated at 72 trees/acre with a mean diameter of 6 inches. The majority of the plants are larger and average between 8 and 12 ft.

The herbaceous understory is dominated by perennial grasses, but the dominate grass is bulbous bluegrass with 30% cover. Bulbosa bluegrass acts like a winter annual, but is an invasive perennial species. This characteristic means it can deplete soil moisture and nutrients before native perennial grasses. Native perennial grasses include crested, bluebunch, and intermediate wheatgrass. Cheatgrass is also present on the site with 3% cover. Forbs are few and predominately low growing annual species.

The Desirable Components Index rated this site as fair with a score of 35 due to lots of perennial grasses, although most of this is bulbous bluegrass, an invasive species.

### 2004 winter range condition (DC Index) - fair (35) Lower Potential scale

#### HERBACEOUS TRENDS -- Management unit 21R, Study no: 2

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron cristatum	38	1.14
G	Agropyron intermedium	82	2.11
G	Agropyron spicatum	81	2.92
G	Bromus tectorum (a)	98	2.91

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	<i>Poa bulbosa</i>	403	29.68
G	<i>Poa secunda</i>	10	.19
Total for Annual Grasses		98	2.91
Total for Perennial Grasses		614	36.06
Total for Grasses		712	38.97
F	<i>Alyssum alyssoides</i> (a)	16	.05
F	<i>Collinsia parviflora</i> (a)	5	.01
F	<i>Cryptantha</i> spp.	-	.00
F	<i>Erodium cicutarium</i> (a)	4	.03
F	<i>Holosteum umbellatum</i> (a)	5	.01
F	<i>Petradoria pumila</i>	20	.55
F	<i>Phlox austromontana</i>	12	.10
F	<i>Ranunculus testiculatus</i> (a)	18	.04
F	<i>Streptanthus cordatus</i>	1	.00
F	<i>Vicia americana</i>	2	.00
Total for Annual Forbs		48	0.14
Total for Perennial Forbs		35	0.66
Total for Forbs		83	0.80

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

#### BROWSE TRENDS --

Management unit 21R, Study no: 2

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	34	3.29
B	<i>Chrysothamnus viscidiflorus</i>	18	.40
B	<i>Cowania mexicana</i> <i>stansburiana</i>	8	2.79
B	<i>Gutierrezia sarothrae</i>	18	.26
B	<i>Juniperus osteosperma</i>	4	10.50
B	<i>Leptodactylon pungens</i>	13	.43
B	<i>Purshia tridentata</i>	1	.38
Total for Browse		96	18.07

CANOPY COVER, LINE INTERCEPT --  
 Management unit 21R, Study no: 2

Species	Percent Cover '04
Artemisia tridentata wyomingensis	4.44
Chrysothamnus viscidiflorus	1.33
Cowania mexicana stansburiana	5.00
Gutierrezia sarothrae	.40
Juniperus osteosperma	14.43
Leptodactylon pungens	.31
Purshia tridentata	.31

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 21R, Study no: 2

Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	1.5
Cowania mexicana stansburiana	3.4

POINT-QUARTER TREE DATA --  
 Management unit 21R, Study no: 2

Species	Trees per Acre '04	Average diameter (in) '04
Juniperus osteosperma	72	6.1

BASIC COVER --  
 Management unit 21R, Study no: 2

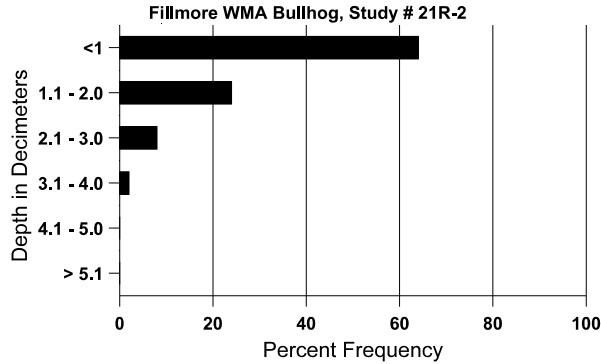
Cover Type	Average Cover % '04
Vegetation	56.72
Rock	1.56
Pavement	3.18
Litter	32.65
Cryptogams	1.07
Bare Ground	18.92

SOIL ANALYSIS DATA --

Management unit 21R, Study no: 2, Study Name: Fillmore WMA Bullhog

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.4	77.6 (12.0)	7.2	48.4	22.2	29.5	2.7	9.4	188.8	0.6

### Stoniness Index



PELLET GROUP DATA --

Management unit 21R, Study no: 2

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	42	-
Elk	-	5 (12)
Deer	51	190 (469)
Cattle	5	11 (27)

BROWSE CHARACTERISTICS --

Management unit 21R, 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>Artemisia tridentata wyomingensis</i>												
04	<b>1060</b>	-	40	600	420	620	34	49	40	32	32	28/34
<i>Chrysothamnus viscidiflorus</i>												
04	<b>420</b>	-	-	400	20	-	10	5	5	-	0	11/19
<i>Cowania mexicana stansburiana</i>												
04	<b>220</b>	-	40	180	-	-	0	100	-	-	0	75/81
<i>Gutierrezia sarothrae</i>												
04	<b>620</b>	-	240	380	-	-	0	0	-	-	0	8/8
<i>Juniperus osteosperma</i>												
04	<b>80</b>	-	-	80	-	-	25	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Leptodactylon pungens</i>												
04	<b>540</b>	-	-	540	-	100	0	0	-	-	0	6/11
<i>Purshia tridentata</i>												
04	<b>20</b>	-	-	20	-	-	0	100	-	-	0	40/59

Trend Study 21R-3-04

Study site name: Dry Creek .

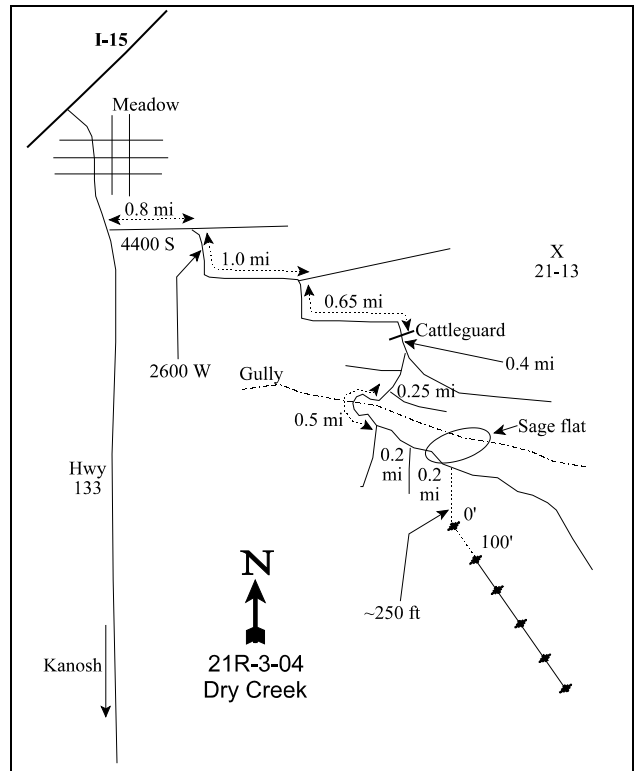
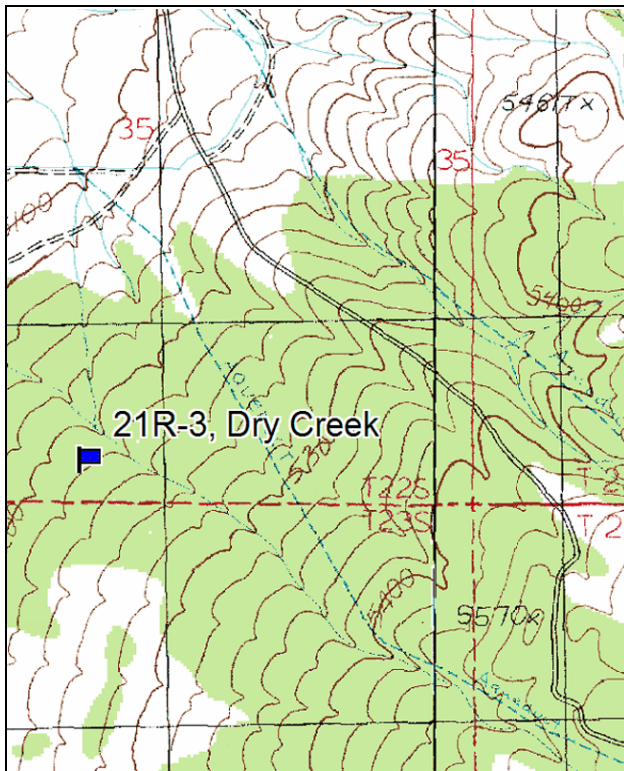
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 145 degrees magnetic.

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

LOCATION DESCRIPTION

Go south from Meadow (southwest of Fillmore) on SR 133 to mile marker 6. Go approximately 0.05 miles further south on SR 133 and turn east on a gravel road (4400 South). Go east 0.8 miles to a junction. Turn right onto 200 West and follow this road for 1 mile around several bends until the main road turns back to the south. Follow this main road for another 0.65 miles to a cattleguard. Continue 0.4 miles to a road that will come in on the right. Turn right onto this road and drive 0.25 miles staying left at the first fork and going right at the second fork. From the second fork continue 0.5 miles around a 90 degree bend to another fork. From this fork stay left and continue 0.2 miles staying to the left. From this point use the GPS and walk to the 0-foot stake.



Map Name: Kanosh

Diagrammatic Sketch

Township 22S , Range 5W , Section 35

GPS: NAD 27, UTM 12S 4300629 N, 379790 E



## DISCUSSION

### Dry Creek - Trend Study No. 21R-3

The Dry Creek study is located southeast of Meadow, UT on private land. The range type is an association of Utah juniper, Wyoming big sagebrush, and cheatgrass. The elevation is 5,220 ft with a west aspect and a 3-5% slope. The encroaching juniper has crowded out the sagebrush and understory species that are critical to wintering mule deer. This has forced deer onto the valley floor causing damage to agriculture fields and increased hazards to motorist. A 1,000 acre chaining and seeding project was to take place in the fall of 2005. The area was to be chained one-way and then broadcast seeded aurally from a fixed-winged aircraft. The chain made a second pass to cover seed and to insure good juniper removal. A second aurally seeding consisting of small shrubs species that require shallow planting was flown on after the second pass. Pellet group data from 2004 was estimated at 8 elk and 13 deer days use/acre (20 edu/ha and 31 ddu/ha).

The soil texture is a sandy loam with a very shallow effective rooting depth. Soil is rocky below 12 inches and cover of rock and pavement was 12%. The soil reaction is neutral with a pH of 6.6. The ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground was good at 4.3:1. Cheatgrass cover was high which provided protection from erosion except for some isolated spots. Bare ground cover was estimated at 16% and litter cover was 53%. The erosion condition class determined soil movement as stable in 2005.

Key browse species are limited to Wyoming big sagebrush, which was not very common. The density of Wyoming big sagebrush was estimated at 240 plants/acre with a cover value of less than 1%. Decadence was extremely high at 83% and 50% of the density was classified as dying. Use on the sagebrush was moderate to heavy. Utah juniper was dominant at 39% canopy cover with a density of 346 trees/acre. The mean diameter was 6.9 inches and averaged 8 to 12 ft tall. A small portion of the population (30%) was in a smaller age class of 1 to 4 ft tall.

The herbaceous understory is dominated by cheatgrass with very few perennial grasses. Cheatgrass cover was high at 25% and all other grasses and forbs were less than 2%. The perennial grasses that were observed included Sandberg bluegrass, squirreltail, and sheep fescue. All forbs were low growing annuals.

The Desirable Components Index rated this site as very poor with a score of -14 due to lots of cheatgrass and very little key browse species.

### 2004 winter range condition (DC Index) - very poor (-14) Lower Potential scale

#### HERBACEOUS TRENDS --

Management unit 21R, Study no: 3

Type	Species	Nest Frequency		Average Cover %	
		'04	'04	'04	'04
G	Bromus tectorum (a)	422		24.74	
G	Festuca ovina	5		.00	
G	Poa secunda	99		1.53	
G	Sitanion hystrix	4		.04	
G	Vulpia octoflora (a)	4		.01	
Total for Annual Grasses		426		24.75	
Total for Perennial Grasses		108		1.58	

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
Total for Grasses		534	26.34
F	Alyssum alyssoides (a)	6	.01
F	Descurainia pinnata (a)	2	.00
F	Draba spp. (a)	5	.00
F	Gilia spp. (a)	3	.01
F	Microsteris gracilis (a)	4	.01
F	Polygonum douglasii (a)	1	.00
F	Ranunculus testiculatus (a)	2	.01
Total for Annual Forbs		23	0.05
Total for Perennial Forbs		0	0
Total for Forbs		23	0.05

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

#### BROWSE TRENDS --

Management unit 21R, Study no: 3

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata wyomingensis	11	.68
B	Gutierrezia sarothrae	3	.38
B	Juniperus osteosperma	21	7.12
Total for Browse		35	8.18

#### CANOPY COVER, LINE INTERCEPT --

Management unit 21R, Study no: 3

Species	Percent Cover
	'04
Artemisia tridentata wyomingensis	.45
Juniperus osteosperma	39.00

POINT-QUARTER TREE DATA --  
Management unit 21R, Study no: 3

Species	Trees per Acre	Average diameter (in)
	'04	'04
Juniperus osteosperma	346	6.9

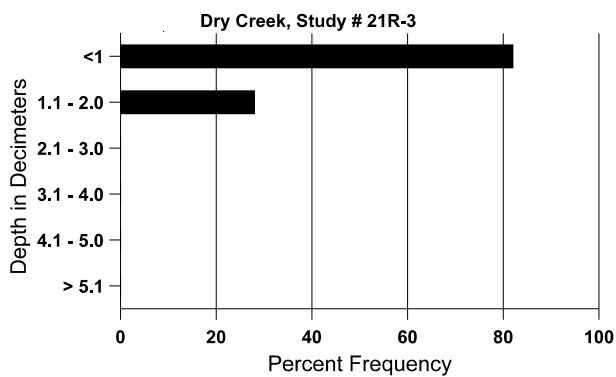
BASIC COVER --  
Management unit 21R, Study no: 3

Cover Type	Average Cover %
	'04
Vegetation	33.34
Rock	8.55
Pavement	3.32
Litter	52.87
Cryptogams	3.18
Bare Ground	16.13

SOIL ANALYSIS DATA --  
Management unit 21R, Study no: 3, Study Name: Dry Creek

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
8.5	64.4 (9.1)	6.6	61.4	25.1	13.5	1.9	14.2	134.4	0.6

## Stoniness Index



PELLET GROUP DATA --  
 Management unit 21R, Study no: 3

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	21	-
Elk	7	8 (20)
Deer	16	13 (31)
Cattle	1	-

BROWSE CHARACTERISTICS --  
 Management unit 21R, 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 wyomingensis</i>												
04	<b>240</b>	-	-	40	200	300	50	33	83	50	50	17/22
<i>Gutierrezia sarothrae</i>												
04	<b>60</b>	-	-	60	-	-	0	0	-	-	0	9/12
<i>Juniperus osteosperma</i>												
04	<b>520</b>	20	260	260	-	-	0	4	-	-	4	-/-

Trend Study 22R-5-04

Study site name: Black Mountain Forb Seeding.

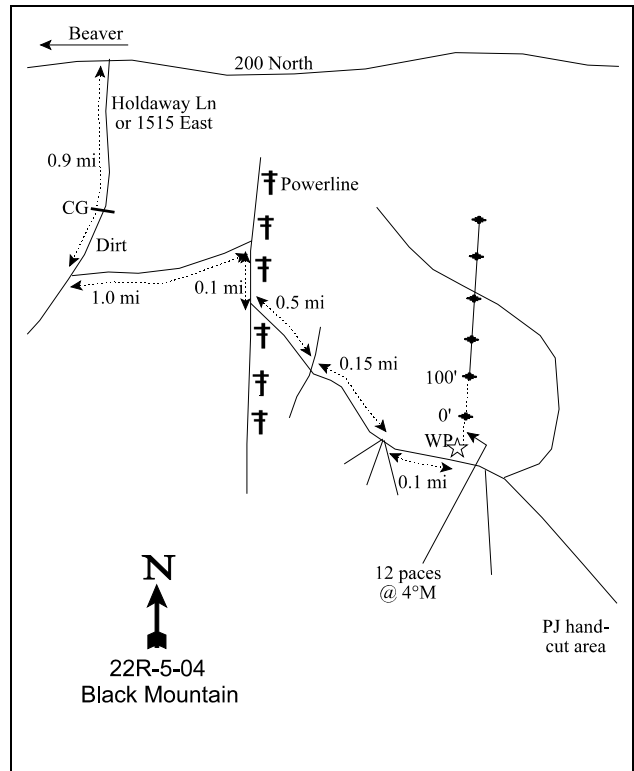
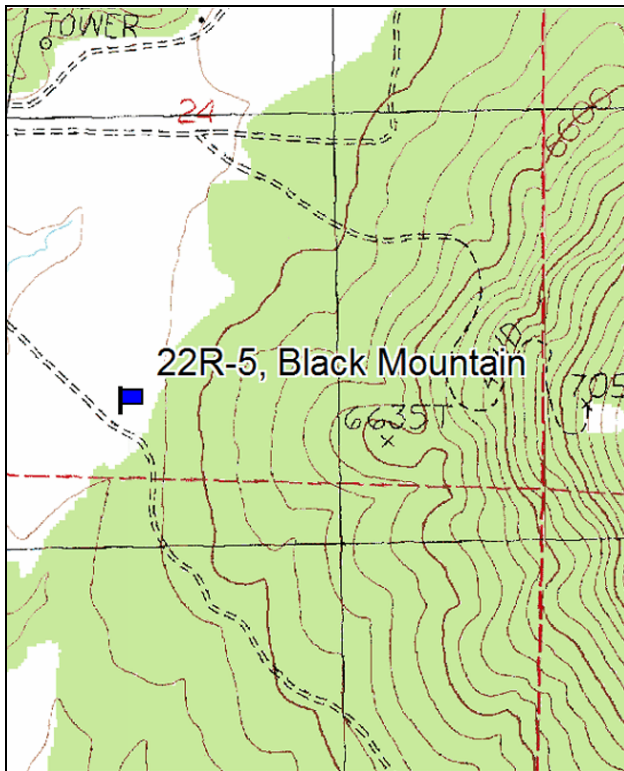
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 2 degrees magnetic.

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

LOCATION DESCRIPTION

From Beaver head east on 200 North. Holdaway Lane (1515 East) comes in from the south. Turn south onto this road and drive 0.9 miles to a road coming in on the left. Turn onto this road and travel 1.0 mile to the powerlines. At the powerlines turn south and travel 0.1 miles to a fork. At the fork go left and travel 0.5 miles to an intersection. Continue straight for 0.15 miles where three roads come in on the right. Continue to the left for another 0.1 miles to a witness post on the left side of the road. The 0-foot stake is 12 paces from the witness post at 4°M.



Map Name: Black Ridge

Diagrammatic Sketch

Township 29S, Range 7W, Section 24

GPS: NAD 27, UTM 12S 4236300 N, 360493 E

## DISCUSSION

### Black Mountain Forb Seeding – Trend Study No. 22R-5

The Black Mountain Forb Seeding treatment was established to monitor a forb enhancement project in Wyoming big sagebrush. The project was lead by the Utah Sportsmen for Wildlife. In February of 2004, a mix of forb seed was applied aerially over the treatment area with no ground disturbance prior to the seeding. The treatment area is located on the foothills approximately 1 mile southeast of Beaver. The monitoring study is located on southwestern aspect with a 3% slope at an elevation of 6,300 feet. In 2005, estimated pellet group data were 27 deer and 5 cow days use/acre (68 ddu/ha and 13 cdu/ha). Deer use was from the previous winter and cattle pats were from the previous summer.

The soil is a shallow clay loam with an effective rooting depth of 11 inches. Surface rock and pavement provided 24% cover in 2004. Little rock was sampled in the soil profile. The soil pH is slightly alkaline (7.4). The soil phosphorus concentration is 5.6 ppm, values less than 6.0 ppm may limit normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). In 2004, a soil erosion condition class rating was stable.

Wyoming big sagebrush is the key browse species. It provided 15% cover and 18% line intercept cover in 2004. Sagebrush density was 3,860 plants/acre. Mature plants made up 62% of the population and decadent individuals made up 38%. Young plants made up less than 1% of the population and plants classified as dying made up 16%. Use was light to moderate in 2004. The average sagebrush leader growth was 4.2 inches.

Pinyon and juniper trees were scattered across the sample area. Pinyon and juniper provided a combine overstory cover of nearly 5% in 2004. Juniper tree density was 28 trees/acre with an average trunk diameter of 2.9 inches. Pinyon density was 9 trees/acre with a trunk diameter of 3.5 inches.

Seven species of grasses were sampled in 2004, 1 of which was an annual. Indian ricegrass provided nearly 3% cover with a quadrat frequency of 58%. Needle-and-thread grass provided nearly 1% cover with a quadrat frequency of 20%. Cheatgrass was present, but provided very little cover and a quadrat frequency of 6%.

Nine species of forbs were sampled in 2004, 5 of which were annuals. All species provided less than 1% cover individually and only 2% cover combined. Alfalfa, forage kochia, small burnett, and yellow sweetclover were seeded on the treatment area in February of 2004.

### 2004 Post-Treatment Assessment

None of the seeded species were sampled the summer following the seeding. The timing of the seeding, late in the winter, may have decreased the success of seed germination. The herbaceous understory is sparse and should provide little competition with the seeded species should they germinate and begin to establish. The lack of ground disturbance may hinder the ability of the seeded species to germinate and establish, however. The Desirable Components Index score rated this site as fair due to good browse cover, but poor perennial grass cover, and poor perennial forb cover.

