

Trend Study 1R-4-05

Study site name: Coldwater 1.

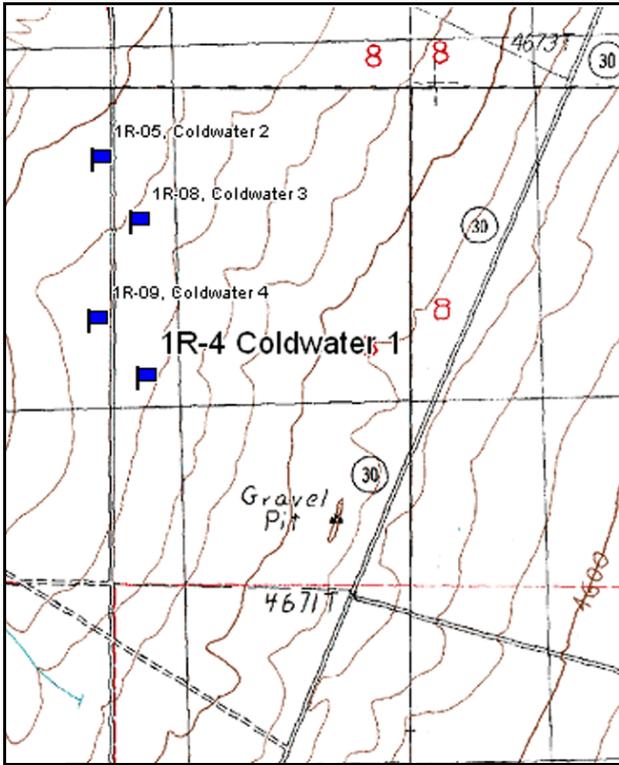
Vegetation type: Burn, Spray, Seeded.

Compass bearing: frequency baseline 73 degrees magnetic.

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

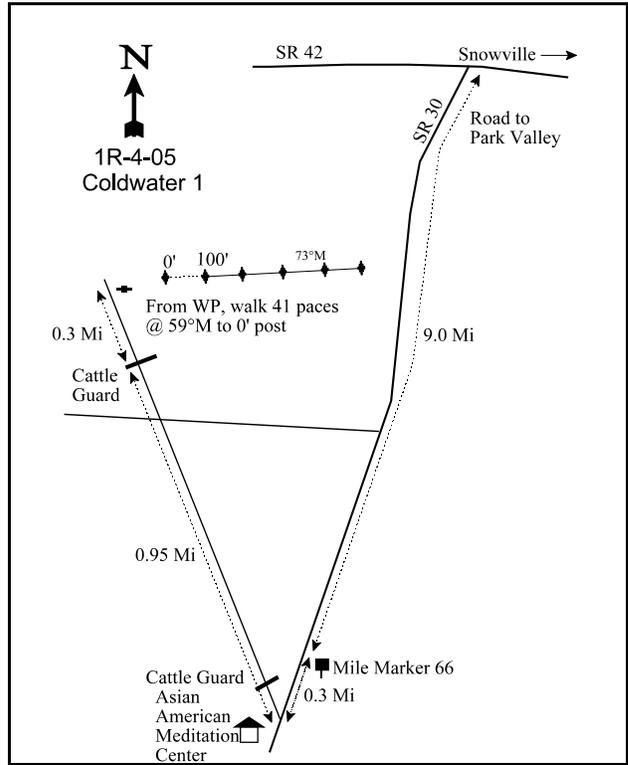
LOCATION DESCRIPTION

Head west on SR-42 from Snowville, UT to Curlew Junction and turn south (left) onto SR-30 and drive toward Park Valley, UT. Drive to mile marker 66 and proceed another 0.3 miles to the Asian American Meditation Center on the right and turn right. Drive north on this dirt road 0.95 miles to a cattle guard and continue another 0.3 miles to the witness post on the east (right) side of the road. From the witness post, walk 41 paces at 59°M to the 0' stake. The 0' stake is marked with browse tag #56.



Map Name: Black Butte

Township 13 N, Range 11 W, Section 8



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4637053 N, 322884 E

## DISCUSSION

### Coldwater 1 – 1R-04

The Coldwater 1 study was established to monitor a two-treatment project to test the effectiveness of Plateau on cheatgrass. Three other monitoring studies were established to compare the results. The treatment areas are located approximately 10 miles northeast of Park Valley, Utah.

The study is located on an eastern aspect with a 2% slope at 4,800 feet. In 2005, estimated pellet group data was 12 cow days use/acre (29 cdu/ha).

The soil is a shallow loam with an effective rooting depth of 13 inches. In 2004, 6% of the soil surface was covered with rock and pavement. The phosphorus concentration is 6.5 ppm, values less than 6 ppm may hinder normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.6). Bare ground cover was 14% in 2005. The 2005 soil erosion condition measurement determined the soil to be stable.

Wyoming big sagebrush was the key browse species, but appears to have been treated to improve grazing. It provided no cover in 2005 and the density of living sagebrush plants was 60 plants/acre, all of which were mature. Dead plant density was 6,820 plants/acre. Use was light and annual leader growth was not measured. Rubber rabbitbrush was also sampled, but density was only 200 plants/acre.

Six species of grasses were sampled in 2005, 2 of which were annuals. Cheatgrass is the dominant grass. It provided 46% cover in 2005 with 100% quadrat frequency. Sixweeks fescue provided nearly 2% cover and 53% quadrat frequency. Sandberg bluegrass was the only perennial grass with 1% cover. The other 3 perennial grasses provided less than 1% cover combined. Crested wheatgrass is present, but was only sampled in 3% of the quadrats.

Fifteen species of forbs were sampled in 2005, 10 of which were perennials. Low fleabane was the dominant forb species in 2005 with 12% cover and 100% quadrat frequency. Russian thistle provided 10% cover at 99% quadrat frequency. Burr buttercup provided nearly 4% cover with 78% quadrat frequency. Western salsify and tumble mustard provided 1% cover each.

### 2005 Pretreatment Assessment

The site is dominated by cheatgrass. The browse and native herbaceous understory components are being out-competed by the cheatgrass. It could be difficult and costly to remove the weeds in this area. The Desirable Components Index score is very poor due to the lack of browse, low perennial grass cover, and very high annual grass cover.

2005 winter range condition (DC Index) –very poor (-6) Lower potential scale

### HERBACEOUS TRENDS --

Management unit 01R, Study no: 4

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	3	.10
G	Bromus tectorum (a)	488	45.69
G	Oryzopsis hymenoides	7	.33

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Poa secunda</i>	42	1.11
G	<i>Sitanion hystrix</i>	5	.33
G	<i>Vulpia octoflora</i> (a)	158	1.89
Total for Annual Grasses		646	47.59
Total for Perennial Grasses		57	1.87
Total for Grasses		703	49.46
F	<i>Astragalus</i> spp.	5	.21
F	Unknown cruciferae	5	.06
F	<i>Descurainia pinnata</i> (a)	13	.05
F	<i>Erodium cicutarium</i> (a)	13	.24
F	<i>Erigeron pumilus</i>	1	.00
F	<i>Lactuca serriola</i>	403	11.85
F	<i>Malcolmia africana</i>	7	.06
F	<i>Machaeranthera canescens</i>	1	.03
F	<i>Phlox longifolia</i>	5	.04
F	<i>Ranunculus testiculatus</i> (a)	237	3.65
F	<i>Salsola iberica</i> (a)	416	9.88
F	<i>Senecio</i> spp.	2	.03
F	<i>Sisymbrium altissimum</i> (a)	52	1.14
F	<i>Sphaeralcea coccinea</i>	15	.48
F	<i>Tragopogon dubius</i>	27	1.05
Total for Annual Forbs		731	14.98
Total for Perennial Forbs		471	13.84
Total for Forbs		1202	28.82

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

#### BROWSE TRENDS --

Management unit 01R, Study no: 4

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	3	.00
B	<i>Chrysothamnus nauseosus</i>	5	.34
Total for Browse		8	0.34

CANOPY COVER, LINE INTERCEPT --  
 Management unit 01R, Study no: 4

Species	Percent Cover
	'05
Artemisia tridentata vaseyana	.15
Chrysothamnus nauseosus	.83

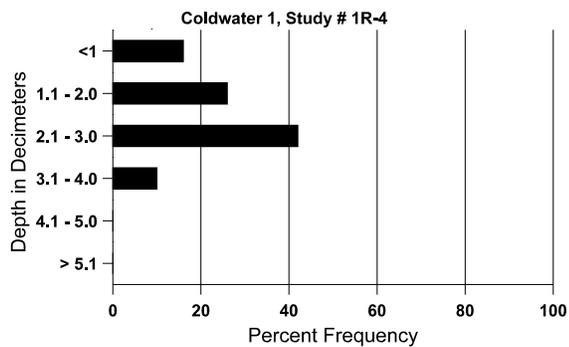
BASIC COVER --  
 Management unit 01R, Study no: 4

Cover Type	Average Cover %
	'05
Vegetation	67.18
Rock	.98
Pavement	5.35
Litter	16.92
Cryptogams	.28
Bare Ground	14.10

SOIL ANALYSIS DATA --  
 Management unit 1R, Study no: 4, Study Name: Cold Water 1

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.3	57.8 (14.0)	7.6	34.2	42.0	23.8	1.0	6.5	492.8	0.6

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 01R, Study no: 4

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	1	-
Cattle	4	12 (29)

BROWSE CHARACTERISTICS --  
 Management unit 01R, 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>												
05	<b>60</b>	-	-	60	-	6820	0	0	-	-	0	20/26
<i>Chrysothamnus nauseosus</i>												
05	<b>200</b>	-	-	180	20	220	0	0	10	10	10	19/25

Trend Study 1R-5-05

Study site name: Coldwater 2.