2004 winter range condition (DC Index) – fair (37) Lower potential scale

The following species were seeded aurally in February of 2004:

Species seeded	Bulk lbs in Mix	Bulk lbs/acre
Alfa "Ladak+"	2800	4.7
Forage Kochia	1952	3.3
Small Burnet "Delar"	2238	3.8
Yellow Sweetclover	3025	5.1
<b>Total</b>	<b>10015</b>	<b>17.0</b>
PLS lbs/acre		14.9
Live seeds/sq. ft.		66.3

HERBACEOUS TRENDS --

Management unit 22R, Study no: 5

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron smithii	24	.14
G	Agropyron spicatum	6	.03
G	Bromus tectorum (a)	16	.03
G	Hilaria jamesii	9	.04
G	Oryzopsis hymenoides	148	2.84
G	Sitanion hystrix	4	.07
G	Stipa comata	52	.91
Total for Annual Grasses		16	0.03
Total for Perennial Grasses		243	4.03
Total for Grasses		259	4.07
F	Collinsia parviflora (a)	-	.00
F	Descurainia pinnata (a)	10	.02
F	Draba spp. (a)	5	.01
F	Gilia spp. (a)	56	.16
F	Leucelene ericoides	52	.46
F	Phlox hoodii	11	.07
F	Phlox longifolia	23	.11
F	Ranunculus testiculatus (a)	193	.88
F	Sphaeralcea coccinea	75	.58
Total for Annual Forbs		264	1.08
Total for Perennial Forbs		161	1.23
Total for Forbs		425	2.31

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

BROWSE TRENDS --

Management unit 22R, Study no: 5

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata wyomingensis	85	14.76
B	Atriplex canescens	0	-
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Juniperus osteosperma	3	.98
B	Pinus edulis	1	1.23
Total for Browse		89	16.97

CANOPY COVER, LINE INTERCEPT --

Management unit 22R, Study no: 5

Species	Percent Cover
	'04
Artemisia tridentata wyomingensis	17.64
Juniperus osteosperma	1.39
Pinus edulis	3.31

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22R, Study no: 5

Species	Average leader growth (in)
	'04
Artemisia tridentata wyomingensis	1.7

POINT-QUARTER TREE DATA --

Management unit 22R, Study no: 5

Species	Trees per Acre	Average diameter (in)
	'04	
Juniperus osteosperma	28	2.9
Pinus edulis	9	3.5



**BASIC COVER --**

Management unit 22R, Study no: 5

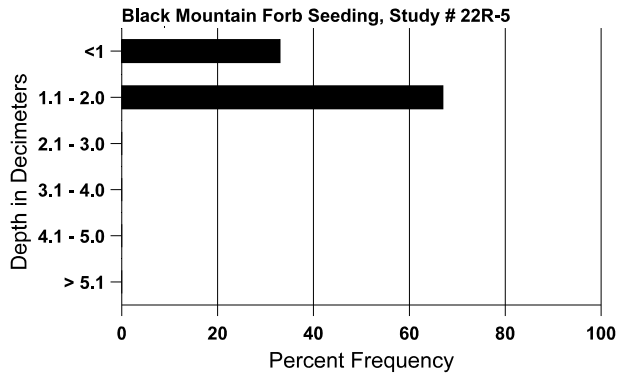
Cover Type	Average Cover % '04
Vegetation	23.12
Rock	2.92
Pavement	20.58
Litter	28.73
Cryptogams	.43
Bare Ground	39.30

**SOIL ANALYSIS DATA --**

Management unit 22R, Study no: 5, Study Name: Black Mountain Forb Seeding

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.9	67.2 (28.4)	7.4	41.0	31.5	27.5	2.2	5.6	163.2	0.7

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 22R, Study no: 5

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	4	-
Deer	11	27 (68)
Cattle	3	5 (13)

BROWSE CHARACTERISTICS --  
 Management unit 22R, 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 wyomingensis</i>												
04	<b>3860</b>	60	20	2380	1460	620	32	11	38	16	17	19/29
<i>Atriplex canescens</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	27/37
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	13/15
<i>Juniperus osteosperma</i>												
04	<b>60</b>	-	40	20	-	-	0	0	-	-	0	-/-
<i>Pinus edulis</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-

Trend Study 22R-6-04

Study site name: Greenville Bench Bullhog .

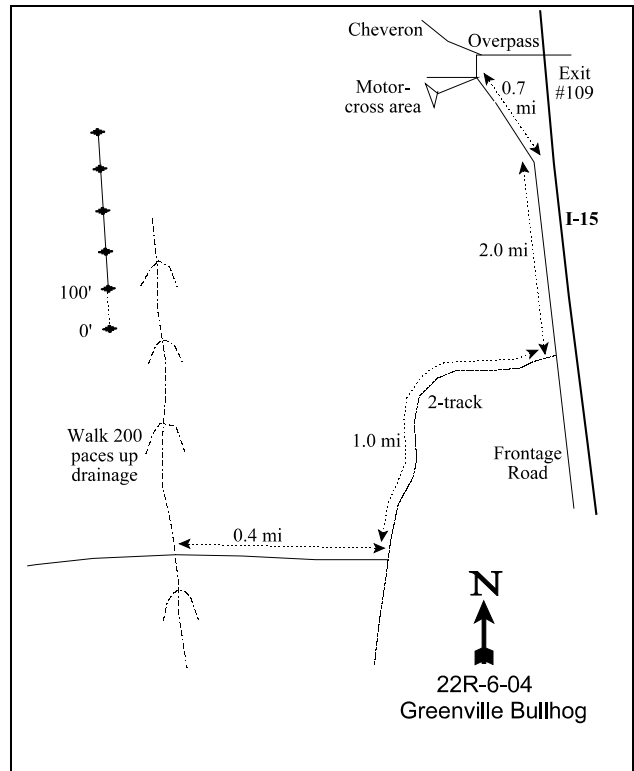
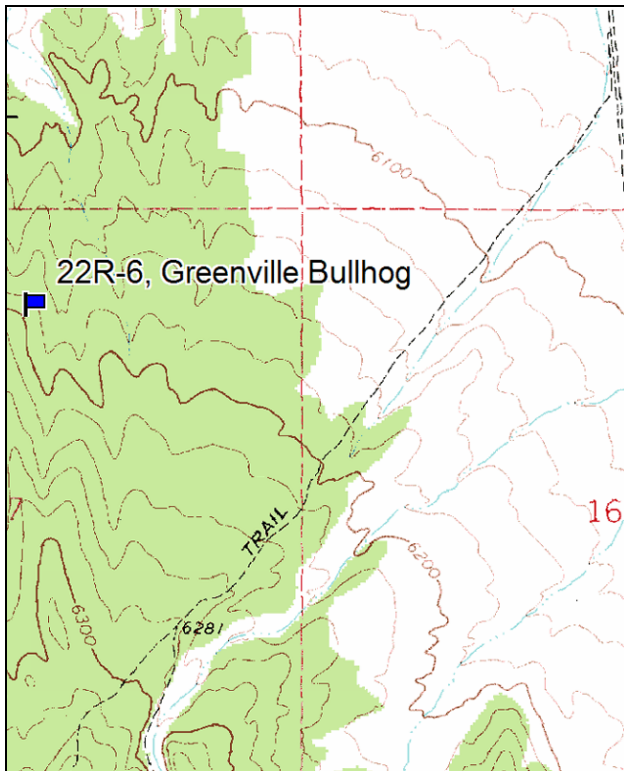
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 353 degrees magnetic.

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

LOCATION DESCRIPTION

Take Exit # 109 off of I-15 and go west on the overpass toward a Chevron Station. From the Chevron Station head south for 0.7 miles through the motor-cross area. Stay on the left most road to where the road turns more south. From here travel 2.0 miles to a road coming in on the right. Turn onto this road and travel 1.0 mile to another road that comes in from the right. Turn west here and travel 0.4 miles to a drainage. Stop here and walk 200 paces north up the drainage to the baseline off to the left.



Map Name: Greenville Bench

Diagrammatic Sketch

Township 30S , Range 7W , Section 17

GPS: NAD 27, UTM 12S 4229490 N, 354156 E

## DISCUSSION

### Greenville Bench Bullhog – Trend Study No. 22R-6

The Greenville Bench Bullhog study monitors a bullhog treatment southwest of Beaver, Utah. In November of 2004, a 1,500-acre area was bullhogged, then drill seeded with a rangeland drill. Later, a mix of browse seed was aerially applied to the bullhogged area. The treatment area is located approximately 5 miles southwest of Beaver. The monitoring study is on a northeast aspect with a 6% slope at an elevation of 6,200 feet. In 2004, estimated pellet group data was 8 deer days use/acre (20 ddu/ha), all of which was from winter.

The soil is a shallow sandy loam with an effective rooting depth of 14 inches. The soil profile is very rocky with a calcium carbonate gravel layer at 11 inches. Soil phosphorus is adequate for wildland soils and the soil pH is neutral (7.3). Rock and pavement covered nearly 40% of the soil surface in 2004. Bare ground covered 24% of the soil surface. In 2004, a soil erosion condition class rating was slight due to moderate pedestalling around shrubs and moderate to high recent litter movement.

Although sparse, Wyoming big sagebrush is the key browse species. It provided much less than 1% cover in 2004. Only 180 sagebrush plants/acre were sampled in 2004, 89% of which were decadent and the other 11% were mature. Plants classified as dying made up 78% of the population. Use was light to moderate. The average leader growth was 6.7 inches in 2004. The sagebrush community is dying off due to the high pinyon-juniper canopy cover.

The combined pinyon and juniper overstory canopy cover before the bullhog in 2004 was 32%. 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 was estimated at 133 trees/acre with an average trunk diameter of 8.8 inches in 2004. Estimated pinyon density was 102 trees/acre with an average trunk diameter of 5.2 inches.

Two species of grasses were sampled in 2004, cheatgrass and squirreltail bottlebrush. Both of which provided far less than 1% cover. Cheatgrass was sampled in only 5% of the quadrats and squirreltail in 2%.

Eight species of forbs were sampled in 2004, 4 of which were annuals. The combined cover of forbs was one-fourth of a percent. It is obvious that the pinyon-juniper overstory is hindering forb growth.

### 2004 Pretreatment Assessment

The pinyon-juniper overstory is preventing browse and herbaceous species from growing. The bullhog and seeding treatments will definitely improve this winter range. The Desirable Components Index score was very poor due to the lack of browse, perennial grass, and perennial forb cover.

2004 winter range condition (DC Index) – very poor (0) Lower potential scale

The following seed mix was applied using a rangeland drill:

Species seeded	Bulk lbs in mix	Bulk lbs/acre
Snake River Wheatgrass 'Secar'	3000	2.0
Indian Ricegrass 'Nezpar'	1600	1.1
Crested Wheatgrass 'Hycrest'	1700	1.1
Pubescent Wheatgrass	2980	2.0
Sandberg Bluegrass 'SID MT'	375	0.3
Blue Flax 'Appar'	1200	0.8
Western Yarrow	150	0.1
Yellow Sweetclover	100	0.1
Small Burnet 'Delar'	1450	1.0
Alalfa 'Ladak+'	1500	1.0
Bitterbrush--Ada/Boise ID	375	0.3
<b>Total</b>	<b>14430</b>	<b>9.6</b>
PLS lbs/acre		8.7

The following seed mix was aerially applied to the treatment area:

Species seeded	Bulk lbs in mix	Bulk lbs/acre
Sagebrush, Wyoming	400	0.3
<b>Total</b>	<b>400</b>	<b>0.3</b>
PLS lbs/acre		0.03

HERBACEOUS TRENDS --  
Management unit 22R, Study no: 6

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Bromus tectorum (a)	10	.02
G	Sitanion hystrix	6	.01
Total for Annual Grasses		10	0.02
Total for Perennial Grasses		6	0.00
Total for Grasses		16	0.03
F	Astragalus spp.	8	.01
F	Eriogonum cernuum (a)	24	.18
F	Eriogonum ovalifolium	1	.03
F	Euphorbia spp.	1	.00
F	Gayophytum ramosissimum(a)	1	.00
F	Gilia spp. (a)	1	.00
F	Lappula occidentalis (a)	-	.00
F	Streptanthus cordatus	4	.01
Total for Annual Forbs		26	0.19
Total for Perennial Forbs		14	0.06

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
Total for Forbs		40	0.25

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

#### BROWSE TRENDS --

Management unit 22R, Study no: 6

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	8	.15
B	<i>Eriogonum microthecum</i>	7	.03
B	<i>Gutierrezia sarothrae</i>	55	1.30
B	<i>Juniperus osteosperma</i>	8	11.60
B	<i>Opuntia</i> spp.	1	-
B	<i>Pinus edulis</i>	4	7.80
B	<i>Polygala subspinosa</i> <i>subspinosa</i>	9	.02
Total for Browse		92	20.93

#### CANOPY COVER, LINE INTERCEPT --

Management unit 22R, Study no: 6

Species	Percent Cover
	'04
<i>Gutierrezia sarothrae</i>	1.04
<i>Juniperus osteosperma</i>	18.79
<i>Pinus edulis</i>	13.44

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22R, Study no: 6

Species	Average leader growth (in)
	'04
<i>Artemisia tridentata</i> <i>wyomingensis</i>	2.6

POINT-QUARTER TREE DATA --  
 Management unit 22R, Study no: 6

Species	Trees per Acre
	'04
Juniperus osteosperma	133
Pinus edulis	102

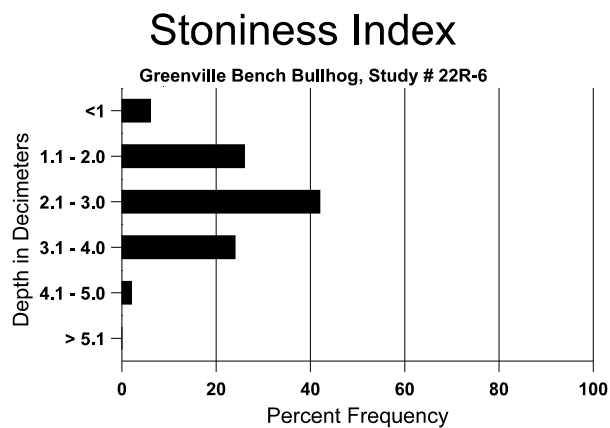
Average diameter (in)
'04
8.8
5.2

BASIC COVER --  
 Management unit 22R, Study no: 6

Cover Type	Average Cover %
	'04
Vegetation	21.37
Rock	7.48
Pavement	31.97
Litter	39.84
Cryptogams	.96
Bare Ground	24.25

SOIL ANALYSIS DATA --  
 Management unit 22R, Study no: 6, Study Name: Greenville Bench Bullhog

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.6	67.0 (15.9)	7.3	61.7	20.4	17.8	2.5	6.8	99.2	0.6



PELLET GROUP DATA --  
 Management unit 22R, Study no: 6

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	10	-
Deer	4	8 (20)

BROWSE CHARACTERISTICS --  
 Management unit 22R, 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)
<i>Artemisia tridentata wyomingensis</i>												
04	<b>180</b>	20	-	20	160	1740	33	22	89	78	78	19/23
<i>Eriogonum microthecum</i>												
04	<b>360</b>	-	-	360	-	-	39	28	-	-	0	3/4
<i>Gutierrezia sarothrae</i>												
04	<b>2600</b>	20	660	1940	-	780	0	0	-	-	0	6/8
<i>Juniperus osteosperma</i>												
04	<b>180</b>	-	100	80	-	-	0	0	-	-	0	-/-
<i>Opuntia spp.</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	5/10
<i>Pinus edulis</i>												
04	<b>80</b>	-	20	60	-	-	0	0	-	-	0	-/-
<i>Polygala subspinosa subspinosa</i>												
04	<b>260</b>	-	-	260	-	-	8	0	-	-	0	2/3



Trend Study 23R-1-04

Study site name: Greenwich Disking.

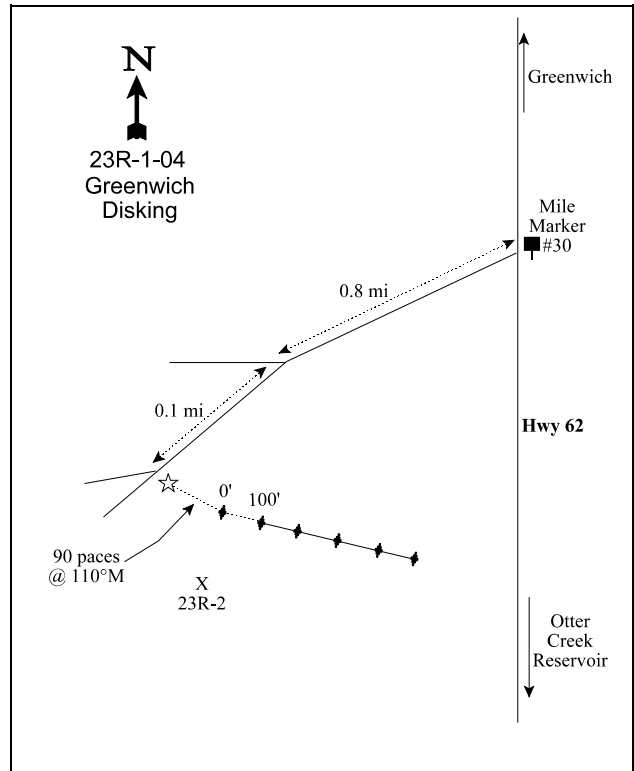
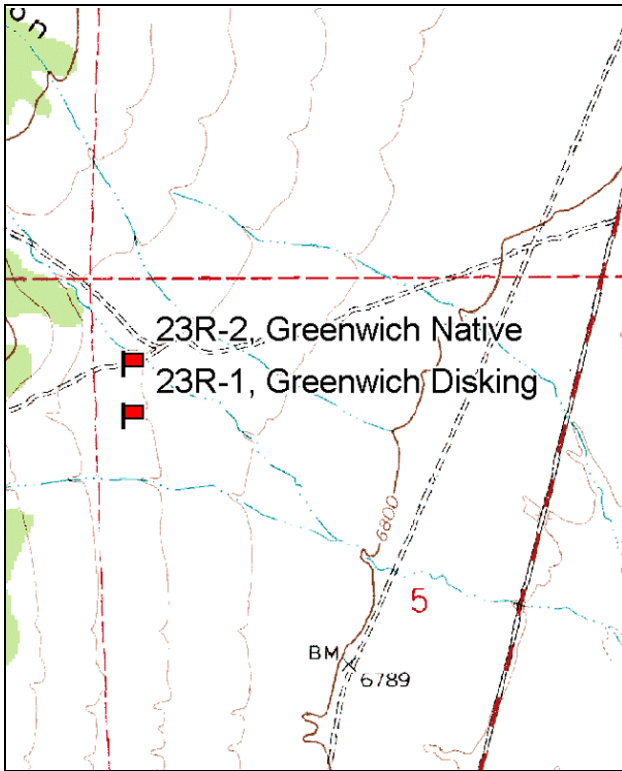
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 86 degrees magnetic.

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

LOCATION DESCRIPTION

Start on Highway 62 between Greenwich and Otter Creek Reservoir. At mile marker 30 there is a road going west. Take this road for 0.8 miles to a fork. Stay right and go 0.1 mile to a witness post on the left (south) side of the road. Walk 90 paces at 110 degrees magnetic into the disking to the 0-foot stake. The study is marked with green, steel fenceposts approximately 12-18 inches in height.



Map name: Greenwich

Diagrammatic Sketch

Township 28S, Range 1W, Section 5

GPS: NAD 27, UTM 12S 4251392 N, 418034 E

## DISCUSSION

### Greenwich Disking - Trend Study No. 23R-1

This trend study samples a sagebrush disking and seeding treatment on big game winter range just south of the town of Greenwich and west of Highway 62. The area was treated during the fall of 1996 to enhance herbaceous vegetation. Long narrow areas were disced (200 ft to 300 ft in width) and seeded leaving large areas of undisturbed sagebrush. After the first year, seeded perennial grasses, forbs, and shrubs were observed growing in the treated strips. The site was reread in 2003 and no shrubs were growing within the strips and cutleaf nightshade (*Solanum triflorum*) was the only herbaceous species encountered. Trend study 23R-3 was established as a control and had overly mature sagebrush with little understory vegetation.

In November of 2004, a second project (Narrows Project) was undertaken to once again establish grasses, forbs, and shrubs. The Greenwich Disking site was broadcasted with grass, forb, and shrub species from the back of the tractor and then one-way harrowed in the previous strips left from the disking treatment in 1996. The Greenwich Native site was two-way harrowed using a cheaper seed mix of only forage kochia. The shrubs were seeded after the first pass of the harrow. A total of 3,600 acres were treated.

Elevation at the site is about 6,850 feet. The terrain is nearly level with a 3% to 5% slope and an eastern aspect. A pellet group transect read during the first reading in 1997 indicated little big game use, estimated at only 3 deer days use/acre (7 ddu/ha). Only one elk pellet group was encountered but rabbit pellets were abundant. Pellet group transect data from 2003 found no deer pellet groups and only one elk pellet group. Rabbit pellets were even more abundant than in 1997, with a quadrat frequency of 91% in 2003. Pellet group data from 2004 estimated 7 elk and 3 deer days use/acre (18 edu/ha and 7 ddu/ha). Rabbit use had a quadrat frequency of 64%.

Soil is moderately deep with an estimated effective rooting depth of nearly 15 inches. Soil texture is a sandy loam which is slightly acidic (pH 6.4). Organic matter is low at <1%. There are moderate amounts of rock and pavement on the surface and in the profile. Protective ground cover is poor leaving abundant bare ground subject to erosion. There is little erosion occurring due to the lack of significant slope. The erosion condition class was determined as slight in 2003 and stable in 2004.

Prior to the treatment, the site was dominated by a thick stand of Wyoming big sagebrush with a poor understory. After the disking, little sagebrush remained in the treatment strips. Density was estimated at 740 plants/acre in 1997. These shrubs were not utilized and in good vigor. Seeded fourwing saltbush established well with a density of 720 young plants/acre. During the 2003 reading, no sagebrush was encountered within the shrub density strips but a few surviving sagebrush were measured for height/crown and leader growth measurements. These shrubs were vigorous and producing abundant seed. Annual leader growth averaged 2.6 inches. No fourwing saltbush was found during the 2003 survey. In 2004, a few seedling and young sagebrush and fourwing saltbush were sampled.

Seeded grasses and forbs established well during the first growing season in 1997. Crested and intermediate wheatgrass had quadrat frequencies of 79% and 36% respectively. Cover was estimated at 3.5% for crested wheat and 1% for intermediate wheatgrass. Annual cheatgrass was encountered in only 1 quadrat. Seeded alfalfa and small burnet also established well. Alfalfa had a quadrat frequency value of 79% and produced 6% cover. Annual kochia was abundant in 1997, but the only other weedy forb found was some willowweed. During the 2003 and 2004 readings, no seeded grasses were found and the only forb encountered was cutleaf nightshade (*Solanum triflorum*). A few more annual forbs were sampled in 2004, but in small quantities.

### 1997 APPARENT TREND ASSESSMENT

The treatment has effectively eliminated much of the sagebrush cover and established a good stand of seeded grasses and forbs. Soil conditions are poor with abundant bare ground exposed but this should improve as the

herbaceous plants increase. There is little erosion occurring due to the gentle terrain. Seeded fourwing saltbush has established well and should increase as well as the surviving sagebrush. The Desirable Components Index rated this site as poor with a score of 21 due to low browse cover and low perennial grasses cover.