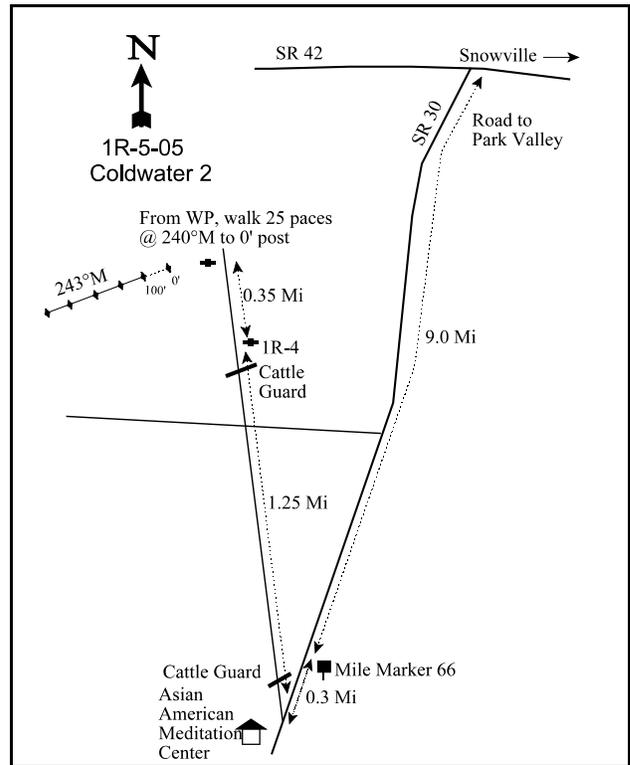
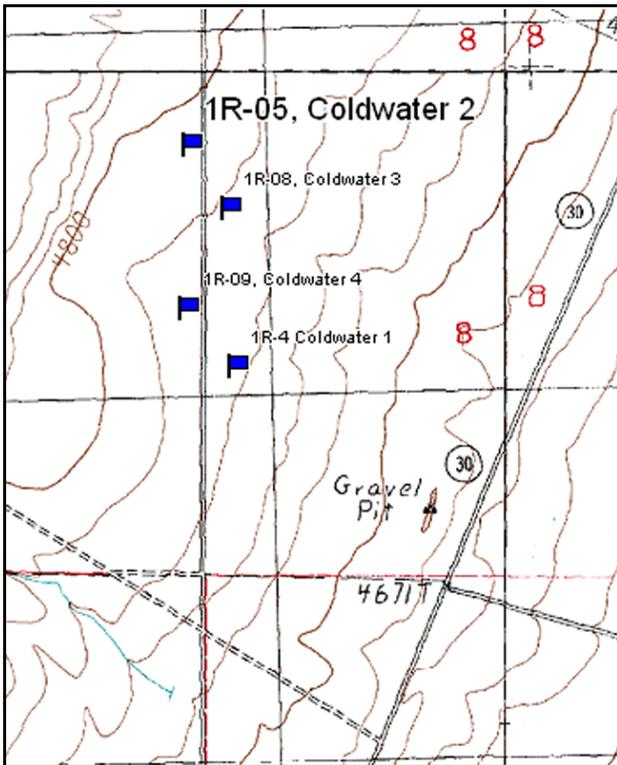
Vegetation type: Burn, Spray, Seeded.

Compass bearing: frequency baseline 243 degrees magnetic.

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

LOCATION DESCRIPTION

Head west on SR-42 from Snowville, UT to Curlew Junction and turn south (left) onto SR-30 and drive toward Park Valley, UT. Drive to mile marker 66 and proceed another 0.3 miles to the Asian American Meditation Center on the right and turn right. Drive north on this dirt road 1.25 miles to the witness post of 1R-4 on the east (right) side of the road. Continue 0.35 miles to the witness post on the west (left) of the road. From the witness post, walk 25 paces at 240°M to the 0' stake. The 0' stake is marked with browse tag #57.



Map Name: Black Butte

Diagrammatic Sketch

Township 13 N, Range 11 W, Section 7

GPS: NAD 27, UTM 12T 4637658 N, 322773 E

## DISCUSSION

### Coldwater 2 – 1R-05

The Coldwater 2 study was established to monitor a two-treatment project to test the effectiveness of Plateau on cheatgrass. Three other monitoring studies were established to compare the results. The treatment areas are located approximately 10 miles northeast of Park Valley, Utah.

The study is located on an eastern aspect with a 2% slope at 4,800 feet. In 2005, estimated pellet group data was 46 cow days use/acre (115 cdu/ha). Cattle pats were from the spring.

The soil is a shallow clay loam with an effective rooting depth of 10 inches. In 2004, 4% of the soil surface was covered with rock and pavement. A high rock percentage is found in the profile. The phosphorus concentration is 6.6 ppm, values less than 6 ppm may hinder normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is moderately alkaline (8.2). Bare ground cover was 26% in 2005. The 2005 soil erosion condition measurement determined the soil to be stable.

Wyoming big sagebrush was the key browse species, but appears to have been treated to improve grazing. It provided one-half percent cover in 2005 and the density of living sagebrush plants was 100 plants/acre, 80% of which were mature. Decadent plants made up 20% of the population. Dead plant density was 6,260 plants/acre. Use was light and annual leader growth was not measured.

Five species of grasses were sampled in 2005, 2 of which were annuals. Cheatgrass is the dominant grass. It provided 29% cover in 2005 with 99% quadrat frequency. Sandberg bluegrass and squirreltail bottlebrush provided nearly 1% cover each. Crested wheatgrass is present, but was only sampled in 1% of the quadrats.

Fifteen species of forbs were sampled in 2005, 10 of which were perennials. Burr buttercup was the dominant forb with 15% cover and 97% quadrat frequency. Prickly lettuce and clasping pepperweed provided 8% cover each. Russian thistle provided 1% cover with a quadrat frequency of 37%.

### 2005 Pretreatment Assessment

The site is dominated by cheatgrass. The browse and native herbaceous understory components are being out-competed by the cheatgrass. It could be difficult and costly to remove the weeds in this area. The Desirable Components Index score is very poor due to the lack of browse, low perennial grass cover, and very high annual grass cover.

2005 winter range condition (DC Index) –very poor (-6) Lower potential scale

### HERBACEOUS TRENDS --

Management unit 01R, Study no: 5

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	1	.04
G	Bromus tectorum (a)	450	29.08
G	Poa secunda	54	.76
G	Sitanion hystrix	30	.95
G	Vulpia octoflora (a)	31	.13

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
	Total for Annual Grasses	481	29.21
	Total for Perennial Grasses	85	1.75
	Total for Grasses	566	30.96
F	Allium spp.	10	.05
F	Astragalus spp.	3	.03
F	Cardaria draba	34	.75
F	Descurainia pinnata (a)	13	.04
F	Lactuca serriola	269	8.35
F	Lepidium perfoliatum	107	8.00
F	Malcolmia africana	9	.21
F	Medicago sativa	-	.00
F	Phlox longifolia	5	.04
F	Polygonum douglasii (a)	2	.01
F	Ranunculus testiculatus (a)	396	15.31
F	Salsola iberica (a)	126	1.04
F	Sisymbrium altissimum (a)	4	.03
F	Sphaeralcea coccinea	5	.16
F	Tragopogon dubius	19	.31
	Total for Annual Forbs	541	16.45
	Total for Perennial Forbs	461	17.93
	Total for Forbs	1002	34.38

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

#### BROWSE TRENDS --

Management unit 01R, Study no: 5

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata wyomingensis	4	.53
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Kochia prostrata	1	.15
B	Opuntia spp.	0	-
	Total for Browse	5	0.68

CANOPY COVER, LINE INTERCEPT --  
 Management unit 01R, Study no: 5

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	.15

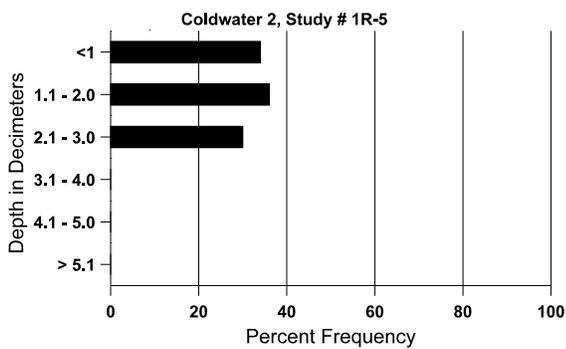
BASIC COVER --  
 Management unit 01R, Study no: 5

Cover Type	Average Cover %
	'05
Vegetation	56.84
Rock	1.08
Pavement	2.57
Litter	27.95
Cryptogams	2.98
Bare Ground	26.48

SOIL ANALYSIS DATA --  
 Management unit 1R, Study no: 5, Study Name: Cold Water 2

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.7	56.4 (20.6)	8.2	24.2	41.0	34.8	1.1	6.6	937.6	0.9

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 01R, Study no: 5

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	3	-
Cattle	13	46 (115)

BROWSE CHARACTERISTICS --  
 Management unit 01R, 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>												
05	<b>100</b>	-	-	80	20	6260	0	0	20	-	0	20/22
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	13/17
<i>Kochia prostrata</i>												
05	<b>20</b>	-	-	20	-	-	100	0	-	-	0	-/-
<i>Opuntia spp.</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	5/8

Trend Study 1R-6-05

Study site name: Hereford 1.