1997 winter range condition (DC Index) - poor (21) Lower Potential

### 2003 TREND ASSESSMENT

Trend for soil is down. Percent cover of bare ground is unchanged but there is less protective vegetation cover than was estimated in 1997. There are no perennial grasses and only cutleaf nightshade is left on the site. The soil erosion condition class was determined to be slight but erosion is limited by the gentle terrain. Trend for browse is down. There was no sagebrush or fourwing saltbush sampled within the shrub density strips in 2003. Trend for the herbaceous understory is down. No seeded grasses or forbs were found in 2003. The only herbaceous plant sampled was cutleaf nightshade, a weedy annual forb. It appears, that due to the lack of wildlife and livestock use, rabbit use combined with drought conditions have caused these trends. Data from the Koosharem weather station indicates that spring precipitation (April-June) has been well below average since 2000, averaging only 59% of normal (2000-2003). Total annual precipitation was 80% of normal in 2001 and 82% of normal in 2002. Pellet group data indicates abundant rabbit use of these treated areas with quadrat frequency of rabbit pellets increasing from 11% in 1997 to 91% in 2003. Quadrat frequency of rabbit pellets was also high in 2003 on the adjacent native site increasing from only 1% in 1997 to 64% in 2003. Treatments like this, especially if small in scope, often concentrate use by wildlife. The Desirable Components Index rated this site as very poor with a score of 0 due to no browse or perennial grass and forb cover.

#### TREND ASSESSMENT

soil - down (-2)

browse - down (-2)

herbaceous understory - down (-2)

winter range condition (DC Index) - very poor (0) Lower Potential scale

### 2004 TREND ASSESSMENT

Trend for soil is stable. Percent cover of bare ground is unchanged. The protective cover (vegetation, litter, cryptograms) to bare ground ratio is low and has not changed. Erosion is limited, but could increase with large rain showers. Trend for browse is stable. A few seedlings and young plants of both sagebrush and fourwing saltbush were observed, but are very limited. The trend for the herbaceous understory is stable. The herbaceous understory is dominated by cutleaf nightshade and a few other annuals. A few perennial forbs were sampled and included alfalfa and a milk vetch species. The Desirable Components Index rated this site as very poor with a score of 0 due to no browse or perennial grass and forb cover.

#### TREND ASSESSMENT

soil - stable (0)

browse - stable (0)

herbaceous understory - stable (0)

winter range condition (DC Index) - very poor (0) Lower Potential scale

Seeded Species	Bulk lbs in mix	Bulk lbs/acre
*Basin Wildrye	1800	0.50
*Crested Wheatgrass	3600	1.00
*Four-wing Saltbush	1000	0.28
*Four-wing Saltbush	1800	0.50
*Four-wing Saltbush	800	0.22
*Indian Ricegrass	750	0.21
*Indian Ricegrass	1800	0.50
*Lewis Flax	1550	0.43
*Lewis Flax	2000	0.56
*Pubescent Wheatgrass	7200	2.00
*Russian Wildrye	600	0.17
*Russina Wildrye	3000	0.83
*Sandberg Bluegrass	600	0.17
*Sandberg Bluegrass	3000	0.83
*Sheep Fescue	3000	0.83
*Sheep Fescue	300	0.08
*Sheep Fescue	300	0.08
*Small Burnet	7200	2.00
*Yellow Sweetclover	3600	1.00
Sainfoin	5400	1.50
Prickly Lettuce--Sanpete UT	48	0.01
Western Yarrow	250	0.07
Cicer Milkvetch 'Lutana'	525	0.15
Annual Sunflower	150	0.04
Alalfa 'Ladak+'	5400	1.50
<b>Total</b>	<b>55673</b>	<b>15.46</b>
Wyoming Sagebrush	550	0.5
*Forage Kochia	550	0.5
<b>Total</b>	<b>1100</b>	<b>1</b>
<b>PLS lbs/acre</b>	<b>0.14</b>	
<b>PLS/ft<sup>2</sup></b>	<b>14.8</b>	

\*seed provided by BLM

HERBACEOUS TRENDS --  
Management unit 23R, Study no: 1

Type	Species	Nested Frequency			Average Cover %		
		'97	'03	'04	'97	'03	'04
G	Agropyron cristatum	209	-	-	3.49	-	-
G	Agropyron intermedium	83	-	-	1.22	-	-
G	Bromus tectorum (a)	2	-	-	.00	-	-
<b>Total for Annual Grasses</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>0.00</b>	<b>0</b>	<b>0</b>
<b>Total for Perennial Grasses</b>		<b>292</b>	<b>0</b>	<b>0</b>	<b>4.71</b>	<b>0</b>	<b>0</b>
<b>Total for Grasses</b>		<b>294</b>	<b>0</b>	<b>0</b>	<b>4.71</b>	<b>0</b>	<b>0</b>
F	Astragalus spp.	2	-	-	.03	-	.03
F	Cleome spp. (a)	-	-	4	-	-	1.21
F	Descurainia pinnata (a)	-	-	-	-	-	.03

T y p e	Species	Nested Frequency			Average Cover %		
		'97	'03	'04	'97	'03	'04
		F	<i>Epilobium brachycarpum</i> (a)	7	-	-	.07
F	<i>Kochia scoparia</i> (a)	156	-	-	5.71	-	-
F	<i>Lappula occidentalis</i> (a)	-	-	1	-	-	.00
F	<i>Medicago sativa</i>	226	-	6	6.09	-	.21
F	<i>Nicotiana attenuata</i> (a)	-	-	1	-	-	.15
F	<i>Salsola iberica</i> (a)	-	-	6	-	-	.19
F	<i>Sanguisorba minor</i>	33	-	-	.22	-	-
F	<i>Solanum triflorum</i> (a)	-	5	152	-	4.94	31.43
Total for Annual Forbs		163	5	164	5.78	4.94	33.02
Total for Perennial Forbs		261	0	6	6.36	0	0.24
Total for Forbs		424	5	170	12.14	4.94	33.26

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

#### BROWSE TRENDS --

Management unit 23R, Study no: 1

T y p e	Species	Strip Frequency			Average Cover %		
		'97	'03	'04	'97	'03	'04
		B	<i>Artemisia tridentata wyomingensis</i>	24	0	1	.58
B	<i>Atriplex canescens</i>	21	0	1	.02	-	-
B	<i>Atriplex confertifolia</i>	0	0	0	.11	-	-
B	<i>Opuntia</i> spp.	1	0	0	.15	-	-
Total for Browse		46	0	2	0.86	0	0

#### BASIC COVER --

Management unit 23R, Study no: 1

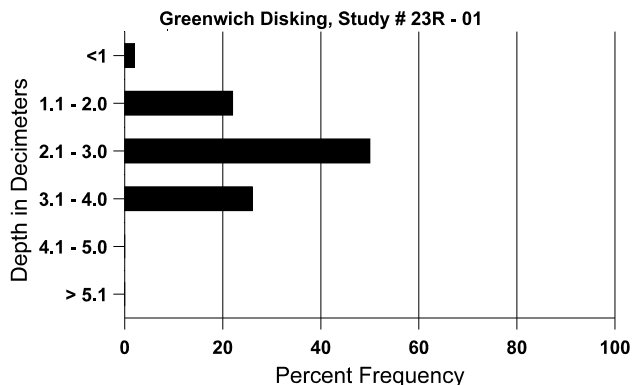
Cover Type	Average Cover %		
	'97	'03	'04
Vegetation	15.51	5.21	33.64
Rock	4.41	9.32	4.32
Pavement	4.51	3.75	5.36
Litter	20.42	36.52	22.22
Cryptogams	.18	.11	.01
Bare Ground	51.62	49.48	46.60

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 1, Study Name: Greenwich Disking

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
14.8	62.7 (13.0)	6.4	57.6	25.1	17.3	1.0	22.7	288.0	0.5

### Stoniness Index



PELLET GROUP DATA --

Management unit 23R, Study no: 1

Type	Quadrat Frequency			Days use per acre (ha)	
	'97	'03	'04	'03	'04
Rabbit	11	91	64	-	-
Elk	-	4	3	2 (1)	7 (18)
Deer	6	-	3	-	-
Cattle	-	1	-	-	3 (7)

BROWSE CHARACTERISTICS --

Management unit 23R, Study no: 1

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<b>Artemisia tridentata wyomingensis</b>												
97	<b>740</b>	20	480	220	40	2500	0	0	5	-	0	14/23
03	<b>0</b>	-	-	-	-	-	0	0	0	-	0	21/31
04	<b>20</b>	20	20	-	-	-	0	0	0	-	0	18/24
<b>Atriplex canescens</b>												
97	<b>720</b>	20	720	-	-	-	0	0	-	-	0	11/9
03	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
04	<b>20</b>	-	20	-	-	-	0	100	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia spp.												
97	<b>20</b>	-	-	20	-	-	0	0	-	-	0	6/11
03	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 23R-2-04

Study site name: Greenwich Native.

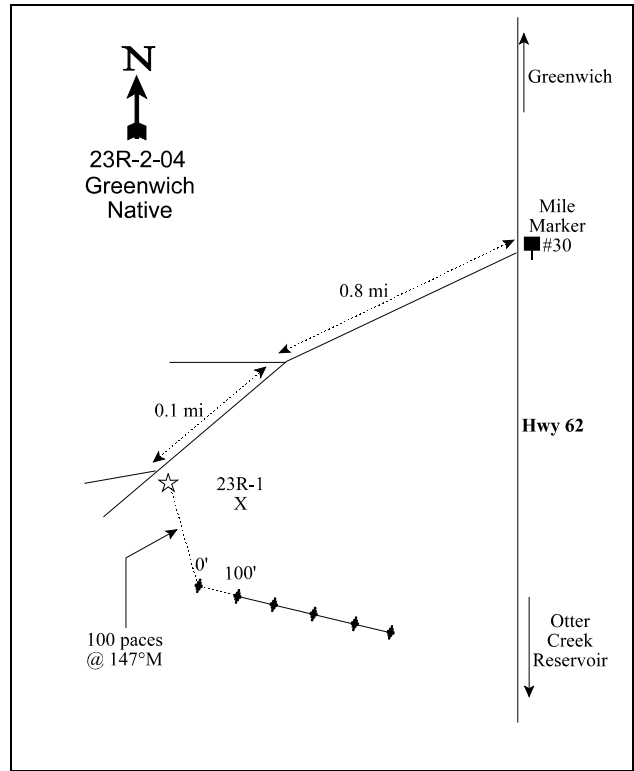
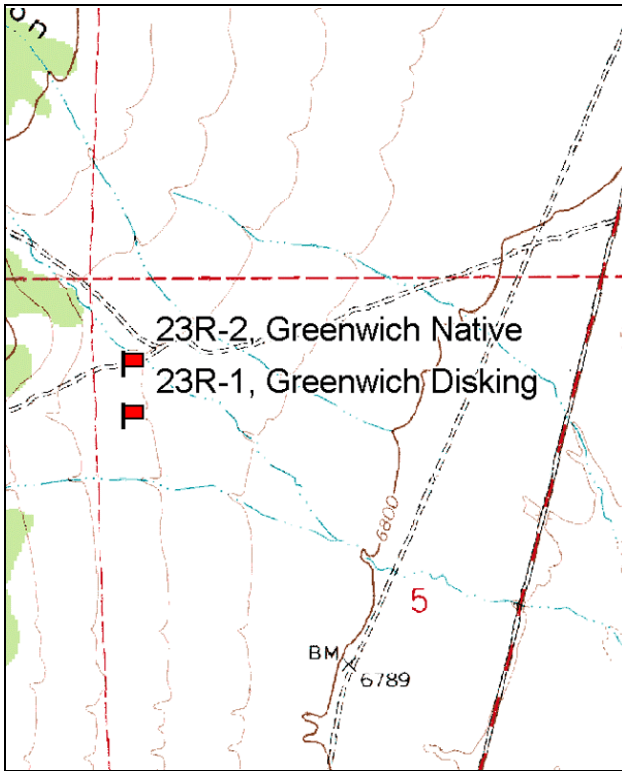
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 79 degrees magnetic.

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

LOCATION DESCRIPTION

Start on Highway 62 between Greenwich and Otter Creek Reservoir. At mile marker 30 there is a road going west. Take this road for 0.8 miles to a fork. Stay right and go 0.1 mile to a witness post on the left (south) side of the road. From the witness post walk 100 paces at 147 degrees magnetic to the 0-foot stake. The study is marked with green, steel fenceposts approximately 12-18 inches in height.



Map name: Greenwich

Diagrammatic Sketch

Township 28S, Range 1W, Section 5

GPS: NAD 27, UTM 12S 4251329 N, 417972 E



## DISCUSSION

### Greenwich Native - Trend Study No. 23R-2

This trend study samples an undisturbed sagebrush site adjacent to the discing and seeding treatment sampled by the previous trend study (23R-1). The area is considered big game winter range just south of the town of Greenwich and west of Highway 62. Elevation at the site is about 6,850 feet. The terrain is nearly level with a 3% to 5% slope and an eastern aspect. The area appears to be only lightly used by deer and elk. Pellet group transect data from 1997 estimated only 6 deer days use/acre (15 ddu/ha). Only one elk pellet group was encountered. During the 2003 reading, no deer pellet groups were encountered and elk use was estimated at only 1 day use/acre (3 edu/ha). Rabbit pellets were fairly common in 1997 and abundant in 2003 with a quadrat frequency of 64%.

In November of 2004, a second project (Narrows Project) was undertaken to once again establish grasses, forbs, and shrubs. The Greenwich Discing site (23R-1) was broadcasted with grass, forb, and shrub species from the back of the tractor and then one-way harrowed in the previous strips left from the discing treatment in 1996. A total of 3,600 acres were treated. The Greenwich Native site (23R-2) was two-way harrowed using a cheaper seed mix of only forage kochia. The shrubs were seeded after the first pass of the harrow. A total of 1,100 acres were treated.

Soils are moderately deep with an estimated effective rooting depth of 11 inches. Soil texture is a sandy loam which is slightly acidic (pH 6.3). Organic matter is low at 1%. Rock and pavement are abundant on the soil surface and moderate amounts of rock are found in the soil profile. Sagebrush plants are pedestalled with cryptogamic plants concentrated under the shrub canopies. There is little erosion occurring due to the lack of significant slope. The erosion condition class was determined as slight in 2003 and stable in 2004.

The site is dominated by an over mature stand of Wyoming big sagebrush. It accounts for virtually all of the browse cover with canopy cover estimated at nearly 17%. Density was estimated at 4,200 plants/acre in 1997, 4,220 in 2003, and 4,280 in 2004. Utilization was mostly light and vigor was good in 1997, but, declined in 2003 and 2004. Decadence on the sagebrush increased from 17% in 1997 to 82% in 2003, and 57% in 2004. Sagebrush plants classified as dying increased from 3% in 1997 to 40% in 2003, and 29% in 2004. Young recruitment was remained fairly constant at 4-6%. Many of the sagebrush had good seed production in 2003 and seedlings were very abundant in 2004 with above normal precipitation. Annual leader growth averaged 2 inches in 2003 and 2004. The only other shrubs consist of a few broom snakeweed and prickly pear cactus.

The herbaceous understory is very poor, consisting of small numbers of blue grama and bottlebrush squirreltail. Forbs are rare with only one forb being sampled in one quadrat in 1997 and 2003. A few more forbs were sampled in 2004, but are still very rare. Total herbaceous cover has estimated less than 1% since 1997.

### 1997 APPARENT TREND ASSESSMENT

Soil conditions are marginal. Rock and pavement cover are high while litter cover is low. Herbaceous vegetation cover is very low. Exposed bare ground is confined to the shrub interspaces with most litter and cryptogamic cover found under sagebrush canopies. There is little erosion occurring due to the gentle terrain. The sagebrush stand is abundant, lightly browsed, and vigorous. Most of the population is mature but age class distribution would indicate a stable population. The herbaceous understory is very poor. Perennial grasses are represented by low numbers of blue grama and bottlebrush squirreltail. Forbs are rare. The Desirable Components Index rated this site as fair to good with a score of 45 due good browse cover and low decadence.

1997 winter range condition (DC Index) - fair to good (45) Lower Potential scale

## 2003 TREND ASSESSMENT

Trend for soil is stable due to similar ground cover characteristics compared to 1997. Trend for browse is down. The Wyoming big sagebrush population has remained stable in density but it has shifted from a mostly mature population to a mostly decadent one. The number of decadent sagebrush has increased from 17% in 1997 to 82% in 2003. In addition, half of the decadent plants sampled were classified as dying which represents 1,680 plants/acre. Many of the sagebrush had good seed production in 2003 and annual leader growth averaged 2 inches. Utilization remains light so drought conditions are the likely culprit for the downward trends in sagebrush. Data from the Koosharem weather station indicate that spring precipitation (April-June) has been well below average since 2000, averaging only 59% of normal (2000-2003). Total annual precipitation was 80% of normal in 2001 and 82% of normal in 2002. The sagebrush stand is fairly dense for a Wyoming big sagebrush type. Drought will likely cause a thinning of the stand but there are plenty of plants that will survive. Trend for the herbaceous understory is stable and in very poor condition. Perennial grasses are uncommon and produce little forage. Forbs are even more rare with only one forb being found in one quadrat in 1997 and 2003. Since 1997, the only fairly common perennial grass, bottlebrush squirreltail, has declined significantly in nested frequency. The Desirable Components Index rated this site as poor with a score of 23 due good browse cover, but very high decadence.

### TREND ASSESSMENT

soil - stable (0)

browse - down (-2)

herbaceous understory - stable (0)

winter range condition (DC Index) - poor (23) Lower Potential scale

## 2004 TREND ASSESSMENT

Trend for soil is stable due to similar ground cover characteristics compared to 2003. Trend for browse is stable. The Wyoming big sagebrush density has remained stable, but it is still mostly a decadent population. Seedling production was high and may help replace the dying plants if they survive. Utilization continues to be light. Trend for the herbaceous understory is stable and has not changed over the course of the study. Herbaceous cover combined is less than 1%. The Desirable Components Index rated this site as fair with a score of 30 due good browse cover, but moderately high decadence.

### TREND ASSESSMENT

soil - stable (0)

browse - stable (0)

herbaceous understory - stable (0)

winter range condition (DC Index) - fair (30) Lower Potential scale

Seeded Species	Bulk lbs in mix	Bulk lbs/acre
*Forage Kochia	550	0.5
Total	550	0.5
PLS lbs/acre	0.14	
PLS/ft <sup>2</sup>	14.8	

\*seed provided by BLM

HERBACEOUS TRENDS --

Management unit 23R, Study no: 2

Type	Species	Nested Frequency			Average Cover %		
		'97	'03	'04	'97	'03	'04
G	<i>Bouteloua gracilis</i>	17	9	10	.27	.07	.04
G	<i>Sitanion hystrix</i>	42	11	-	.49	.05	-
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		59	20	10	0.76	0.12	0.04
Total for Grasses		59	20	10	0.76	0.12	0.04
F	<i>Astragalus</i> spp.	2	-	-	.03	-	-
F	<i>Cryptantha</i> spp.	-	-	-	-	-	.00
F	<i>Descurainia pinnata</i> (a)	-	-	14	-	-	.10
F	<i>Solanum triflorum</i> (a)	-	1	-	-	.00	-
F	Unknown forb-perennial	-	-	-	-	-	.00
Total for Annual Forbs		0	1	14	0	0.00	0.10
Total for Perennial Forbs		2	0	0	0.03	0	0.01
Total for Forbs		2	1	14	0.03	0.00	0.11

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

BROWSE TRENDS --

Management unit 23R, Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'97	'03	'04	'97	'03	'04
B	<i>Artemisia tridentata wyomingensis</i>	88	86	88	22.94	21.12	19.82
B	<i>Gutierrezia sarothrae</i>	0	0	0	-	-	-
B	<i>Opuntia</i> spp.	1	0	1	.06	-	-
Total for Browse		89	86	89	23.00	21.12	19.82

CANOPY COVER, LINE INTERCEPT --

Management unit 23R, Study no: 2

Species	Percent Cover		
	'97	'03	'04
<i>Artemisia tridentata wyomingensis</i>	-	16.56	21.36
<i>Opuntia</i> spp.	-	-	.06

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23R, Study no: 2

Species	Average leader growth (in)	
	'03	'04
Artemisia tridentata wyomingensis	2.0	2.1

BASIC COVER --

Management unit 23R, Study no: 2

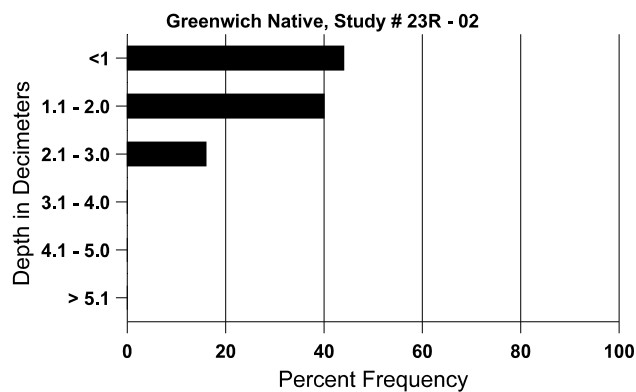
Cover Type	Average Cover %		
	'97	'03	'04
Vegetation	24.26	21.27	19.88
Rock	22.26	19.95	9.39
Pavement	37.05	18.17	30.99
Litter	23.88	22.29	27.65
Cryptogams	12.39	7.34	2.51
Bare Ground	25.52	21.89	27.09

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 2, Study Name: Greenwich Native

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.8	63.3 (11.4)	6.3	55.3	26.2	18.6	1.2	17.7	147.2	0.4

## Stoniness Index



PELLET GROUP DATA --

Management unit 23R, Study no: 2

Type	Quadrat Frequency		
	'97	'03	'04
Rabbit	1	64	42
Elk	-	-	-
Deer	3	-	1

Days use per acre (ha)		
'97	'03	'04
-	-	-
1 (2)	1 (3)	5 (12)
78 (193)	-	1 (2)

BROWSE CHARACTERISTICS --  
 Management unit 23R, 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 wyomingensis</i>												
97	<b>4200</b>	160	240	3240	720	1040	42	.47	17	3	7	27/41
03	<b>4220</b>	-	160	600	3460	1520	11	1	82	40	40	22/28
04	<b>4280</b>	5500	160	1700	2420	1200	2	1	57	29	29	24/34
<i>Gutierrezia sarothrae</i>												
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
03	<b>0</b>	-	-	-	-	-	0	0	-	-	0	8/6
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	10/6
<i>Opuntia spp.</i>												
97	<b>40</b>	-	-	40	-	-	0	0	-	-	0	-/-
03	<b>0</b>	-	-	-	-	-	0	0	-	-	0	5/13
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	5/15

Trend Study 23R-5-04

Study site name: Elbow Ranch 1 .

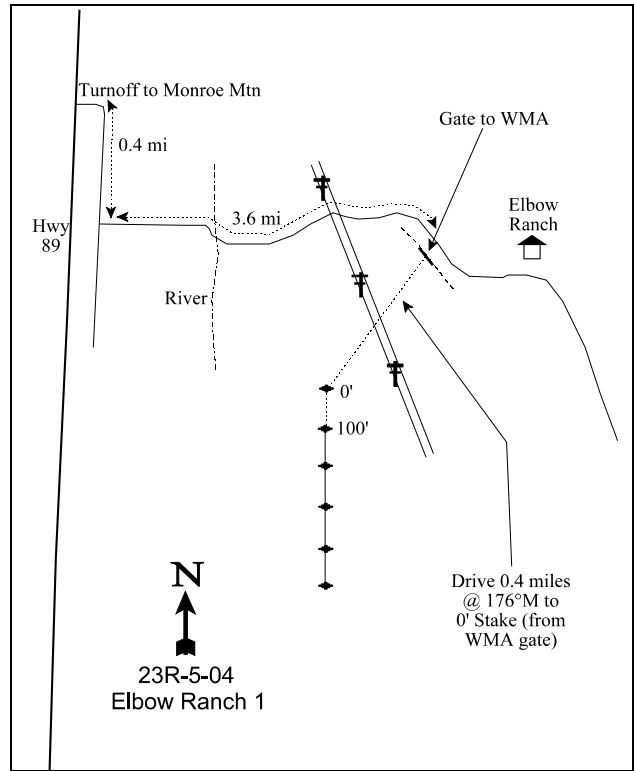
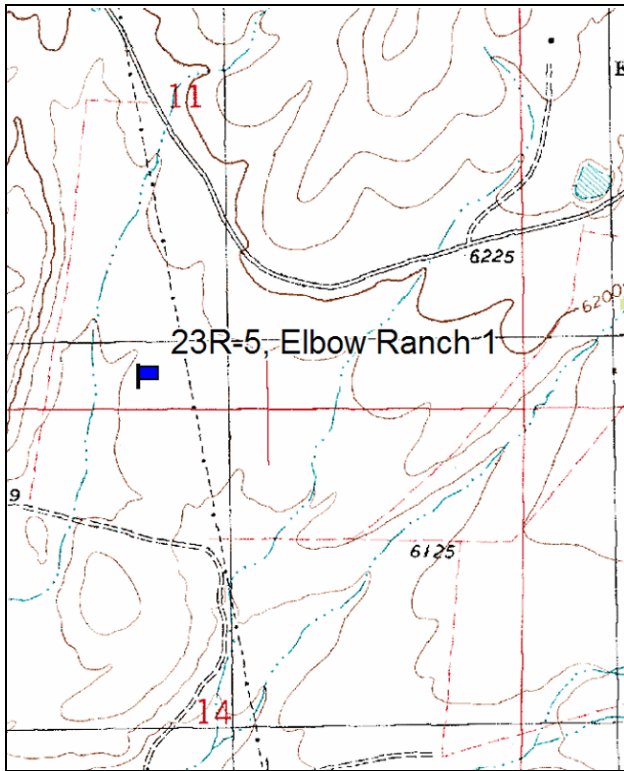
Vegetation type: Annual Forb .

Compass bearing: frequency baseline 172 degrees magnetic.

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

LOCATION DESCRIPTION

From US 89, just south of Marysvale, take the turnoff to Monroe Mountain. Travel 0.4 miles to a road that will come in from the east (left). Turn onto this road and travel 3.6 miles to the WMA gate before Elbow Ranch. From here drive 0.4 miles at 176°M to the 0-foot stake of the baseline.



Map name: Marysvale

Diagrammatic Sketch

Township 28S , Range 3W , Section 11

GPS: NAD 27, UTM 12S 4248872 N, 397766 E

## DISCUSSION

### Elbow Ranch 1 - Trend Study No. 23R-5

The Elbow Ranch 1 study is located on abandon cropland now managed by the Utah Division of Wildlife southeast of Marysvale, UT. The range type is an association of weedy forbs due to previous agriculture practices. The elevation is 6,130 ft on a west exposure with a 6-8% slope. In November of 2005, two 150 acres plots were broadcasted with seed and one-way harrowed to establish drought tolerate vegetation for wintering mule deer. A 24ft harrow was used and seed was broadcasted from the back of the tractor. No pellet groups were found on the study in 2004.

The soil texture is a sandy loam with an effective rooting depth of 11 inches. The soil reaction is slightly alkaline with a pH of 7.7. A clay hardpan exits at about 10 inches and is about 6 inches thick. Several rocks are in the profile and are coated with CaCO<sub>3</sub>. Rock cover was estimated at 3 % and pavement was estimated at 26%. Bare ground cover was high at 41%. The ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground was low at 1.4:1. The erosion condition class determined soil movement as stable in 2005, but could greatly increase with large rain storms.

There are no key browse species located on the study area. A few sagebrush are located along the roadsides.

The herbaceous understory is dominated by two weedy species, Russian thistle and halogeton. No grasses or perennial species were observed, only annuals.

The Desirable Components Index rated this site as very poor with a score of 0 due to lots of annual forbs and very no browse species.

### 2004 winter range condition (DC Index) - very poor (0) Lower Potential scale

Seeded Species	Bulk lbs in mix	Bulk lbs/acre
Crested Wheatgrass 'Hycrest'	450	1.50
Siberian Wheatgrass 'Vavilov'	200	0.67
Siberian Wheatgrass 'Vavilov'	250	0.83
Pubescent Wheatgrass	200	0.67
Pubescent Wheatgrass	250	0.83
Russian Wildrye	450	1.50
Snake River Wheatgrass 'Secar'	450	1.50
Hard Fescue 'Durar'	300	1.00
Indian Ricegrass 'Rimrock'	450	1.50
Sandberg Bluegrass 'Toole MT'	150	0.50
Bottlebrush Squirreltail	100	0.33
<b>Total</b>	<b>3250</b>	<b>10.83</b>
PLS lbs/acre	9.77	
Sagebrush, Wyoming--Sanpete UT	200	0.67
Forage Kochia--Millard UT	300	1
<b>Total</b>	<b>500</b>	<b>1.67</b>
PLS lbs/acre	0.95	

HERBACEOUS TRENDS --

Management unit 23R, Study no: 5

Type	Species	Nested Frequency	Average Cover %
		'04	'04
F	Chenopodium album (a)	7	.01
F	Descurainia pinnata (a)	5	.04
F	Halogeton glomeratus (a)	150	10.81
F	Mentzelia albicaulis (a)	155	3.07
F	Salsola iberica (a)	291	21.64
Total for Annual Forbs		608	35.59
Total for Perennial Forbs		0	0
Total for Forbs		608	35.59

BASIC COVER --

Management unit 23R, Study no: 5

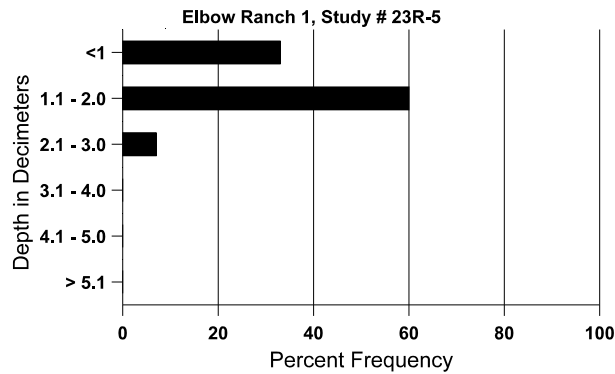
Cover Type	Average Cover %
	'04
Vegetation	35.34
Rock	3.16
Pavement	25.93
Litter	4.94
Bare Ground	41.21

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 5, Study Name: Elbow Ranch 1

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.2	61.6 (11.6)	7.7	65.1	17.4	17.5	1.3	16.5	985.6	0.8

### Stoniness Index





PELLET GROUP DATA --  
Management unit 23R, Study no: 5

Type	Quadrat Frequency
	'04
Rabbit	11

Days use per acre (ha)
'04
-

Trend Study 23R-6-04

Study site name: Elbow Ranch 2 .

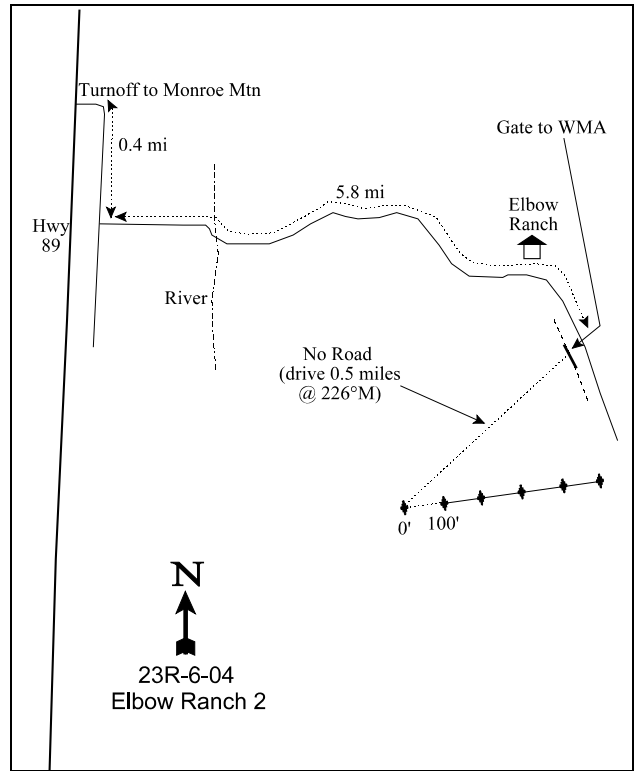
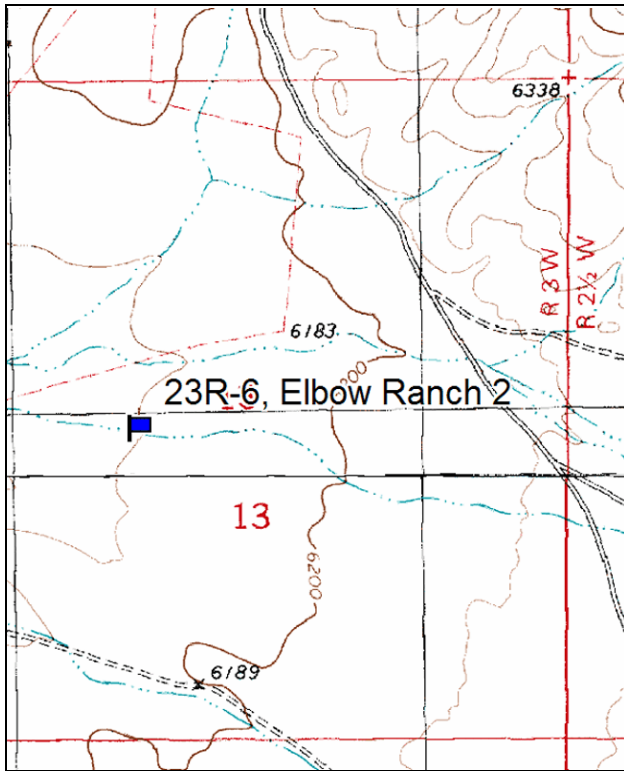
Vegetation type: Annual Forb .

Compass bearing: frequency baseline 80 degrees magnetic.

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

LOCATION DESCRIPTION

From US 89, just south of Marysvale, take the turnoff to Monroe Mountain. Travel 0.4 miles to a road that will come in from the east (left). Turn onto this road and travel 5.8 miles passed Elbow Ranch to the WMA gate. From here drive 0.5 miles at 266°M to the 0-foot stake of the baseline.



Map name: Marysvale

Diagrammatic Sketch

Township 28S , Range 3W , Section 13

GPS: NAD 27, UTM 12S 4247927 N, 399284 E

## DISCUSSION

### Elbow Ranch 2 - Trend Study No. 23R-6

The Elbow Ranch 2 study is located on abandon cropland now managed by the Utah Division of Wildlife southeast of Marysville, UT. The range type is an association of weedy forbs. The elevation is 6,160 ft on a west exposure with a 2% slope. The area was to be one-way harrowed and broadcast seeded in November of 2005, but was not treated. No pellet groups were found on the study in 2004.

The soil texture is a loam with an effective rooting depth of 8 inches. The soil reaction is slightly alkaline with a pH of 7.8. Several rocks are in the profile and are coated with CaCO<sub>3</sub>. Rock cover was estimated at 6 % and pavement was estimated at 28%. Bare ground cover was high at 48%. The ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground was low at 1.2:1. The erosion condition class determined soil movement as stable in 2005, but could greatly increase with large rain storms.

The key browse species is forage kochia. Forage kochia cover averaged 6% and density was estimated at 2,640 plants/acre. A quarter of the population was classified as young plants. Utilization was light and vigor was good. A few fourwing saltbushes were scattered on the study and averaged 25 inches tall by 35 inches across.

The herbaceous understory is dominated by Russian thistle and halogeton which averaged 12% cover. Perennial grasses forbs were not abundant. Globe mallow and an unknown perennial grasses were the only species that were moderately abundant and not weedy species.

The Desirable Components Index rated this site as fair with a score of 44 due to lots forage kochia, but understory was dominated by weedy annual species.

#### 2004 winter range condition (DC Index) - fair (44) Lower Potential scale

#### HERBACEOUS TRENDS --

Management unit 23R, Study no: 6

Type	Species	Nest Frequency	
		'04	'04
G	Unknown grass - perennial	6	1.13
Total for Annual Grasses		0	0
Total for Perennial Grasses		6	1.13
Total for Grasses		6	1.13
F	Astragalus spp.	8	.07
F	Chenopodium album (a)	23	.55
F	Convolvulus arvensis	1	.00
F	Descurainia pinnata (a)	10	.13
F	Halogeton glomeratus (a)	96	4.46
F	Lappula occidentalis (a)	36	.42
F	Navarretia intertexta (a)	1	.03
F	Phlox longifolia	3	.00
F	Salsola iberica (a)	163	7.83

Type	Species	Nested Frequency	Average Cover %
		'04	'04
F	Sphaeralcea coccinea	26	2.50
Total for Annual Forbs		329	13.42
Total for Perennial Forbs		38	2.57
Total for Forbs		367	16.00

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

#### BROWSE TRENDS --

Management unit 23R, Study no: 6

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Atriplex canescens	0	-
B	Kochia prostrata	56	6.01
Total for Browse		56	6.01

#### CANOPY COVER, LINE INTERCEPT --

Management unit 23R, Study no: 6

Species	Percent Cover
	'04
Kochia prostrata	11.73

#### BASIC COVER --

Management unit 23R, Study no: 6

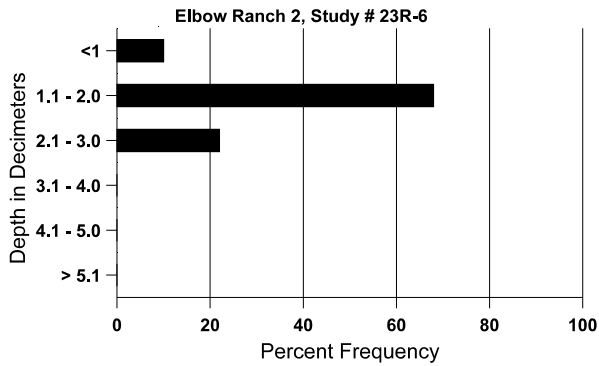
Cover Type	Average Cover %
	'04
Vegetation	22.52
Rock	5.67
Pavement	28.17
Litter	4.78
Bare Ground	48.45

#### SOIL ANALYSIS DATA --

Management unit 23R, Study no: 6, Study Name: Elbow Ranch 2

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m
8.0	69.8 (7.8)	7.8	49.0	30.5	20.5	0.9	9.5	809.6	0.8

# Stoniness Index



## PELLET GROUP DATA --

Management unit 23R, Study no: 6

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	49	-

## BROWSE CHARACTERISTICS --

Management unit 23R, 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)
Atriplex canescens												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	25/38
Kochia prostrata												
04	<b>2640</b>	20	660	1980	-	20	0	0	-	-	0	21/35

Trend Study 23R-7-04

Study site name: South Narrows .

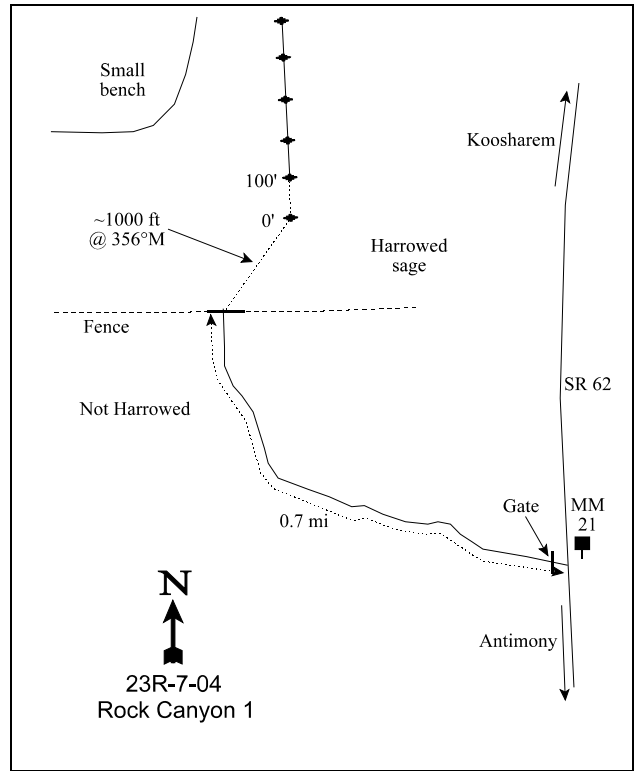
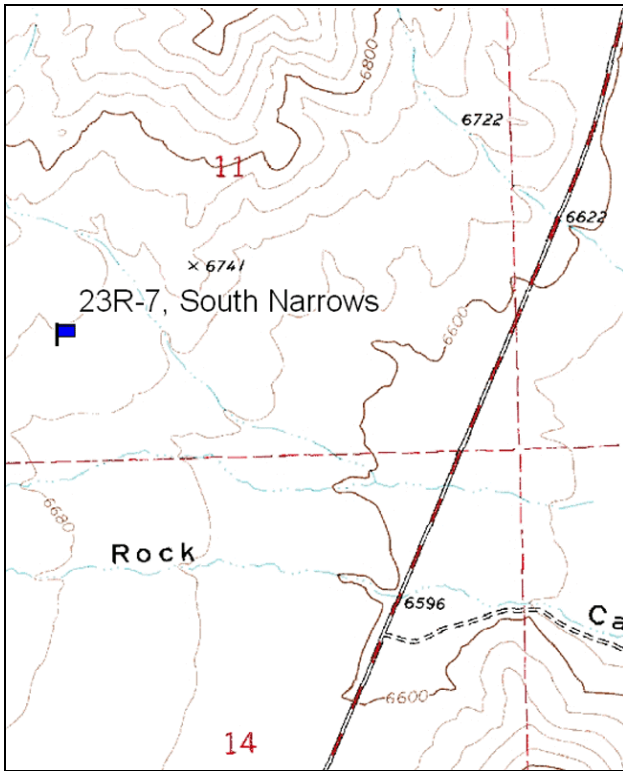
Vegetation type: Annual Forb .

Compass bearing: frequency baseline 336 degrees magnetic.

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

LOCATION DESCRIPTION

From State Route 62, south of Koosharem, there will be a road coming in from the west by mile marker 21. Turn onto this road, passing through a gate, and travel 0.7 miles to another fence with a gate. From here walk about 1000 feet at 356°M to the 0-foot stake.



Map name: Parker Knoll

Diagrammatic Sketch

Township 29S , Range 2W , Section 11

GPS: NAD 27, UTM 12S 4238982 N, 413669 E

## DISCUSSION

### South Narrows - Trend Study No. 23R-7

The South Narrows study is located on land managed by the Bureau of Land Management just north of the Otter Creek Reservoir. The study is within the South Narrows livestock allotment. The range type was a Wyoming big sagebrush community that was 2-way harrowed and seeded in 1996. Most of the seed did not establish, much like the Greenwich sites to the north. In December of 2005, 2,300 acres were re-seeded and 2-way harrowed. The seeder was attached to the back of the tractor and the dixie harrow was pulled behind. The second swath was to seed the shrub species. The elevation is 6,700 ft on a south exposure with a 4-5% slope. Pellet group data from 2004 was estimated at 3 elk, 5 deer, and 2 cow days use/acre (8 edu/ha, 12 ddu/ha, and 4 cdu/ha).

The soil texture is a sandy loam with an effective rooting depth of 14 inches. The soil reaction is slightly alkaline with a pH of 7.5. A hardpan exists at about 15 inches and several rock are coated with CaCO<sub>3</sub> at this depth. Rock cover was estimated at 8 % and pavement was estimated at 22%. Bare ground cover was high at 44%. The ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground was low at 1.3:1. The erosion condition class determined soil movement as stable in 2005, but could greatly increase with large rain storms.

The key browse species was Wyoming big sagebrush. Wyoming big sagebrush cover was estimated at 0.15% with 40 plants/acre. Decadence was high at 50%, although only a few plants were sampled. Use on sagebrush was light.

Herbaceous understory is dominated by annual forbs. Russian thistle, cutleaf nightshade, and slimleaf goosefoot are the three most abundant annuals. Squirreltail was the only grass sampled and has less than half a percent of cover. The two perennial forbs sampled were Astragalus spp. and gooseberryleaf golbemallow. The Desirable Components Index rated this site as very poor with a score of 10 due to very little browse cover and lots of weedy annual forbs.