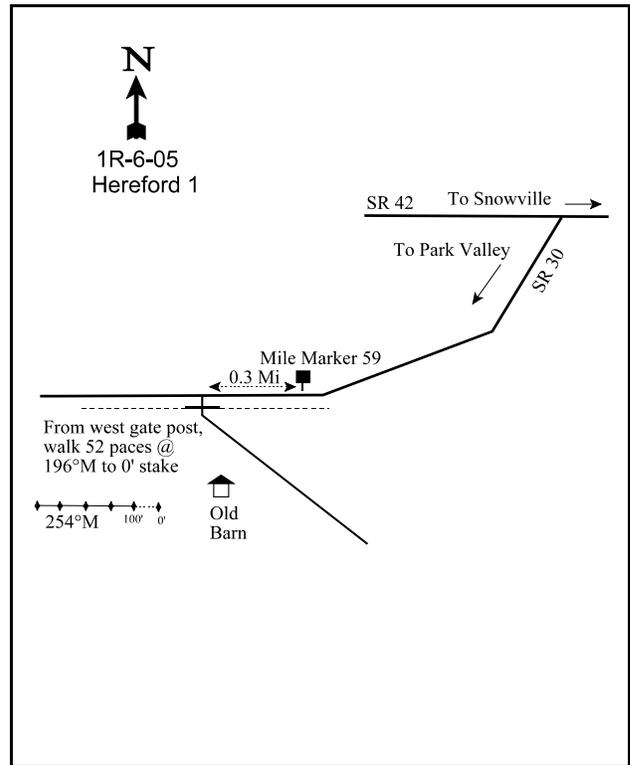
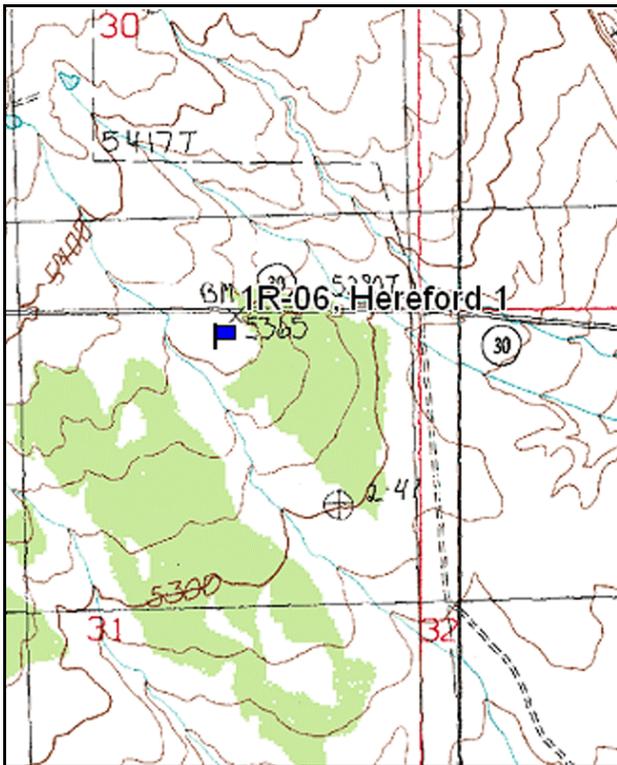
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 254 degrees magnetic.

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

LOCATION DESCRIPTION

Head west on SR-42 from Snowville, UT to Curlew Junction and turn south (left) onto SR-30 and drive toward Park Valley, UT. Drive to mile marker 59 and proceed another 0.3 miles to a gate on the south (left) side of the road with a “No Trespassing” sign. There is a small burn area just inside the gate. From the west (right) post, walk 52 paces at 254°M to the 0' stake. The 0' stake is marked with browse tag #58.



Map Name: Park Valley

Diagrammatic Sketch

Township 13 N, Range 12 W, Section 31

GPS: NAD 27, UTM 12T 4631660 N, 312495 E

## DISCUSSION

### Hereford 1 – 1R-06

This study was basin big sagebrush dominated system that was originally to be disked and drill seeded in the autumn of 2005, but was accidentally burned in the Park Valley fire in July of 2005. The fire burned 18,000 acres of private, SITLA, and BLM land southeast of Park Valley. The burn was drill seeded in some areas and aerially seeded then chained with a smooth chain on other areas in November of 2005. Forage kochia was seeded aerially in March of 2006. The study site is located in the northern tip of the burn and appears have been completely burned, although the last 100-200 feet may remain undisturbed. It is located just south of SR 30 around 3.5 miles east of Park Valley. The study is on a 3% slope with a southwest aspect at 5,350 feet in elevation. Estimated animal use in 2005 was 17 deer, 12 cow, and 1 sheep days use/acre (43 ddu/ha, 30 cdu/ha, and 2 sdu/ha).

The soil is a shallow loam with an effective rooting depth of 12 inches. Phosphorus concentrations are 6.5 ppm, values less than 6 ppm may hinder normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The pH is mildly alkaline (7.5). The majority of rock and pavement measured in the soil profile is between 4-8 inches deep. The pavement cover was nearly 5% in 2005. Bare ground cover was 35%. Erosion is evident, although not extreme. Two large gullies cross the baseline transect and there is also obvious soil movement and pedestalling around shrubs. The 2005 erosion condition measurement was slight.

Basin big sagebrush is the key browse species. It provided 13% cover, 81% of the browse cover, in 2005. Sagebrush density was 2,540 plants/acre, 36% of which were decadent. Dying individuals made up 18% of the population and young individuals only made up 5%. A very large number of seedlings were measured in 2005. Other species sampled in low numbers include: rubber rabbitbrush, whitestem rubber rabbitbrush, stickyleaf low rabbitbrush, cactus, black greasewood. Utah juniper was also sampled, but provided less than 1% cover.

Grass diversity was moderate to high previous to the fire. Seven total grass species were sampled in 2005, 6 of which were perennial species. Grass species included: crested wheatgrass, thickspike wheatgrass, cheatgrass, Indian ricegrass, bulbous bluegrass, Sandberg's bluegrass, and bottlebrush squirreltail. Cheatgrass provided the most cover with 7% and a quadrat frequency of 90%. Bulbous bluegrass, also an invasive increaser species, was identified on the study, but only once. Crested wheatgrass provided the most perennial species cover (6%) and quadrat frequency (71%).

Forb diversity was relatively low. Thirteen forb species were identified in 2005, 7 of which were annual species. Only one species, burr buttercup, provided more than 1/5 of a percent cover. It, however, provided 28% cover and was sampled in 98% of the quadrats

### 2005 Pretreatment Assessment

There is some soil erosion in the treatment area, which could increase after the fire with the shrubs no longer holding the soil. The basin big sagebrush was relatively healthy with moderate cover and density. After the fire, it will be completely, or nearly completely, removed. Grasses and forbs are dominated by cheatgrass and burr buttercup, which could prevent desirable and seeded species from establishing following the fire. Bulbous bluegrass could also spread with the disturbance of the area and prevent desirable species from establishing. The Desirable Components Index score was fair due moderate browse cover and perennial grasscover.

2005 winter range condition (DC Index) –fair (36) Lower potential scale

The following tables show the species seeded on the burn. The first table shows the species that were drill seeded in November 2005 and the second table shows the sources of the Kochia that was aerielly seeded in March 2006.

Species in mix	Bulk lbs per acre	PLS lbs/acre
Crested Wheatgrass 'Hycrest'	1.4	1.3
Crested Wheatgrass 'Douglas'	0.3	0.2
Crested Wheatgrass 'Ephraim'	0.3	0.2
Siberian Wheatgrass 'Vavilov'	0.7	0.7
Siberian Wheatgrass 'Vavilov'	0.1	0.1
Great Basin Wildrye 'Trailhead'	1.0	0.8
Alfalfa 'Ladak-'	0.1	0.1
Alfalfa 'Nomad'	0.5	0.4
Alfalfa 'Spredor 4'	0.5	0.4
Sainfoin 'Eski'	2.4	2.2
Sainfoin 'Eski'	0.6	0.6
Small Burnet 'Delar'	1.8	1.7
Russian Wildrye 'Bozoisky'	0.1	0.1
Russian Wildrye	0.8	0.7
Russian Wildrye 'Bozoisky'	0.2	0.1
Snake River Wheatgrass 'Secar'	0.2	0.2
Snake River Wheatgrass 'Secar'	0.8	0.8
Fourwing Saltbush--Sevier UT	0.0	0.0
Fourwing Saltbush--Beaver UT	0.2	0.1
Small Burnet 'Delar'	0.2	0.2
<b>Total</b>		<b>10.9</b>

Species in mix	Bulk lbs per acre	PLS lbs/acre
Forage Kochia--Beaver UT	1.4	0.1
Forage Kochia--Beaver UT	1.2	0.3
Forage Kochia--Sanpete UT	1.3	0.4
<b>Total</b>	<b>3.9</b>	<b>0.7</b>

HERBACEOUS TRENDS --  
Management unit 01R, Study no: 6

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	193	5.94
G	Agropyron dasystachyum	-	.00
G	Bromus tectorum (a)	328	7.27
G	Oryzopsis hymenoides	21	.03
G	Poa bulbosa	1	.00