#### 2004 winter range condition (DC Index) - very poor (10) Lower Potential scale

Seeded Species	Bulk lbs in mix	Bulk lbs/acre
Crested Wheatgrass 'Douglas'	1150	0.50
Crested Wheatgrass 'Hycrest'	1150	0.50
Pubescent Wheatgrass	4600	2.00
Great Basin Wildrye 'Trailhead'	1750	0.76
Russian Wildrye	2300	1.00
Sandberg Bluegrass 'SID OR'	930	0.40
Sheep Fescue 'Covar'	2300	1.00
Yellow Sweetclover	1300	0.57
Alfalfa 'Ladak+'	2300	1.00
Sainfoin 'Eski'	3450	1.50
Small Burnet 'Delar'	4600	2.00
Blue Flax	545	0.24
Annual Sunflower	750	0.33
Fourwing Saltbush--Juab UT	735	0.32
Fourwing Saltbush--Juab UT	550	0.24
Blue Flax	500	0.22
<b>Total</b>	<b>28910</b>	<b>12.57</b>
PLS lbs/acre	10.77	

HERBACEOUS TRENDS --

Management unit 23R, Study no: 7

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Sitanion hystrix	16	.09
Total for Annual Grasses		0	0
Total for Perennial Grasses		16	0.08
Total for Grasses		16	0.08
F	Astragalus spp.	38	3.97
F	Chenopodium leptophyllum(a)	11	2.53
F	Descurainia pinnata (a)	4	.06
F	Eriogonum cernuum (a)	3	.06
F	Lappula occidentalis (a)	5	.51
F	Nicotiana attenuata (a)	-	.19
F	Salsola iberica (a)	22	3.57
F	Solanum triflorum (a)	14	1.25
F	Sphaeralcea grossulariaefolia	-	.79
Total for Annual Forbs		59	8.19
Total for Perennial Forbs		38	4.76
Total for Forbs		97	12.96

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

BROWSE TRENDS --

Management unit 23R, Study no: 7

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata wyomingensis	1	.15
Total for Browse		1	0.15



**BASIC COVER --**

Management unit 23R, Study no: 7

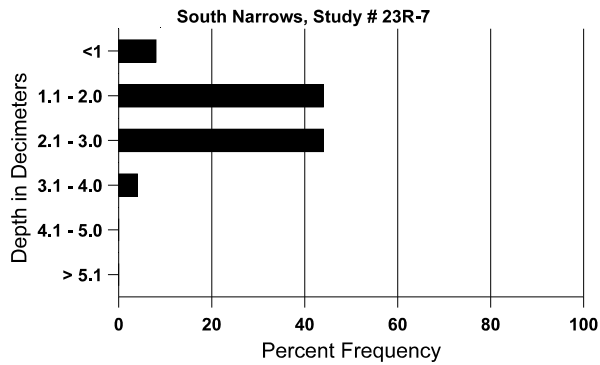
Cover Type	Average Cover % '04
Vegetation	14.13
Rock	7.82
Pavement	21.52
Litter	22.57
Cryptogams	.34
Bare Ground	44.05

**SOIL ANALYSIS DATA --**

Management unit 23R, Study no: 7, Study Name: South Narrows

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
14.4	65.4 (13.4)	7.5	55.0	27.5	17.5	1.1	12.5	604.8	0.7

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 23R, Study no: 7

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	70	-
Elk	1	3 (8)
Deer	1	5 (12)
Cattle	1	1 (4)

BROWSE CHARACTERISTICS --  
 Management unit 23R, 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>												
04	<b>40</b>	-	-	20	20	100	0	0	50	50	50	18/26

Trend Study 23R-8-04

Study site name: Browns Canyon Drill.

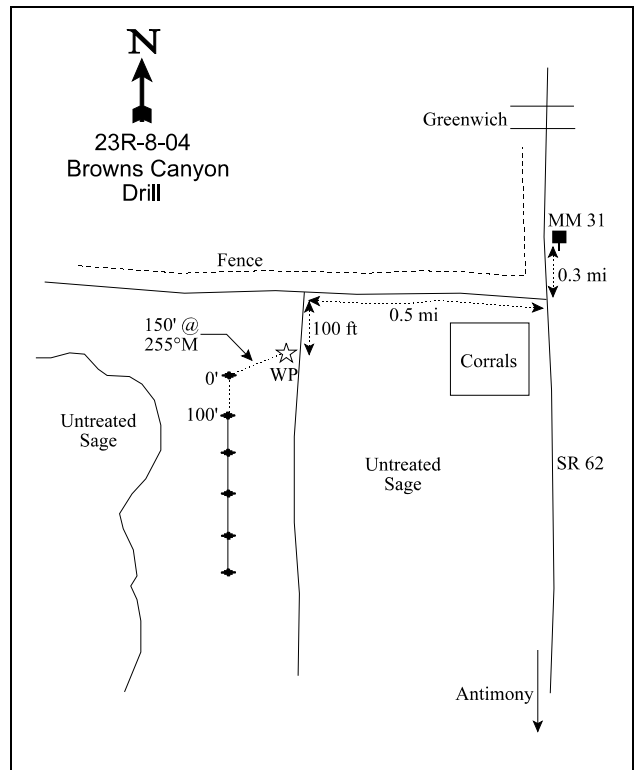
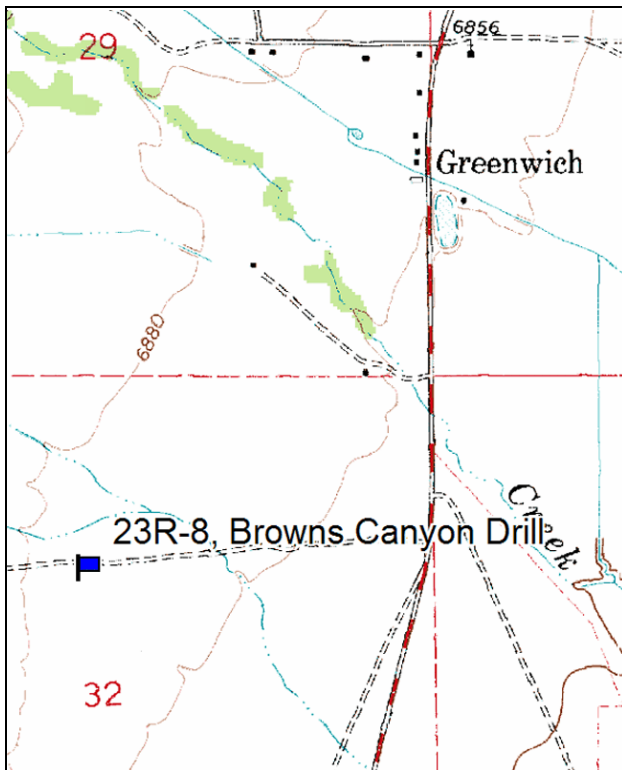
Vegetation type: Annual Forb.

Compass bearing: frequency baseline 170 degrees magnetic.

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

**LOCATION DESCRIPTION**

Travel south of Greenwich on State Route 62. From mile marker 31 travel 0.3 miles south to a road that will come in from the west. Turn onto this road and travel 0.5 miles to a road that will come in from the left (south). Turn onto this road and drive 100 feet to a witness post on the right side of the road. From the witness post walk 150 feet at 255°M to the 0-foot stake that is marked with browse tag #54.



Map name: Greenwich

Diagrammatic Sketch

Township 27S, Range 1W, Section 32

GPS: NAD 27, UTM 12S 4252807 N, 418667 E

## DISCUSSION

### Browns Canyon Drill - Trend Study No. 23R-8

The Browns Canyon Drill study is located on land managed by the state of Utah (SITLA), just south of Greenwich, UT. The elevation is 6,900 feet on a east exposure with a 2% slope. The area was previously disked and seeded to remove Wyoming big sagebrush, but only annual weeds were the result. In October of 2003, 275 acres were seeded with grasses, forbs, forage kochia, and Wyoming big sagebrush using a Truax drill. The project title was called Greenwich disking, but the study was not named this due to other range trend studies in the area with the same name. Pellet group data from 2004 was estimated at 7 elk and 3 deer days use/acre (17 edu/ha and 8 ddu/ha). Rabbit use was fairly high with quadrat frequency at 55%.

The soil texture is a sandy clay loam with an effective rooting depth of 12 inches. A clay hardpan was encountered at about 11 inches in the profile. The soil reaction is slightly alkaline with a pH of 7.4. Rock cover was estimated at 5% and pavement was estimated at 4%. Bare ground cover was high at 45%. The ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground was low at 1.6:1. The erosion condition class determined soil movement as stable in 2005, but could greatly increase with large rain storms.

The historic key browse species was Wyoming big sagebrush. The key browse species that were observed in 2004 was forage kochia and a few young fourwing saltbushes. Foraged kochia cover was estimated at 21% with a density of 5,360 plants/acre. Little use was observed on any plants. Fourwing saltbush cover was less than a half a percent.

The herbaceous understory dominated by annual weedy forbs like Russian thistle and cutleaf nightshade. Annual forb cover was estimated at 14%, while perennial grass and forb cover was less than 2% combined. Only one squirreltail plant and two orchard grass plants were sampled.

The Desirable Components Index rated this site as good with a score of 48 due to lots of forage kochia.

### 2004 winter range condition (DC Index) - good (48) Lower Potential scale

Seeded Species	Bulk lbs in mix	Bulk lbs/acre
Pubescent Wheatgrass	550	2.00
Crested WG, "Douglas"	550	2.00
Great Basin Wildrye "Trailhead"	300	1.09
Western Wheatgrass "Arriba"	400	1.45
Snake River Wheatgrass "Secar"	300	1.09
Russian Wildrye "Bozoisky"	550	2.00
Orchardgrass "Paiute"	150	0.55
Blue Flax "Appar"	100	0.36
Alalfa "Ladak+"	300	1.09
Yellow Sweetclover	100	0.36
Sagebrush, Wyoming	280	1.02
Forage Kochia	300	1.09
Rice Hulls	250	0.91
Total	4130	15.02
PLS lbs/acre	15.02	
PLS/ft <sup>2</sup>	39.75	

HERBACEOUS TRENDS --

Management unit 23R, Study no: 8

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Dactylis glomerata	2	.00
G	Sitanion hystrix	1	.00
Total for Annual Grasses		0	0
Total for Perennial Grasses		3	0.00
Total for Grasses		3	0.00
F	Agastache urticifolia	15	.26
F	Astragalus spp.	57	.89
F	Cleome serrulata (a)	4	.83
F	Descurainia pinnata (a)	-	.03
F	Lappula occidentalis (a)	5	.08
F	Nicotiana attenuata (a)	16	.12
F	Salsola iberica (a)	90	9.09
F	Solanum triflorum (a)	157	3.85
F	Unknown forb-perennial	21	.18
Total for Annual Forbs		272	14.01
Total for Perennial Forbs		93	1.33
Total for Forbs		365	15.35

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

BROWSE TRENDS --

Management unit 23R, Study no: 8

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Atriplex canescens	1	.15
B	Kochia prostrata	100	21.04
B	Opuntia spp.	3	.00
Total for Browse		104	21.20

CANOPY COVER, LINE INTERCEPT --

Management unit 23R, Study no: 8

Species	Percent Cover
	'04
Kochia prostrata	30.91
Opuntia spp.	.01

**BASIC COVER --**

Management unit 23R, Study no: 8

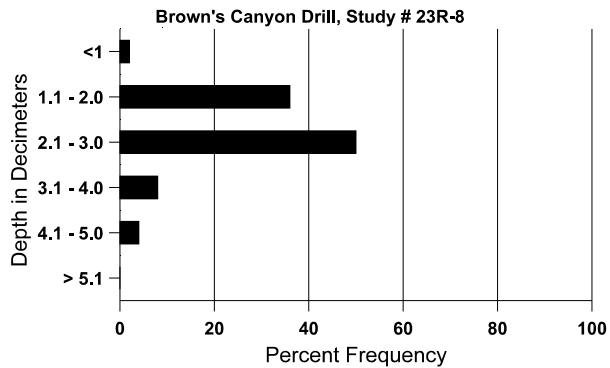
Cover Type	Average Cover % '04
Vegetation	38.31
Rock	4.68
Pavement	3.91
Litter	21.70
Cryptogams	.06
Bare Ground	45.29

**SOIL ANALYSIS DATA --**

Management unit 23R, Study no: 8, Study Name: Browns Canyon Drill

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.8	63.4 (11.8)	7.4	51.0	26.8	22.2	1.1	15.7	249.6	0.7

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 23R, Study no: 8

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	55	-
Elk	3	7 (17)
Deer	-	3 (8)

BROWSE CHARACTERISTICS --  
 Management unit 23R, 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)
Atriplex canescens												
04	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
Kochia prostrata												
04	<b>5360</b>	-	40	5320	-	-	9	0	-	-	0	13/15
Opuntia spp.												
04	<b>80</b>	-	-	60	20	-	0	0	25	-	0	4/12

Trend Study 24R-6-04

Study site name: Panguitch East Bench Harrow .

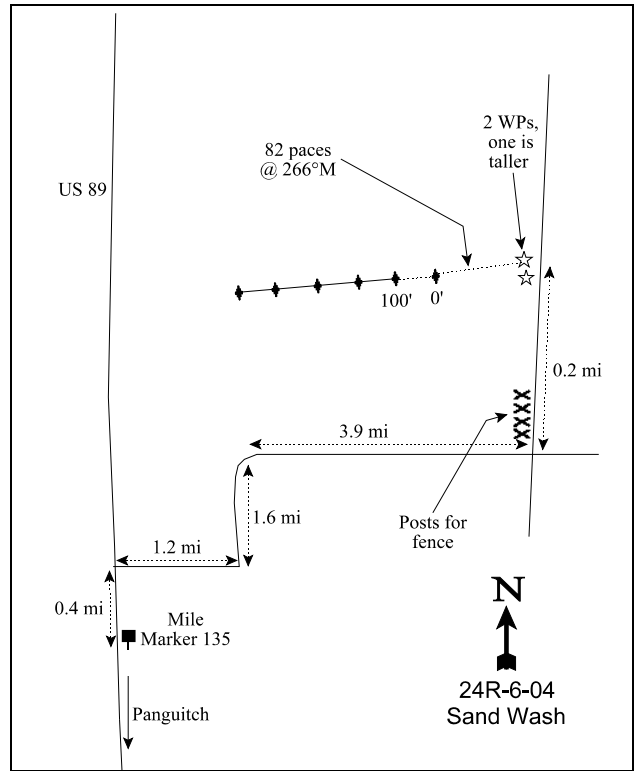
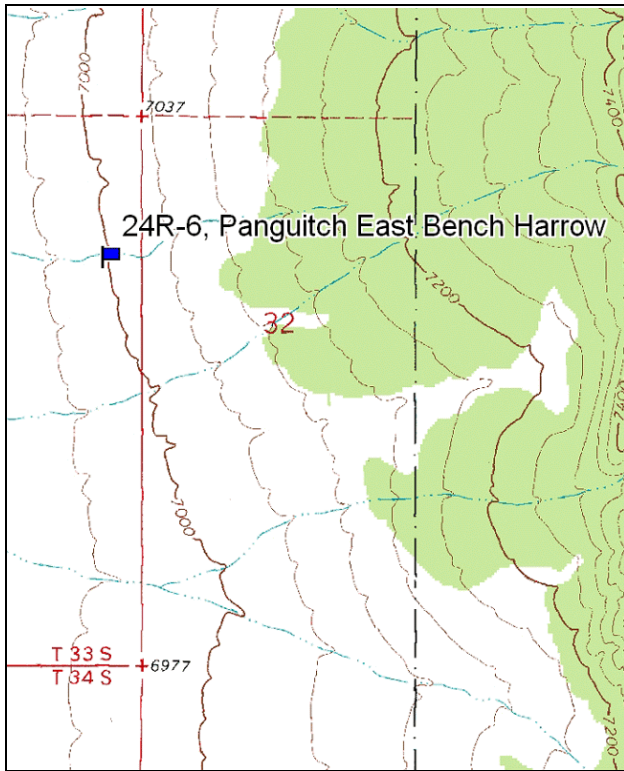
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 255 degrees magnetic.

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

**LOCATION DESCRIPTION**

Travel north of Panguitch on US 89 to mile marker 135. Continue 0.4 miles north of the mile marker to a road that comes in from the right (east). Turn onto this road and travel 1.2 miles to an intersection. Turn left and travel 1.6 miles to a 90° turn. Continue 3.9 miles to a road that comes in from the left (north). Turn here and travel 0.2 miles to two witness posts that are right next to each other. From the witness posts walk 82 paces at 266°M to the 0-foot stake that is marked with browse tag #41.



Map name: Blind Spring Mountain

Diagrammatic Sketch

Township 33S , Range 4½W , Section 31

GPS: NAD 27, UTM 12S 4195527 N, 382111 E



## DISCUSSION

### Panguitch East Bench Harrow – Trend Study No. 24R-06

The Panguitch East Bench Harrow study was established to monitor the Panguitch East Bench treatment. This 300-acre area was treated with a 30-foot wide Dixie pipe harrow in a single direction in October of 2004. Seed was applied on the treatment with a broadcast spreader attached to the tractor pulling the harrow. The treatment is located near sage grouse habitat approximately 7 miles northeast of Panguitch, Utah. The study is on a southwest aspect with a slope of 3-5% at 7,000 feet. In 2004, pellet group estimates were 1 antelope days use/acre (3 adu/ha), which was from late winter or early spring.

The soil is a shallow sandy clay loam with an effective rooting depth of 13 inches. The soil profile has scattered rock and pavement with a distinct layer of rock at 12 inches. Rock and pavement covered 27% of the soil surface in 2004. Phosphorus concentrations are adequate for wildland soils (Tiedemann and Lopez 2004). Bare ground cover was 37% in 2004. In 2004, a soil erosion condition class rating was slight due moderate-high pedestalling and moderate-sized gullies.

Wyoming big sagebrush is the key browse species. It provided 18% cover and 19% line intercept cover in 2004. Sagebrush density was 6,960 plants/acre in 2004, 48% of which were mature individuals and 45% were decadent. Young plants provided 7% of the population and plants classified as dying made up 26%. Use was light and the average leader growth was only 1.0 inch.

Three species of grasses were sampled in 2004, all of which were perennials. Blue grama was the dominant grass with 4% cover and a quadrat frequency of 53%. Squirreltail bottlebrush provided 1% cover and a quadrat frequency of 14%. Sandberg bluegrass was also sampled, but only in 2% of the quadrats.

Two species of forbs were sampled in 2004, 1 which was a perennial. These species provided very little cover.

### 2004 Pretreatment Assessment

The sagebrush density and cover is moderately high for a Wyoming big sagebrush site, but the sagebrush is also very decadent. The single direction harrow treatment should thin out the decadent sagebrush and prepare the soil for the seeded species. The Desirable Components Index score is fair due to excellent browse cover, moderate perennial grass cover, but high browse decadence.

2004 winter range condition (DC Index) – fair (43) Lower potential scale

The following seed mix was broadcast over the treatment area:

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Crested Wheatgrass 'Douglas'	150	0.5
Crested Wheatgrass 'Hycrest'	150	0.5
Indian Ricegrass 'Rimrock'	150	0.5
Needle and Threadgrass	35	0.1
Bottlebrush Squirreltail	40	0.1
Intermediate Wheatgrass	150	0.5
Newhy WG	150	0.5
Hard Fescue	150	0.5
Russian Wildrye 'Bozoisky'	150	0.5
Yellow Sweetclover	13	0.0
Alalfa 'Ladak+'	300	1.0
Sainfoin	800	2.7
Small Burnet 'Delar'	500	1.7
Blue Flax 'Appar'	50	0.2
Western Yarrow	20	0.1
Rocky Mountain Beeplant--Sanpete UT	150	0.5
Snake River Wheatgrass 'Secar'	350	1.2
<b>Total</b>	<b>3308</b>	<b>11.0</b>
PLS lbs/acre		10.3

HERBACEOUS TRENDS --

Management unit 24R, Study no: 6

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	<i>Bouteloua gracilis</i>	148	4.30
G	<i>Poa secunda</i>	5	.01
G	<i>Sitanion hystrix</i>	38	1.02
Total for Annual Grasses		0	0
Total for Perennial Grasses		191	5.34
Total for Grasses		191	5.34
F	<i>Astragalus</i> spp.	3	.03
F	<i>Descurainia pinnata</i> (a)	16	.10
Total for Annual Forbs		16	0.10
Total for Perennial Forbs		3	0.02
Total for Forbs		19	0.13

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

BROWSE TRENDS --

Management unit 24R, Study no: 6

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata wyomingensis	98	18.24
B	Gutierrezia sarothrae	2	.06
B	Opuntia spp.	2	-
Total for Browse		102	18.30

CANOPY COVER, LINE INTERCEPT --

Management unit 24R, Study no: 6

Species	Percent Cover
	'04
Artemisia tridentata wyomingensis	19.46

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24R, Study no: 6

Species	Average leader growth (in)
	'04
Artemisia tridentata wyomingensis	0.4

BASIC COVER --

Management unit 24R, Study no: 6

Cover Type	Average Cover %
	'04
Vegetation	23.30
Rock	4.09
Pavement	22.95
Litter	23.92
Cryptogams	3.37
Bare Ground	36.83

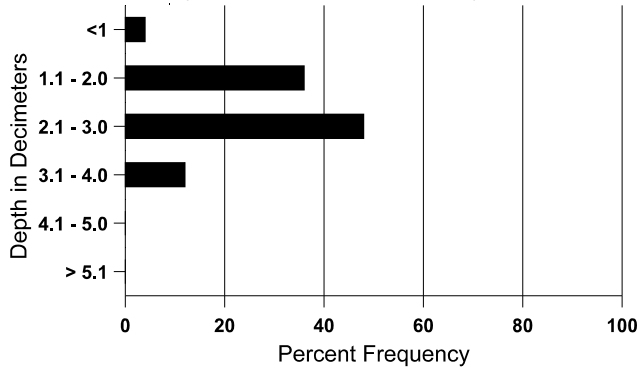
SOIL ANALYSIS DATA --

Management unit 24R, Study no: 6, Study Name: Panguitch East Bench Harrow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.2	63.0 (15.3)	7.6	55.0	23.4	21.6	1.4	7.8	611.2	0.7

# Stoniness Index

Panguitch East Bench Harrow, Study # 24R-6



## PELLET GROUP DATA --

Management unit 24R, Study no: 6

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	26	-
Antelope	1	1 (3)

## BROWSE CHARACTERISTICS --

Management unit 24R, Study no: 6

		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>												
04	<b>6960</b>	60	500	3320	3140	1840	3	0	45	26	26	17/26
<i>Gutierrezia sarothrae</i>												
04	<b>140</b>	-	100	40	-	-	0	0	-	-	0	5/7
<i>Opuntia spp.</i>												
04	<b>40</b>	-	-	40	-	-	0	0	-	-	0	4/9

Trend Study 25R-4-04

Study site name: Onion Field.