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Poa secunda</i>	57	1.50
G	<i>Sitanion hystrix</i>	12	.14
Total for Annual Grasses		328	7.27
Total for Perennial Grasses		284	7.62
Total for Grasses		612	14.90
F	<i>Alyssum alyssoides</i> (a)	4	.01
F	<i>Allium</i> spp.	1	.00
F	<i>Calochortus nuttallii</i>	-	.00
F	<i>Descurainia pinnata</i> (a)	32	.13
F	<i>Gilia</i> spp. (a)	1	.00
F	<i>Iva axillaris</i>	13	.10
F	<i>Lactuca serriola</i>	1	.00
F	<i>Lepidium</i> spp. (a)	5	.06
F	<i>Microsteris gracilis</i> (a)	7	.04
F	<i>Phlox longifolia</i>	8	.02
F	<i>Ranunculus testiculatus</i> (a)	435	27.82
F	<i>Salsola iberica</i> (a)	2	.00
F	<i>Zigadenus paniculatus</i>	1	.03
Total for Annual Forbs		486	28.08
Total for Perennial Forbs		24	0.17
Total for Forbs		510	28.25

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

#### BROWSE TRENDS --

Management unit 01R, Study no: 6

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata tridentata</i>	75	12.73
B	<i>Chrysothamnus nauseosus</i>	9	.48
B	<i>Chrysothamnus nauseosus hololeucus</i>	2	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	1	.03
B	<i>Juniperus osteosperma</i>	0	.41
B	<i>Opuntia</i> spp.	1	-
B	<i>Sarcobatus vermiculatus</i>	4	2.00
Total for Browse		92	15.67

CANOPY COVER, LINE INTERCEPT --  
 Management unit 01R, Study no: 6

Species	Percent Cover
	'05
Artemisia tridentata tridentata	14.39
Chrysothamnus nauseosus	.53
Chrysothamnus viscidiflorus viscidiflorus	.18
Juniperus osteosperma	.65
Sarcobatus vermiculatus	2.50

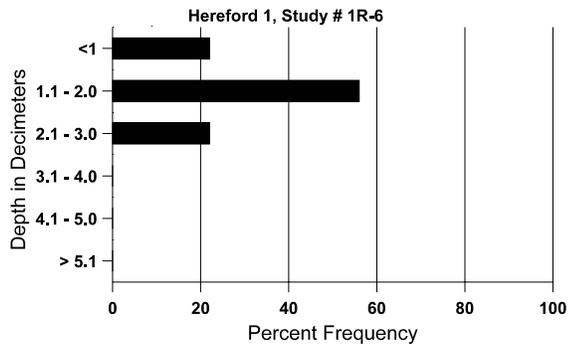
BASIC COVER --  
 Management unit 01R, Study no: 6

Cover Type	Average Cover %
	'05
Vegetation	52.07
Rock	.31
Pavement	4.68
Litter	22.42
Cryptogams	.71
Bare Ground	35.41

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

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.6	56.0 (11.2)	7.5	37.2	39.0	23.8	1.5	6.5	640.0	0.6

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 01R, Study no: 6

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	35	-
Elk	1	-
Deer	7	17 (43)
Cattle	10	12 (30)
Sheep	-	1 (2)

BROWSE CHARACTERISTICS --  
 Management unit 01R, 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 tridentata</i>												
05	<b>2540</b>	2920	120	1500	920	1240	5	0	36	18	18	36/41
<i>Chrysothamnus nauseosus</i>												
05	<b>180</b>	40	20	160	-	-	22	11	-	-	0	23/35
<i>Chrysothamnus nauseosus hololeucus</i>												
05	<b>40</b>	-	20	20	-	-	0	0	-	-	0	19/21
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	14/20
<i>Juniperus osteosperma</i>												
05	<b>0</b>	-	-	-	-	20	0	0	-	-	0	-/-
<i>Opuntia spp.</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	9/11
<i>Sarcobatus vermiculatus</i>												
05	<b>120</b>	340	40	80	-	60	0	0	-	-	0	34/47

Trend Study 1R-7-05

Study site name: Hereford 2.

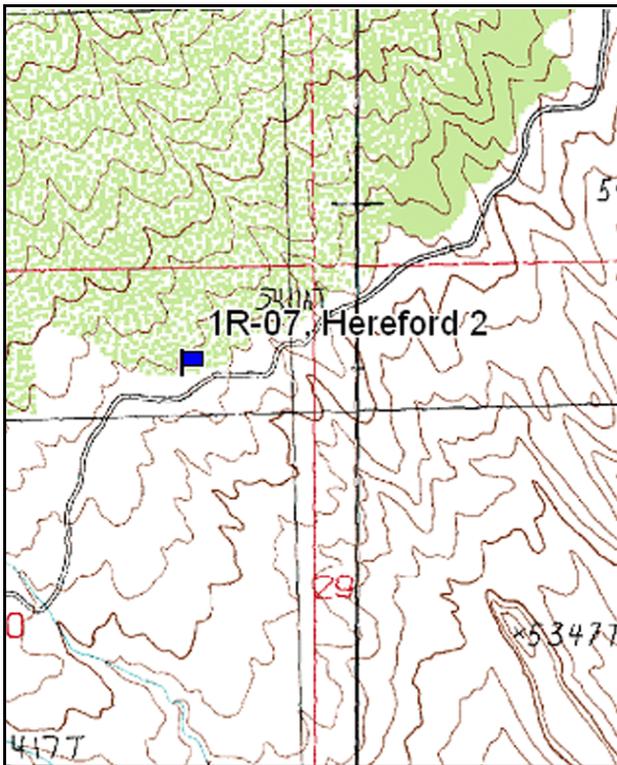
Vegetation type: P-J/ Black Sagebrush.