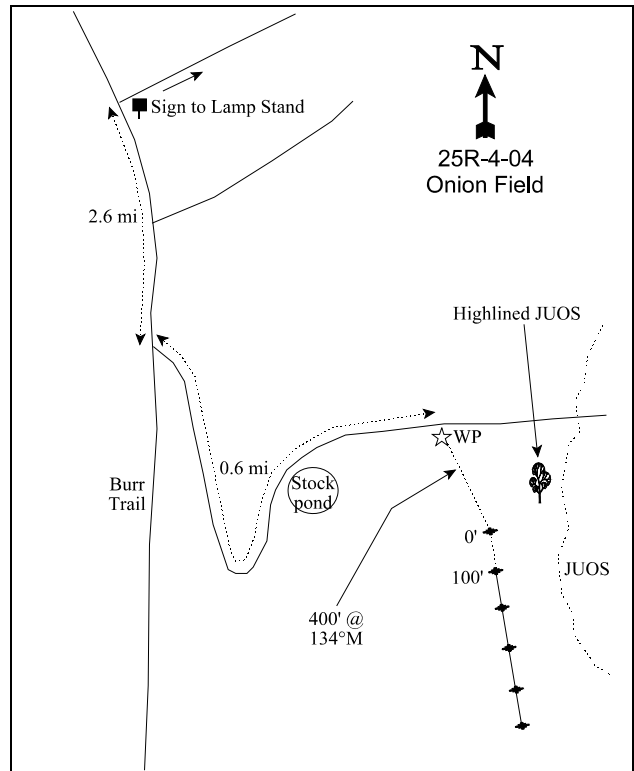
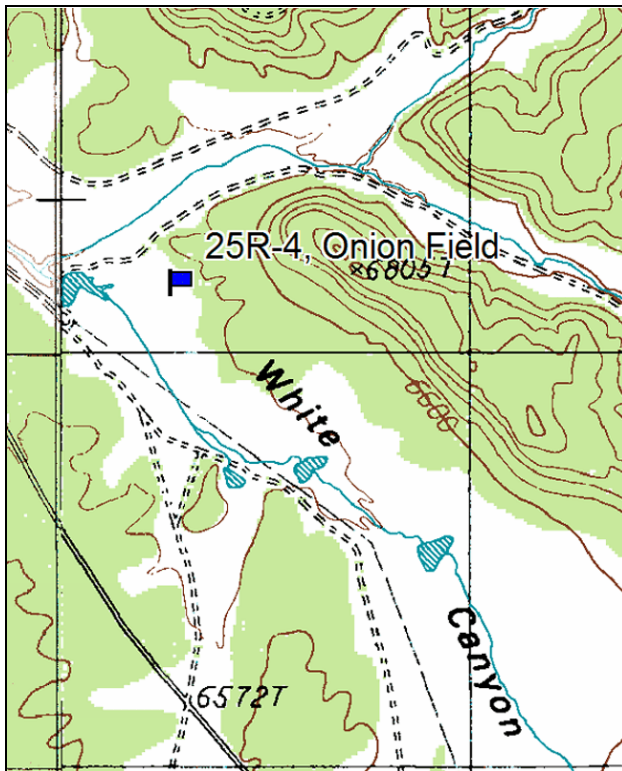
Vegetation type: Perennial Grass.

Compass bearing: frequency baseline 150 degrees magnetic.

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

LOCATION DESCRIPTION

On Burr Trail travel 2.6 miles, southeast past the turnoff for Lamp Stand, to a fork. Take a left and travel 0.6 miles. Pass through a fence and drive past a stock pond on the right. The witness post is on the right side of the road. The 0-foot post is 400 feet from the witness post at 134°M and is marked with browse tag #52.



Map name: Bitter Creek Divide.

Diagrammatic Sketch

Township 33S, Range 7E, Section Unsurveyed

GPS: NAD 27, UTM 12S 4196136 N, 489274 E

## DISCUSSION

### Onion Field - Trend Study No. 25R-4

This trend study is part of the Circle Cliffs range seeding project. This area is located about 27 miles east of Boulder on the Burr Trail. This study was first established in 2004 to monitor a perennial grass flat in the Grand Staircase Escalante National Monument managed by the BLM. The understory grass and forb species in the project area died due to the recent drought conditions in southern Utah. The current shrub species in the project area are non-existent or are becoming decadent. The goal of the DWR's involvement in this project would be primarily to increase winter and spring forage for mule deer and elk. This area will be treated using a rangeland drill. The GSENM intends to use 3-4 different seed mixes with varying degrees of native and exotic species in an attempt to study the effects of the different mixes. The GSENM has committed to instruct the livestock permittees about the requirement to rest any treated allotments for a minimum of 2 years to allow for seedling establishment. It was hoped that the treatment would take place during fall and winter of 2005, but it is unknown if it was treated.

The study site is located at 6,550 feet in elevation. The slope is only 1-2% and the aspect is to the west. A pellet group transect in 2004 found no use by big game or livestock. Rabbit pellets were found in 53% of the quadrats and a cattle pat was found in 1% of the quadrats.

Soil texture is a clay loam. The effective rooting depth was estimated at about 9 inches. A non-restrictive clay layer was found at 6 inches in depth. A dense hardpan was noted at 8-10 inches. Soil phosphorus was marginal at only 8 ppm (Tiedemann and Lopez 2004). Soil reactivity was moderately alkaline (pH = 7.9). Bare ground was very high in 2004 at 78%. An erosion condition class assessment rated erosion as critical. In August of 2004 it was apparent that a lot of overland flow had recently taken place. Live and dead grasses were pedestaled from 4-6 inches. Rills and flow patters covered the flat. There was not much vegetation cover to prevent erosion and to break up the water flow following summer thunder showers.

There was very little browse found on the site in 2004. Fourwing saltbush density was 120 plants/acre and it appeared that rabbits had heavily utilized the plants. Wyoming big sagebrush surrounds this open flat.

In 2004, Russian wildrye was the only grass species sampled. It was found in 42% of the quadrats and cover was 4%. The BLM had noted that crested wheatgrass was present prior to the drought, but had died out. Five forb species were sampled and all were annuals. Annual stickseed was the most abundant. Hopefully, the drill treatment will augment the herbaceous understory.

\*\*\*Need to get information from Tyler. When treated, what treatment, and which seed mix.

### 2004 winter range condition (DC Index) - Very poor (8) Lower Potential scale

#### HERBACEOUS TRENDS --

Management unit 25R, Study no: 4

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Elymus junceus	109	4.01
	Total for Annual Grasses	0	0
	Total for Perennial Grasses	109	4.01
	Total for Grasses	109	4.01

Type	Species	Nested Frequency	Average Cover %
		'04	'04
F	<i>Chenopodium fremontii</i> (a)	89	.71
F	<i>Chorispora tenella</i> (a)	1	.00
F	<i>Lappula occidentalis</i> (a)	287	6.47
F	<i>Mentzelia albicaulis</i> (a)	44	.63
F	<i>Salsola iberica</i> (a)	3	.04
Total for Annual Forbs		424	7.86
Total for Perennial Forbs		0	0
Total for Forbs		424	7.86

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

#### BROWSE TRENDS --

Management unit 25R, Study no: 4

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia tridentata wyomingensis</i>	1	-
B	<i>Atriplex canescens</i>	5	.01
B	<i>Chrysothamnus viscidiflorus</i>	1	-
B	<i>Gutierrezia sarothrae</i>	1	.03
B	<i>Opuntia</i> spp.	1	-
Total for Browse		9	0.03

#### BASIC COVER --

Management unit 25R, Study no: 4

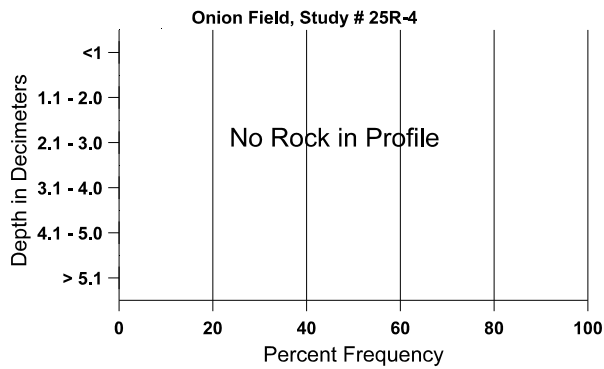
Cover Type	Average Cover %
	'04
Vegetation	12.89
Pavement	5.61
Litter	9.84
Bare Ground	77.99

#### SOIL ANALYSIS DATA --

Management unit 25R, Study no: 4, Study Name: Onion Field

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
8.8	68.2 (13.4)	7.9	32.6	40.2	27.2	0.9	8.3	243.2	0.6

# Stoniness Index



## PELLET GROUP DATA --

Management unit 25R, Study no: 4

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	53	-
Cattle	1	-

## BROWSE CHARACTERISTICS --

Management unit 25R, 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 wyomingensis</i>												
04	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
<i>Atriplex canescens</i>												
04	<b>120</b>	-	80	40	-	-	17	83	-	-	0	30/29
<i>Chrysothamnus viscidiflorus</i>												
04	<b>20</b>	-	-	20	-	-	0	100	-	-	0	3/4
<i>Gutierrezia sarothrae</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-
<i>Opuntia spp.</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	4/19



Trend Study 25R-5-04

Study site name: Lamp Stand .

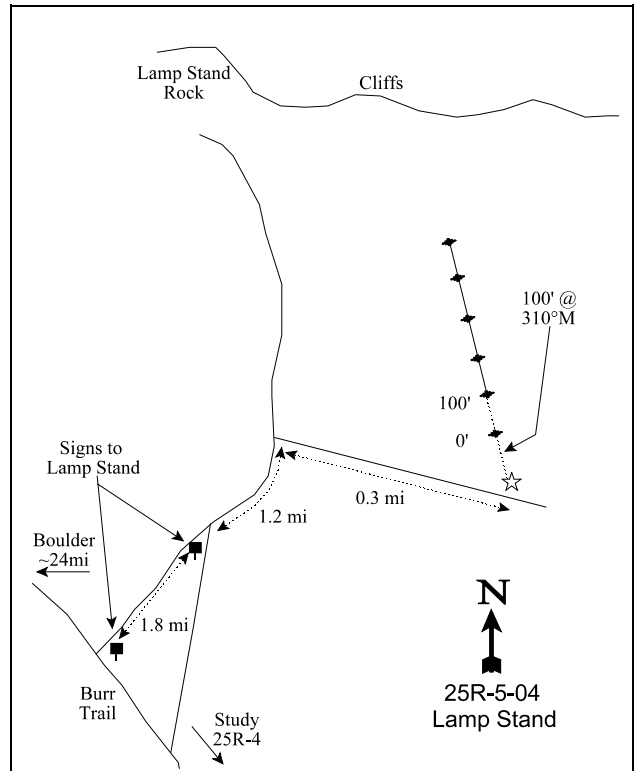
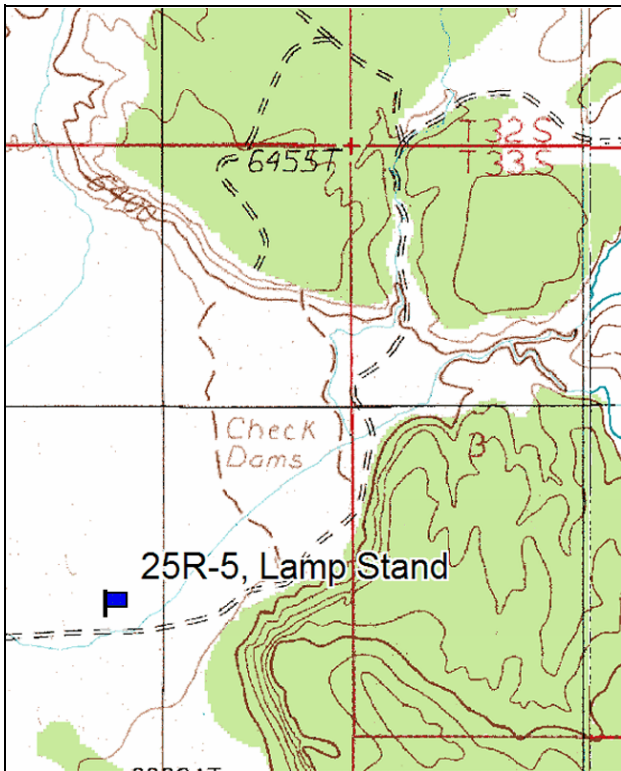
Vegetation type: Annuals .

Compass bearing: frequency baseline 310 degrees magnetic.

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

LOCATION DESCRIPTION

From Burr Trail take the turnoff to Lamp Stand. Travel 1.8 miles to another sign for Lamp Stand. Continue north 1.2 miles to a road on the right. Turn onto this road and travel 0.3 miles to a witness post on the left side of the road. From here the 0-foot stake is 100 feet away at 310°M and is marked with browse tag #53.



Map name: Lamp Stand .

Diagrammatic Sketch

Township 33S, Range 7E, Section Unsurveyed

GPS: NAD 27, UTM 12S 4201492 N, 487866 E

## DISCUSSION

### Lamp Stand - Trend Study No. 25R-5

This trend study is part of the Circle Cliffs range seeding project. This area is located about 27 miles east of Boulder north of the Burr Trail. This study was first established prior to treatment in 2004 to monitor an open flat in the Grand Staircase Escalante National Monument managed by the BLM. This open flat is dominated by weedy annual forbs and was drill seeded with a Truax no-till drill in November of 2004. The goal of the seeding project was to establish perennial grasses, forbs, and shrubs to improve this rangeland. By changing this area from a weedy annual community to a perennial community will stabilize the area and improve habitat for wildlife and grazing for livestock.

The elevation for the study site is 6,360 feet. The flat is nearly level with a slight aspect to the northwest. A stockpond is located about 1,000 feet west of the transect. A pellet group transect found no use by big game or wildlife. Rabbit pellets were found in 46% of the quadrats and older cow pats were found in 6% of the quadrats.

Soil texture is a sandy clay loam. The effective rooting depth was estimated at 12 inches. No rock was found in the soil profile. Soil phosphorus was marginal at 12 ppm (Tiedemann and Lopez 2004). Soil reactivity was moderately alkaline (pH = 7.9). Although there was some evidence of overland flow erosion was rated as stable and not considered a problem. Bare ground was high at 63%. Hopefully, the establishment of perennial species will create more ground cover.

Low rabbitbrush, prickly pear, and fourwing saltbush were the only shrubs found on the site and they were very low in numbers. The seed mixture include five different browse species.

The herbaceous understory was poor prior to treatment. Only three perennial species were sampled. Blue grama, Indian ricegrass, and gooseberryleaf globemallow. Blue grama was only found in 4% of the quadrats and Indian ricegrass in 1% of the quadrats. Gooseberryleaf globemallow was the most abundant perennial as it was found in 25% of the quadrats and had nearly 1% cover. The most abundant annuals were Russian thistle (100% quadrats, 24% cover) and annual stickseed (70% quadrats, 3% cover). A total of 10 annual forbs were sampled.

2004 winter range condition (DC Index) - Very poor (2) Lower Potential scale

<b>Circle Cliffs Seed Mix</b>	<b>Bulk lbs/ac</b>
*Crested WG Nordan	2.5
*Sand Dropseed	0.6
*Thickspike WG Schwendimar	0.1
*Siberian WG P27	2.5
*Thickspike WG Critana	0.1
* Western WG Ariba	3.7
*Alfalfa Ladak Plus	0.3
*Yellow Sweetclover Madrid	0.5
*Small Burnett Delar	0.1
*Fourwing Saltbush	0.1
*Fourwing Saltbush	1.1
*Indian Ricegrass Rimrock	1.2
*Great Basin Wildrye Megnar	0.3
*Antelope Bitterbrush	0.1
Alfalfa 'Nomad'	0.3
Blue Flax 'Appar'	0.1
Palmer Penstemon 'Washington, UT'	0.0
Green Ephedra	0.0
Bitterbrush--Ada/Boise ID	0.1
Munroe Globemallow 'Elbow Ranch'	0.1
Green Ephedra	0.0
<b>Total Bulk lbs/acre</b>	<b>13.7</b>
*Seed provided by BLM	

<b>Circle Cliffs Shrub Seed Mix</b>	<b>Bulk lbs/ac</b>
*Winterfat	0.0
*Big Sagebrush Wyoming	0.3
*Winterfat	0.3
Sagebrush, Wyoming--Beaver UT	0.3
<b>Total Bulk lbs/acre</b>	<b>0.8</b>
<b>Total PLS lbs/acre</b>	<b>0.08</b>
*Seed provided by BLM	

HERBACEOUS TRENDS --  
Management unit 25R, Study no: 5

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Bouteloua gracilis	10	.24
G	Bromus tectorum (a)	-	.00
G	Oryzopsis hymenoides	4	.00
Total for Annual Grasses		0	0.00
Total for Perennial Grasses		14	0.24
Total for Grasses		14	0.25
F	Chenopodium fremontii (a)	33	.22
F	Chenopodium leptophyllum(a)	7	.04
F	Chorispora tenella (a)	44	.91
F	Descurainia pinnata (a)	4	.01
F	Gilia spp. (a)	2	.03
F	Helianthus annuus (a)	24	.14
F	Lappula occidentalis (a)	195	3.09
F	Mentzelia albicaulis (a)	34	.27
F	Plantago patagonica (a)	23	.07
F	Salsola iberica (a)	404	23.60
F	Sphaeralcea grossulariaefolia	44	.67

Type	Species	Nested Frequency	Average Cover %
		'04	'04
Total for Annual Forbs		770	28.41
Total for Perennial Forbs		44	0.67
Total for Forbs		814	29.09

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

#### BROWSE TRENDS --

Management unit 25R, Study no: 5

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Atriplex canescens	0	-
B	Chrysothamnus viscidiflorus	1	.15
B	Opuntia spp.	1	-
Total for Browse		2	0.15

#### BASIC COVER --

Management unit 25R, Study no: 5

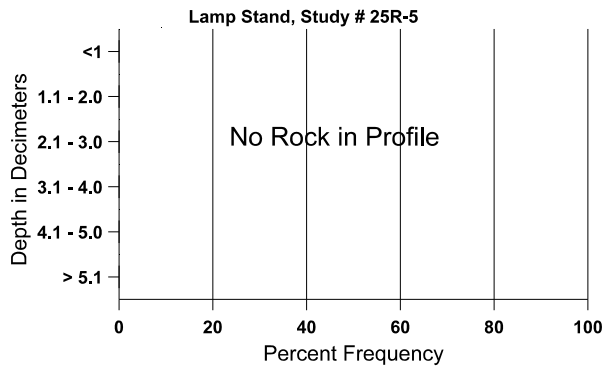
Cover Type	Average Cover %
	'04
Vegetation	30.74
Rock	.03
Pavement	3.42
Litter	10.06
Bare Ground	63.43

#### SOIL ANALYSIS DATA --

Management unit 25R, Study no: 5, Study Name: Lamp Stand

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.7	66.2 (14.3)	7.9	54.3	23.5	22.2	0.8	10.9	534.4	1.0

# Stoniness Index



## PELLET GROUP DATA --

Management unit 25R, Study no: 5

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	46	-
Cattle	6	-

## BROWSE CHARACTERISTICS --

Management unit 25R, Study no: 5

		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>Atriplex canescens</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	33/30
<i>Chrysothamnus viscidiflorus</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	13/14
<i>Opuntia</i> spp.												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	4/22

Trend Study 27R-12-04

Study site name: Paria Road 1.

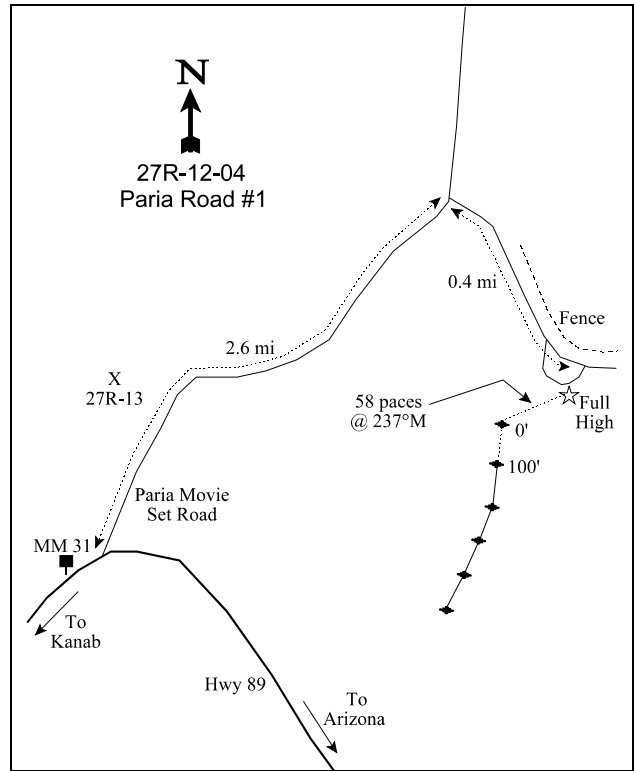
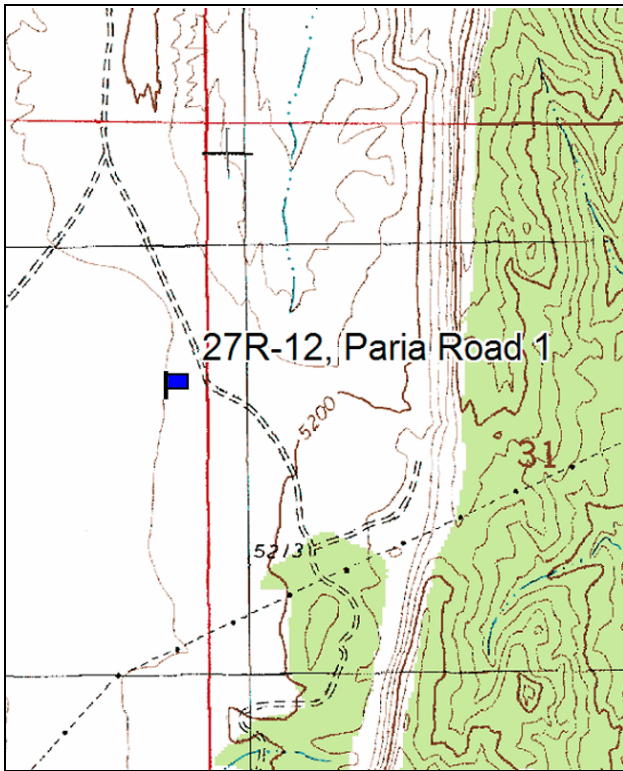
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 179 degrees magnetic.

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

**LOCATION DESCRIPTION**

Travel east of Kanab on US 89 to mile marker 31. Drive a little further to Paria Movie Set Road that comes in on the left (north). Turn onto this road and travel 2.6 miles to a road that comes in from the right. Turn onto this road and travel 0.4 miles to a full high witness post on the right side of the road. From the witness post walk 58 paces at 237°M to the 0-foot stake that is marked with browse tag #159.



Map name: Fivemile Valley

Diagrammatic Sketch

Township 41S, Range 2W, Section 36

GPS: NAD 27, UTM 12S 4117636 N, 414815 E

## DISCUSSION

### Paria Road 1 – Trend Study No. 27R-12

The Paria Road 1 study was established to monitor a BLM treatment in 2004, which has not yet taken place.

The study is located approximately 33 miles east of Kanab, Utah. It is on a western aspect with a 5% slope at 5,200 feet. The estimated pellet group data was 1 deer day use/acre (2 ddu/ha) in 2004.

The soil is a shallow sandy loam with an effective rooting depth of 19 inches. No rock was sampled in the soil profile and very little pavement was sampled on the soil surface in 2004. The soil phosphorus concentration is 4.2 ppm, values less than 6.0 ppm may limit normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is slightly alkaline (7.9). Bare ground cover was 58% in 2004. In 2004, a soil erosion condition class rating was stable.

Although there were very few living during the pretreatment sampling in 2004, basin big sagebrush is the key browse species. Living sagebrush provided around one-half of a percent cover. The density of living sagebrush was 240 plants/acre in 2004, all of which were decadent. Plants classified as dying made up 75% of the population. Dead sagebrush density was 3,280 plants/acre. The average annual leader growth of living individuals was 1.3 inches in 2004 and use was light. Several other browse species were sampled, but in small densities.

Three species of grasses were sampled in 2004, 2 of which were perennials. Galleta grass provided 12% cover and a quadrat frequency of 93% in 2004. The other two species, squirreltail bottlebrush and sixweeks fescue, provided less than 1% cover combined.

Eleven species of forbs were sampled in 2004, 8 of which were annuals. Whitestem mentzelia was the dominant forb species with 2% cover and a quadrat frequency of 27%. The other 10 species provided less than 1% cover combined.

### 2004 Pretreatment Assessment

The browse component of the area can only improve. The galleta grass dominates the herbaceous understory, but there is not cheatgrass on the site. A treatment should greatly improve the area. The Desirable Components Index score was fair due to the excellent perennial grass cover and despite the high dead sagebrush densities.

2004 winter range condition (DC Index) – fair (27) Lower potential scale

### HERBACEOUS TRENDS --

Management unit 27R, Study no: 12

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Hilaria jamesii	321	11.96
G	Sitanion hystrix	13	.53
G	Vulpia octoflora (a)	4	.01
Total for Annual Grasses		4	0.00
Total for Perennial Grasses		334	12.50

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
Total for Grasses		338	12.51
F	Calochortus nuttallii	92	.33
F	Chenopodium fremontii (a)	5	.01
F	Descurainia pinnata (a)	3	.00
F	Erodium cicutarium (a)	1	.00
F	Gilia spp. (a)	1	.00
F	Leucelene ericoides	1	.00
F	Lupinus kingii (a)	1	.00
F	Mentzelia albicaulis (a)	63	1.99
F	Navarretia intertexta (a)	72	.24
F	Plantago patagonica (a)	26	.06
F	Sphaeralcea parvifolia	5	.03
Total for Annual Forbs		172	2.31
Total for Perennial Forbs		98	0.37
Total for Forbs		270	2.69

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

BROWSE TRENDS --

Management unit 27R, Study no: 12

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata tridentata	8	.59
B	Atriplex canescens	0	-
B	Chrysothamnus viscidiflorus	1	.03
B	Ephedra viridis	0	-
B	Gutierrezia sarothrae	2	-
B	Mahonia fremontii	0	-
B	Opuntia polyacantha	7	.41
B	Opuntia whipplei	2	-
B	Sclerocactus sp.	1	-
Total for Browse		21	1.02



CANOPY COVER, LINE INTERCEPT --

Management unit 27R, Study no: 12

Species	Percent Cover
	'04
Artemisia tridentata tridentata	.66
Mahonia fremontii	.06
Opuntia polyacantha	.23

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27R, Study no: 12

Species	Average leader growth (in)
	'04
Artemisia tridentata tridentata	1.3

BASIC COVER --

Management unit 27R, Study no: 12

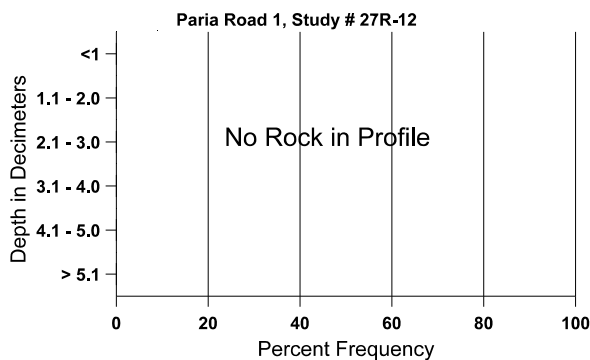
Cover Type	Average Cover %
	'04
Vegetation	15.89
Rock	.00
Pavement	.05
Litter	25.35
Cryptogams	8.55
Bare Ground	57.52

SOIL ANALYSIS DATA --

Management unit 27R, Study no: 12, Study Name: Paria Road 1

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
19.4	55.2 (17.0)	7.9	59.6	21.8	18.6	0.6	4.2	288.0	0.5

## Stoniness Index



PELLET GROUP DATA --

Management unit 27R, Study no: 12

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	67	-
Deer	-	1 (2)
Cattle	3	-

BROWSE CHARACTERISTICS --

Management unit 27R, Study no: 12

		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 tridentata</i>												
04	<b>240</b>	-	-	-	240	3280	0	0	100	75	75	36/46
<i>Atriplex canescens</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	28/19
<i>Chrysothamnus viscidiflorus</i>												
04	<b>20</b>	-	-	20	-	320	0	0	-	-	0	9/16
<i>Ephedra viridis</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	28/32
<i>Gutierrezia sarothrae</i>												
04	<b>40</b>	-	-	40	-	180	0	0	-	-	0	8/8
<i>Mahonia fremontii</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	53/74
<i>Opuntia polyacantha</i>												
04	<b>140</b>	-	-	120	20	20	0	0	14	-	0	8/23
<i>Opuntia whipplei</i>												
04	<b>40</b>	-	-	40	-	-	0	0	-	-	0	18/31
<i>Sclerocactus sp.</i>												
04	<b>20</b>	-	-	20	-	-	0	0	-	-	0	8/5

Trend Study 27R-13-04

Study site name: Paria Road 2 .

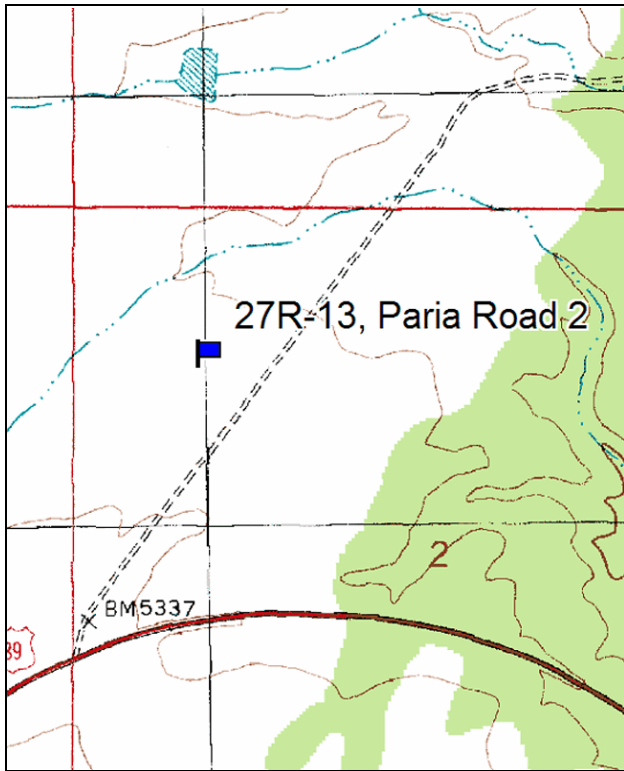
Vegetation type: Basin Big Sagebrush .

Compass bearing: frequency baseline 281 degrees magnetic.

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

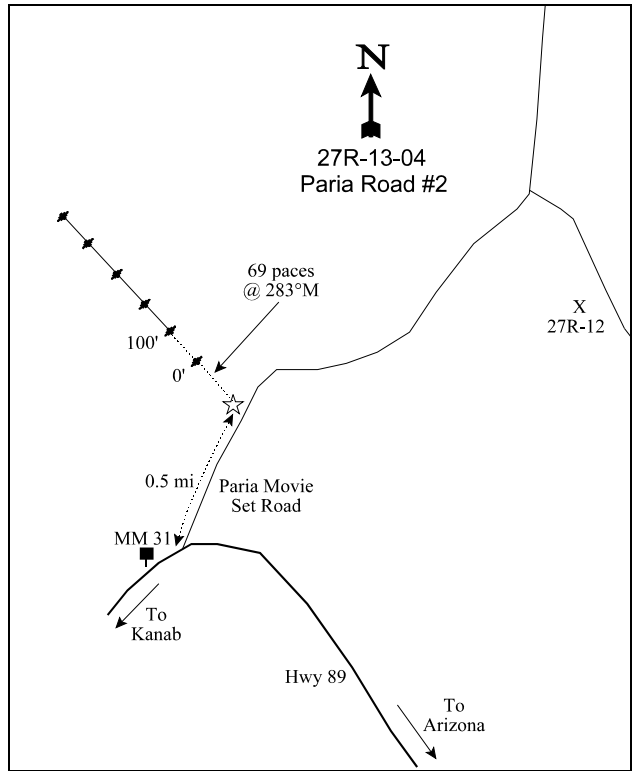
LOCATION DESCRIPTION

Travel east of Kanab on US 89 to mile marker 31. Drive a little further to Paria Movie Set Road that comes in on the left (north). Turn onto this road and travel 0.5 miles to a witness post on the left side of the road. From the witness post walk 69 paces at 283°M to the 0-foot stake that is marked with browse tag #156.



Map name: Fivemile Valley

Township 42S , Range 2W , Section 2



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4116363 N, 411979 E

## DISCUSSION

### Paria Road 2 – Trend Study No. 27R-13

The Paria Road 2 study was established to monitor a BLM treatment in 2004, which has not yet taken place.

The study is located approximately 31 miles east of Kanab, Utah. It is on a northwestern aspect with a 2-4% slope at 5,300 feet. No pellets groups were measured in 2004.

The soil is a shallow sandy clay loam with an effective rooting depth of 17 inches. No rock was sampled in the soil profile and very little pavement was sampled on the soil surface in 2004. The soil phosphorus concentration is 4.2 ppm, values less than 6.0 ppm may limit normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is slightly alkaline (7.9). Bare ground cover was 55% in 2004.

Although there were very few living during the pretreatment sampling in 2004, basin big sagebrush is the key browse species. Living sagebrush provided 2% cover. The density of living sagebrush was 1,260 plants/acre in 2004, 56% of which were decadent. Mature plants made up 37% of the population and young plants made up 7%. Plants classified as dying made up 33% of the population. Dead sagebrush density was 6,200 plants/acre. The average annual leader growth of living individuals was 2.2 inches in 2004 and use was light. Four other browse species were sampled, but in small densities.

Three species of grasses were sampled in 2004, 2 of which were perennials. Galleta grass provided 3% cover and a quadrat frequency of 27% in 2004. Bottlebrush squirreltail provided over 3% cover and a quadrat frequency of 33%. Sixweeks fescue provided very little cover.

Seven species of forbs were sampled in 2004, 5 of which were annuals. All forbs provided less than 1% cover combined in 2004.

### 2004 Pretreatment Assessment

The browse component of the area can only improve. There is little herbaceous understory cover. A treatment should greatly improve the area. The Desirable Components Index score was poor due to the moderate perennial grass cover and the high dead sagebrush densities.

2004 winter range condition (DC Index) – poor (16) Lower potential scale

### HERBACEOUS TRENDS --

Management unit 27R, Study no: 13

Type	Species	Nested Frequency	Average Cover %
		'04	'04
G	Hilaria jamesii	75	2.77
G	Sitanion hystrix	81	3.45
G	Vulpia octoflora (a)	7	.01
Total for Annual Grasses		7	0.00
Total for Perennial Grasses		156	6.23
Total for Grasses		163	6.25
F	Calochortus nuttallii	4	.01

Type	Species	Nested Frequency	Average Cover %
		'04	'04
F	Descurainia pinnata (a)	5	.01
F	Gilia spp. (a)	20	.13
F	Lupinus kingii (a)	2	.00
F	Mentzelia albicaulis (a)	4	.04
F	Navarretia intertexta (a)	41	.33
F	Sphaeralcea parvifolia	-	.15
Total for Annual Forbs		72	0.52
Total for Perennial Forbs		4	0.16
Total for Forbs		76	0.69

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

BROWSE TRENDS --

Management unit 27R, Study no: 13

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata tridentata	42	2.38
B	Ephedra viridis	3	.15
B	Gutierrezia sarothrae	0	-
B	Opuntia polyacantha	2	-
B	Opuntia whipplei	0	-
Total for Browse		47	2.53

CANOPY COVER, LINE INTERCEPT --

Management unit 27R, Study no: 13

Species	Percent Cover
	'04
Artemisia tridentata tridentata	1.68
Ephedra viridis	.45

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27R, Study no: 13

Species	Average leader growth (in)
	'04
Artemisia tridentata tridentata	2.2

BASIC COVER --

Management unit 27R, Study no: 13

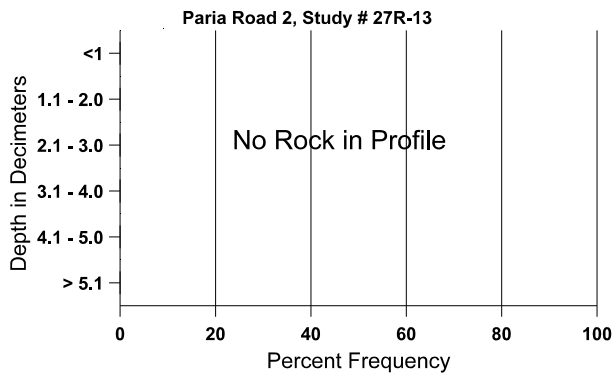
Cover Type	Average Cover % '04
Vegetation	9.63
Rock	.03
Pavement	.12
Litter	32.68
Cryptogams	11.94
Bare Ground	55.25

SOIL ANALYSIS DATA --

Management unit 27R, Study no: 13, Study Name: Paria Road 2

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
17.1	54.6 (16.9)	7.3	50.4	20.7	28.9	0.9	8.5	179.2	0.5

### Stoniness Index



PELLET GROUP DATA --

Management unit 27R, Study no: 13

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	66	-

BROWSE CHARACTERISTICS --  
 Management unit 27R, 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 tridentata</i>												
04	<b>1260</b>	-	100	460	700	6200	0	0	56	33	33	25/26
<i>Ephedra viridis</i>												
04	<b>60</b>	-	-	40	20	-	0	33	33	-	0	12/17
<i>Gutierrezia sarothrae</i>												
04	<b>0</b>	-	-	-	-	20	0	0	-	-	0	12/22
<i>Opuntia polyacantha</i>												
04	<b>40</b>	-	-	20	20	-	0	0	50	-	0	7/15
<i>Opuntia whipplei</i>												
04	<b>0</b>	-	-	-	-	20	0	0	-	-	0	19/33

Trend Study 27R-14-04

Study site name: Telegraph Flat 2.

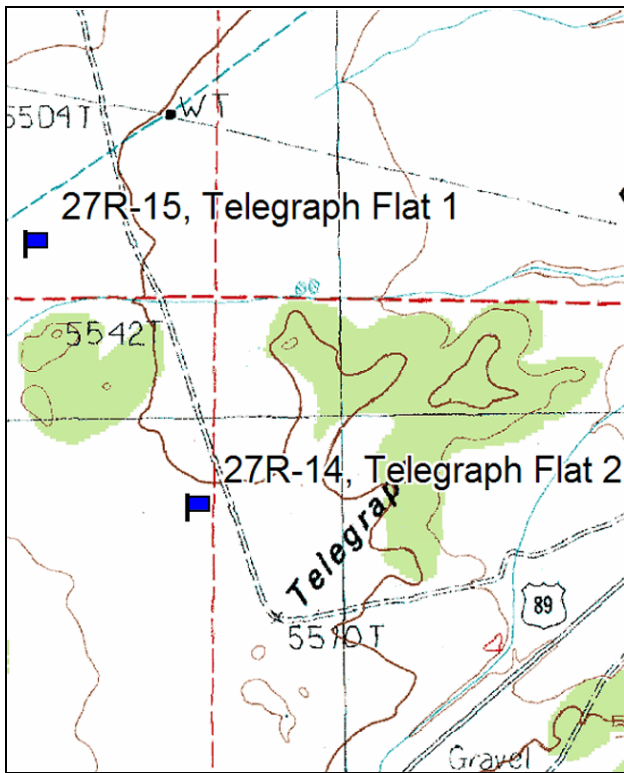
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 267 degrees magnetic.

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

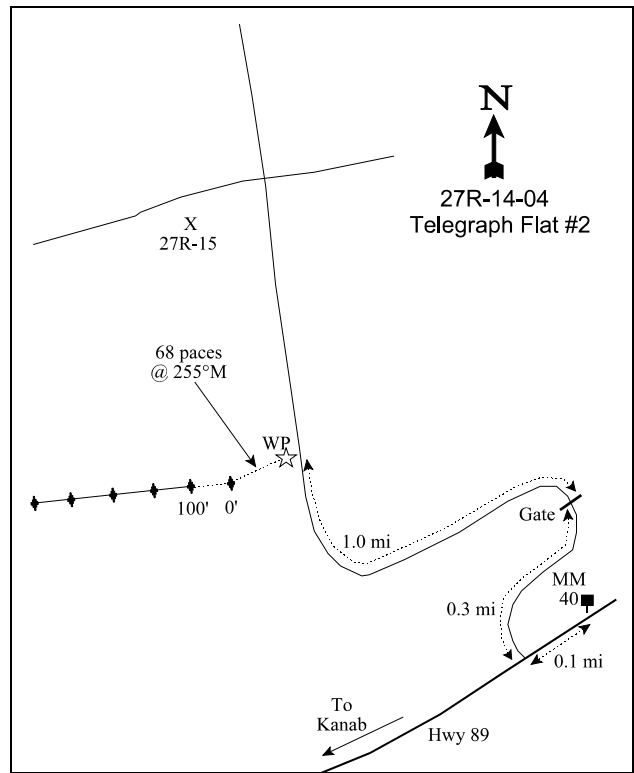
LOCATION DESCRIPTION

Travel east of Kanab on US 89 to the road that comes in from the left 0.1 miles before mile marker 40. Turn onto this road and travel 0.3 miles to a gate. Continue 1.0 mile to a witness post on the left side of the road. From the witness post walk 68 pace at 255°M to the 0-foot stake that is marked with browse tag #155.



Map name: Petrified Hollow

Township 43S, Range 3W, Section 5



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4106748 N, 398638 E



## DISCUSSION

### Telegraph Flat 2 - Trend Study No. 27R-14

The Telegraph Flat 2 study is located on land managed by the Bureau of Land Management and is part of the Mollies Nipple grazing allotment east of Kanab, UT. The elevation is 5,520 feet on a northeast exposure with a 1-2% slope. The range type is a Basin big sagebrush community with annuals dominating the understory. The area was plowed and seeded to crested wheatgrass in 1954, but grazing by livestock has changed the herbaceous understory to annuals. The area is scheduled to be aerated and seeded in the fall of 2006. Pellet group data from 2004 was estimated at 2 deer and 15 cow days use/acre (5 ddu/ha and 36 cdu/ha).

The soil texture is a clay loam with an effective rooting depth of 13 inches. The soil reaction is slightly alkaline with a pH of 7.6. There is little to no rock or pavement within the soil profile and bare ground cover was high 57%. The ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground was fair at 2.0:1. The erosion condition class determined soil movement as stable in 2005, but lot of cracking on the surface due to shrinking and swelling.

The key browse species was Basin big sagebrush and averaged less than 1% cover. Density was estimated at 480 plants/acre and 27% were classified as decadent. Utilization was light and annual leader growth averaged 2.0 inches. The height of plants averaged 17 inches and the crown averaged 22 inches. Other shrub species included broom snakeweed, green rubber rabbitbrush, and corymbed eriogonum.

The herbaceous understory is dominated by Russian thistle and cover averaged 31%. Three perennial grasses, crested wheatgrass, squirreltail, and Indian ricegrass, were sampled in low numbers. Several annual and perennial forbs are on the site, but not common.

The Desirable Components Index rated this site as fair with a score of 28 due to fair amount of basin big sagebrush.

#### 2004 winter range condition (DC Index) - fair (28) Lower Potential scale

#### HERBACEOUS TRENDS --

Management unit 27R, Study no: 14

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Agropyron cristatum	-	.00
G	Oryzopsis hymenoides	5	.18
G	Sitanion hystrix	-	.03
Total for Annual Grasses		0	0
Total for Perennial Grasses		5	0.21
Total for Grasses		5	0.21
F	Calochortus nuttallii	142	.88
F	Eriogonum cernuum (a)	18	.05
F	Gilia spp. (a)	6	.01
F	Lappula occidentalis (a)	1	.00
F	Penstemon spp.	10	.39

Type	Species	Nested Frequency	Average Cover %
		'04	'04
F	Phlox longifolia	13	.08
F	Salsola iberica (a)	443	31.11
F	Sphaeralcea parvifolia	7	.22
F	Unknown forb-perennial	-	.00
Total for Annual Forbs		468	31.18
Total for Perennial Forbs		172	1.59
Total for Forbs		640	32.77

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

BROWSE TRENDS --

Management unit 27R, Study no: 14

Type	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata tridentata	15	.33
B	Chrysothamnus nauseosus graveolens	17	1.41
B	Eriogonum corymbosum	5	.06
B	Gutierrezia sarothrae	11	.27
B	Opuntia polyacantha	1	.15
B	Polygala subspinososa subspinososa	8	.04
Total for Browse		57	2.27

CANOPY COVER, LINE INTERCEPT --

Management unit 27R, Study no: 14

Species	Percent Cover
	'04
Artemisia tridentata tridentata	.30
Chrysothamnus nauseosus graveolens	2.84
Eriogonum corymbosum	.20
Gutierrezia sarothrae	1.00
Polygala subspinososa subspinososa	.15

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 27R, Study no: 14

Species	Average leader growth (in)
	'04
Artemisia tridentata tridentata	2.0

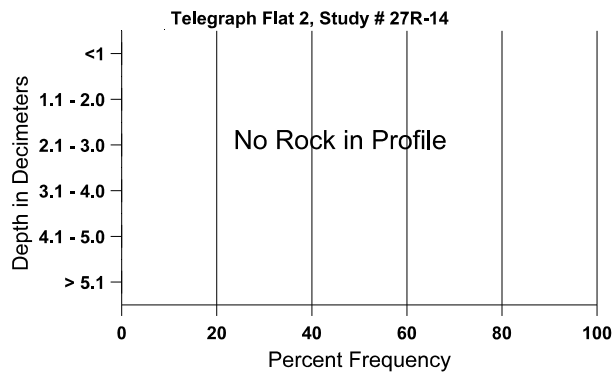
BASIC COVER --  
Management unit 27R, Study no: 14

Cover Type	Average Cover %
	'04
Vegetation	36.93
Litter	10.92
Cryptogams	1.16
Bare Ground	57.39

SOIL ANALYSIS DATA --  
Management unit 27R, Study no: 14, Study Name: Telegraph Flat 2

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.7	49.2 (15.2)	7.6	22.6	40.8	36.6	1.8	4.3	256.0	1.3

## Stoniness Index



PELLET GROUP DATA --  
Management unit 27R, Study no: 14

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	40	-
Deer	2	2 (5)
Cattle	3	15 (36)

BROWSE CHARACTERISTICS --  
Management unit 27R, 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 tridentata</i>												
04	<b>480</b>	-	80	360	40	-	17	0	8	-	0	17/22
<i>Chrysothamnus nauseosus graveolens</i>												
04	<b>360</b>	-	120	200	40	20	11	6	11	-	0	28/36
<i>Eriogonum corymbosum</i>												
04	<b>200</b>	840	20	180	-	-	10	80	-	-	0	5/10
<i>Gutierrezia sarothrae</i>												
04	<b>700</b>	-	-	700	-	-	0	0	-	-	0	8/10
<i>Opuntia polyacantha</i>												
04	<b>40</b>	-	-	40	-	-	0	0	-	-	0	8/48
<i>Polygala subspinoso subspinoso</i>												
04	<b>220</b>	-	-	220	-	-	0	100	-	-	0	3/8

Trend Study 27R-15-04

Study site name: Telegraph Flat 1.

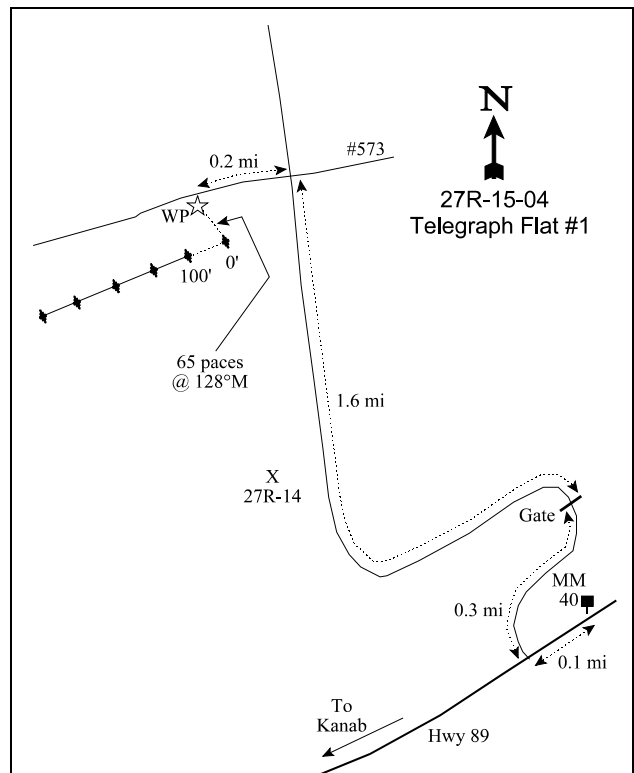
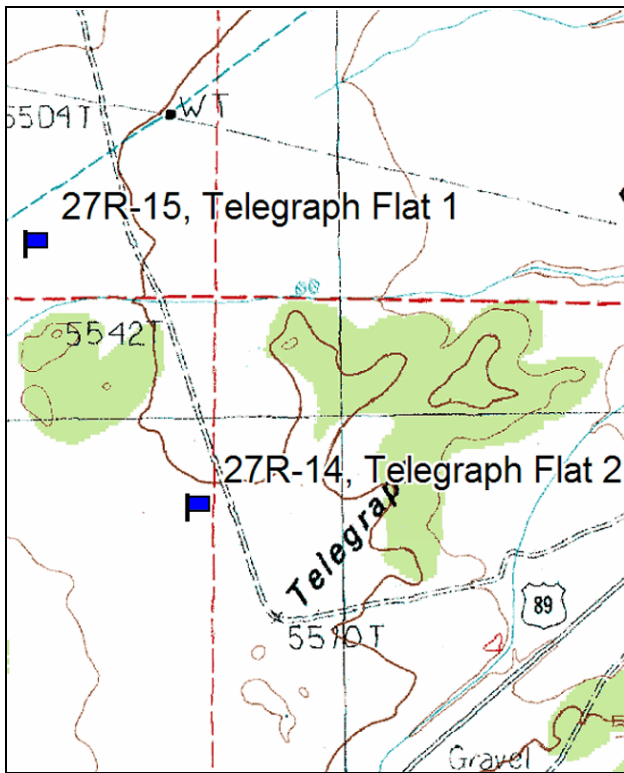
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 235 degrees magnetic.

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

**LOCATION DESCRIPTION**

Travel east of Kanab on US 89 to the road that comes in from the left 0.1 miles before mile marker 40. Turn onto this road and travel 0.3 miles to a gate. Continue 1.6 miles to an intersection. Turn left onto this road (#573) and drive 0.2 miles to a witness post on the left side of the road. From the witness post walk 65 paces at 128°M to the 0-foot stake that is marked with browse tag #154.



Map name: Petrified Hollow

Diagrammatic Sketch

Township 42S, Range 3W, Section 32

GPS: NAD 27, UTM 12S 4107369 N, 398264 E

## DISCUSSION

### Telegraph Flat 1 - Trend Study No. 27R-15

The Telegraph Flat 1 study is located on land managed by the Bureau of Land Management and is part of the Mollies Nipple grazing allotment east of Kanab, UT. The elevation is 5,520 feet on a northeast exposure with a 1% slope. The range type is a Basin big sagebrush community with annuals dominating the understory. The area was plowed and seeded to crested wheatgrass in 1954, but grazing by livestock has changed the herbaceous understory to annuals. The area is scheduled to be aerated and seeded in the fall of 2006. Pellet group data from 2004 was estimated at 19 cow days use/acre (47 cdu/ha).

The soil texture is loam with an effective rooting depth of 21 inches. The soil reaction is slightly alkaline with a pH of 7.4. There is little to no rock or pavement within the soil profile and bare ground cover was high 51%. The ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground was fair at 2.2:1. The erosion condition class determined soil movement as stable in 2005, but lot of cracking on the surface due to shrinking and swelling.

The key browse species was Basin big sagebrush and averaged 7% cover. Density was estimated at 1,960 plants/acre and 27% were classified as decadent. Utilization was light and annual leader growth averaged 2.5 inches. The height of plants averaged 26 inches and the crown averaged 33 inches. The only other shrub species is broom snakeweed and low rabbitbrush.

The herbaceous understory is dominated by Russian thistle and cover averaged 31%. Two perennial grasses, crested wheatgrass and sand dropseed, were sampled in low numbers. Cheatgrass and several annual forbs are on the site, but not common.

The Desirable Components Index rated this site as fair with a score of 28 due to fair amount of basin big sagebrush.

#### 2004 winter range condition (DC Index) - fair (28) Lower Potential scale

#### HERBACEOUS TRENDS --

Management unit 27R, Study no: 15

Type	Species	Nested Frequency		Average Cover %	
		'04	'04	'04	'04
G	Agropyron cristatum	2		.03	
G	Bromus tectorum (a)	3		.00	
G	Sporobolus cryptandrus	14		.37	
Total for Annual Grasses		3		0.00	
Total for Perennial Grasses		16		0.40	
Total for Grasses		19		0.40	
F	Cymopterus spp.	3		.00	
F	Gilia spp. (a)	9		.02	
F	Helianthus annuus (a)	85		.76	
F	Lappula occidentalis (a)	3		.01	
F	Mentzelia albicaulis (a)	68		.68	

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
F	Salsola iberica (a)	475	31.24
F	Sphaeralcea parvifolia	26	2.61
Total for Annual Forbs		640	32.71
Total for Perennial Forbs		29	2.61
Total for Forbs		669	35.33

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

#### BROWSE TRENDS --

Management unit 27R, Study no: 15

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	Artemisia tridentata tridentata	50	7.05
B	Chrysothamnus viscidiflorus	1	-
B	Gutierrezia sarothrae	9	.16
Total for Browse		60	7.22

#### CANOPY COVER, LINE INTERCEPT --

Management unit 27R, Study no: 15

Species	Percent Cover
	'04
Artemisia tridentata tridentata	7.84
Gutierrezia sarothrae	.23

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27R, Study no: 15

Species	Average leader growth (in)
	'04
Artemisia tridentata tridentata	2.6

**BASIC COVER --**

Management unit 27R, Study no: 15

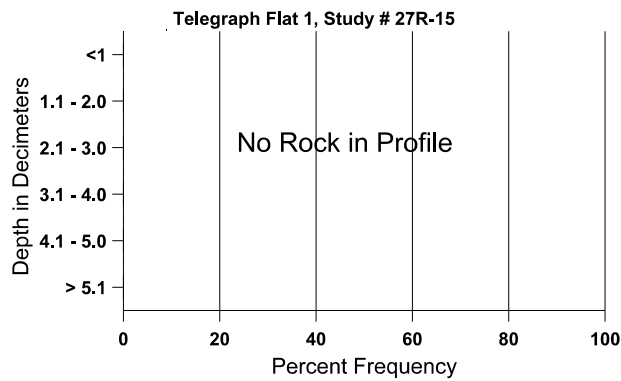
Cover Type	Average Cover % '04
Vegetation	44.51
Pavement	.00
Litter	16.65
Cryptogams	.65
Bare Ground	50.58

**SOIL ANALYSIS DATA --**

Management unit 27R, Study no: 15, Study Name: Telegraph Flat 1

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
21.1	n/a (n/a)	7.4	45.4	31.7	22.9	1.0	4.0	412.8	0.4

## Stoniness Index



**PELLET GROUP DATA --**

Management unit 27R, Study no: 15

Type	Quadrat Frequency '04	Days use per acre (ha) '04
Rabbit	42	-
Deer	1	-
Cattle	10	19 (47)



BROWSE CHARACTERISTICS --  
 Management unit 27R, Study no: 15

		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 tridentata</i>												
04	<b>1960</b>	20	180	1260	520	580	3	0	27	11	11	26/33
<i>Chrysothamnus viscidiflorus</i>												
04	<b>20</b>	-	-	20	-	-	0	100	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
04	<b>420</b>	-	20	360	40	20	0	0	10	-	0	7/10

Trend Study 30R-1-04

Study site name: Newcastle Bullhog .

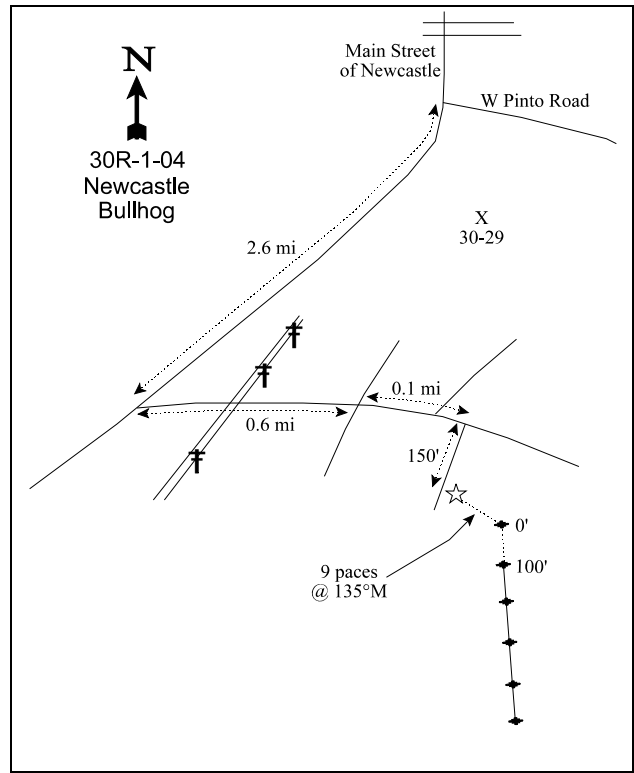
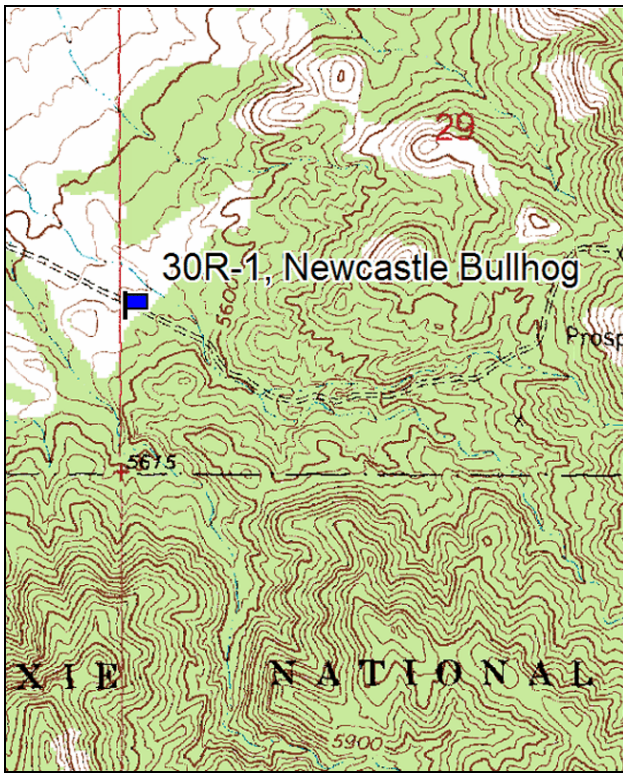
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 174 degrees magnetic.

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

LOCATION DESCRIPTION

From Pinto Canyon Road in Newcastle travel south on Main Street, that turns into Bench Road, for 2.6 miles to a road that comes in from the left (east). Turn onto this road and drive 0.6 miles to and intersection. Continue through the intersection to a road that comes in from the right (south). Turn onto this road and drive 150 feet to a witness post on the left side of the road. From the witness post walk 9 paces at 135°M to the 0-foot stake that is marked with browse tag #44.



Map name: Newcastle

Diagrammatic Sketch

Township 36S , Range 15W , Section 29

GPS: NAD 27, UTM 12S 4168313 N, 273599 E

## DISCUSSION

### New Castle Bullhog - Trend Study No. 30R-1

The New Castle Bullhog study is located on land managed by the Bureau of Land Management just south of Newcastle, UT and is part of the Pinto Creek grazing allotment. The elevation is 5,550 feet on a northwest exposure with a 5% slope. The range type is an association of Wyoming big sagebrush, Utah juniper, and pinyon pine. Over the years, pinyon and juniper encroachment has reached a point that it is beginning to crowd out important forage species for wintering mule deer. In October of 2004, a bullhog was used to thin and remove the pinyon and junipers on 900 acres. Pellet group data from 2004 estimated 72 deer days use/acre (177 ddu/ha).

The soil texture is a sandy loam with an effective rooting depth of 13 inches. The soil reaction is neutral with a pH of 7.3. Rock cover was estimated at 3% and pavement was estimated at 38%. A coarse rock layer exists at about 10-12 inches, which may be a barrier to roots. Bare ground cover was fairly moderate at 18%. The ratio of protective ground cover (vegetation, litter, and cryptogams) to bare ground was moderate at 2.3:1. The erosion condition class determined soil movement as slight in 2004.

The key browse species are Wyoming big sagebrush and a Mexican cliffrose. There may be a hybridization between Wyoming big sagebrush and Black sagebrush, but was difficult to distinguish between them. Wyoming big sagebrush cover was estimated at 6% with a density of 2,580 plants/acre. Decadence was moderately high at 40% and 29% of the population was classified as dying in 2004. Utilization was moderate to heavy and annual leader growth only averaged 1.5 inches. Several of the plants only contained seedstalks and no leaders due to late stages of decadence. A few Mexican cliffrose plants were scattered throughout the site and were heavily utilized. They were tall and only partially available to wildlife. Narrowleaf low rabbitbrush showed signs of moderate use, although not very common on the site.

Utah juniper canopy cover was estimated at 16% with a density of 116 trees/acre. The mean diameter of the trunk averaged 8.2 inches and range from small plant of 1-4 feet tall to mature plants over 12 feet tall. Pinyon pine canopy cover was estimated at 7% with a density of 64 trees/acre. The mean diameter of the trunk averaged 2.8 inches and plants also ranged from 1-4 feet tall to large trees 8-12 feet tall.

The herbaceous understory was dominated by perennial grasses. Galleta was the most abundant species averaging 4% cover and Indian ricegrass was next at 1.5%. Other grasses include squirreltail, needle-and-thread, and sand dropseed. Cheatgrass had very little cover in 2004, but was in 14% of the quadrats. Eight forbs were sampled, but none are common on the site.

The Desirable Components Index rated this site as poor with a score of 23 due to low preferred browse cover and high decadence.

### 2004 winter range condition (DC Index) - poor (23) Lower Potential scale

#### HERBACEOUS TRENDS --

Management unit 30R, Study no: 1

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	Bromus tectorum (a)	33	.12
G	Hilaria jamesii	112	3.89
G	Oryzopsis hymenoides	35	1.58

T y p e	Species	Nested Frequency	Average Cover %
		'04	'04
G	<i>Sitanion hystrix</i>	8	.04
G	<i>Sporobolus cryptandrus</i>	2	.03
G	<i>Stipa comata</i>	3	.00
Total for Annual Grasses		33	0.12
Total for Perennial Grasses		160	5.55
Total for Grasses		193	5.68
F	<i>Arabis</i> spp.	1	.00
F	<i>Eriogonum cernuum</i> (a)	5	.01
F	<i>Lupinus</i> spp.	2	.00
F	<i>Penstemon</i> spp.	1	.00
F	<i>Penstemon pachyphyllus</i>	1	.01
F	<i>Phlox longifolia</i>	3	.00
F	<i>Streptanthus cordatus</i>	7	.01
F	<i>Swertia albomarginata</i>	1	.00
Total for Annual Forbs		5	0.00
Total for Perennial Forbs		16	0.04
Total for Forbs		21	0.05

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

#### BROWSE TRENDS --

Management unit 30R, Study no: 1

T y p e	Species	Strip Frequency	Average Cover %
		'04	'04
B	<i>Artemisia tridentata wyomingensis</i>	57	5.91
B	<i>Chrysothamnus viscidiflorus stenophyllus</i>	6	.41
B	<i>Cowania mexicana stansburiana</i>	1	.18
B	<i>Ephedra viridis</i>	3	-
B	<i>Gutierrezia sarothrae</i>	0	-
B	<i>Juniperus osteosperma</i>	7	6.78
B	<i>Opuntia</i> spp.	4	.18
B	<i>Pinus edulis</i>	7	3.37
Total for Browse			16.84

CANOPY COVER, LINE INTERCEPT --  
 Management unit 30R, Study no: 1

Species	Percent Cover '04
Artemisia tridentata wyomingensis	4.36
Cowania mexicana stansburiana	.08
Juniperus osteosperma	15.91
Opuntia spp.	.08
Pinus edulis	7.18

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 30R, Study no: 1

Species	Average leader growth (in) '04
Artemisia tridentata wyomingensis	1.6

POINT-QUARTER TREE DATA --  
 Management unit 30R, Study no: 1

Species	Trees per Acre '04	Average diameter (in) '04
Juniperus osteosperma	116	8.2
Pinus edulis	64	2.8

BASIC COVER --  
 Management unit 30R, Study no: 1

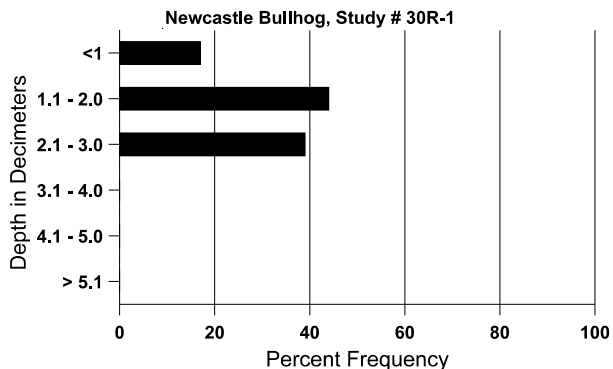
Cover Type	Average Cover % '04
Vegetation	21.56
Rock	3.05
Pavement	38.31
Litter	32.65
Cryptogams	.66
Bare Ground	18.23

SOIL ANALYSIS DATA --

Management unit 30R, Study no: 1, Study Name: New Castle Bullhog

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.9	71.8 (13.9)	7.3	63.0	18.8	18.2	2.3	7.8	182.4	0.8

### Stoniness Index



PELLET GROUP DATA --

Management unit 30R, Study no: 1

Type	Quadrat Frequency	Days use per acre (ha)
	'04	'04
Rabbit	47	-
Deer	23	72 (177)

BROWSE CHARACTERISTICS --

Management unit 30R, Study no: 1

Year	Plants per Acre (excluding seedlings)	Age class distribution (plants per acre)					Utilization					
		Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
04	<b>2580</b>	-	-	1560	1020	1440	41	26	40	29	29	16/24
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
04	<b>120</b>	-	-	120	-	-	17	33	-	-	0	8/10
<i>Cowania mexicana stansburiana</i>												
04	<b>20</b>	-	-	-	20	-	0	100	100	-	0	71/75
<i>Ephedra viridis</i>												
04	<b>100</b>	-	-	80	20	20	0	100	20	-	0	18/25
<i>Gutierrezia sarothrae</i>												
04	<b>0</b>	-	-	-	-	-	0	0	-	-	0	9/9
<i>Juniperus osteosperma</i>												
04	<b>140</b>	-	40	100	-	40	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Opuntia spp.												
04	<b>80</b>	-	-	80	-	-	0	0	-	-	0	5/10
Pinus edulis												
04	<b>140</b>	-	80	60	-	-	0	0	-	-	0	-/-