Compass bearing: frequency baseline 323 degrees magnetic.

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

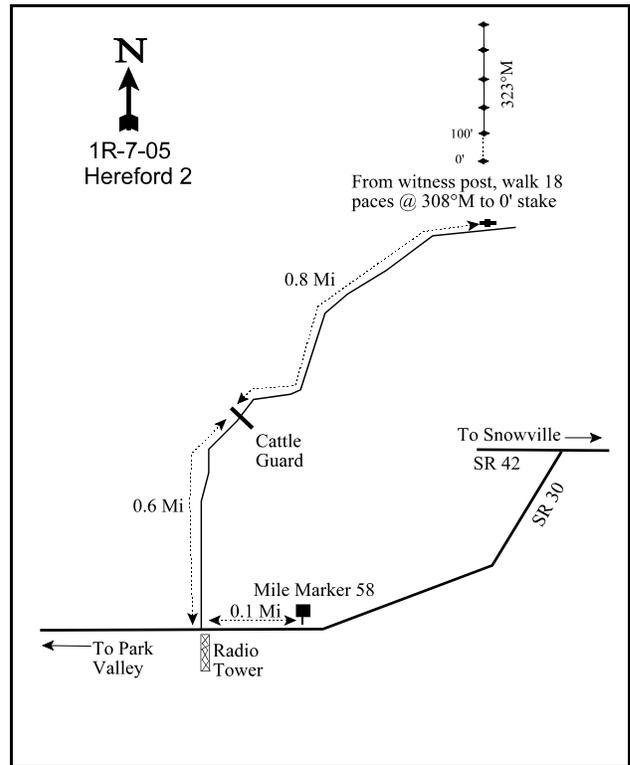
LOCATION DESCRIPTION

Head west on SR-42 from Snowville, UT to Curlew Junction and turn south (left) onto SR-30 and drive toward Park Valley, UT. Drive to mile marker 58 and proceed another 0.1 miles to a radio tower on the on the south (left) side of the road. Turn north (right) through a gate with a private property sign. Follow the road for 0.6 miles to a cattle guard. Continue on the road for 0.8 miles to the witness post on the left. From the witness post, walk 18 paces at 308°M to the 0' stake. The site is on the ridge. The 0' stake is marked with browse tag #59.



Map Name: Park Valley

Township 13 N, Range 12 W, Section 30



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4633093 N, 312727 E

## DISCUSSION

### Hereford 2 – 1R-07

The Hereford 2 study was established to monitor a pinyon-juniper removal project approximately 4 miles northeast of Park Valley, Utah. The project included 600 acres of pinyon-juniper that was planned to be chained and seeded in 2005, but has not yet taken place.

The soil is a shallow loam with an effective rooting depth of 14 inches. The soil is very rocky and gravelly on the surface and in the profile. Rock and pavement cover was 35% in 2004. The soil phosphorus concentration was 6.9 ppm, values less than 6 ppm may limit normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.4). The erosion state was slight slight in 2005 due to slight surface litter movement, slight pedestalling, slight flow patterns, and moderate gully erosion.

The key browse species is black sagebrush. It provided nearly 8% cover in 2005 with a density of 3,220 plants/acre. Mature individuals made up 49% of the population, decadent individuals made up 41%, and young made up 10%. Plants classified as dying made up 17% of the population. Use was light and the average annual browse leader growth was 1.2 inches in 2005.

Juniper dominated the area in 2005. It provided 15% canopy cover. The estimated juniper density was 472 trees/acre with an average trunk diameter of 4.2 inches in 2005. 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.

Seven species of grasses were sampled in 2005, 2 of which were annuals. Cheatgrass was the dominant grass species with slightly more than 1% cover and a quadrat frequency of 90%. The other 6 grass species provided less than 2% cover combined.

Twenty-three species of forbs were sampled in 2005, 7 of which were annuals. Pinnate tansymustard and a species of gilia were the dominant forb species with nearly 1% cover provided by each species. Forbs provided less than 4% cover combined.

### 2005 Pretreatment Assessment

The juniper canopy is decreasing browse and understory growth. The chaining treatment should improve the browse and herbaceous understory components, especially if the studies area seeded. The Desirable Components Index score was poor due to moderate browse cover, low perennial grass cover, and low perennial forb cover.

2005 winter range condition (DC Index) –poor (24) Lower potential scale

HERBACEOUS TRENDS --  
Management unit 01R, Study no: 7

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	28	.28
G	Agropyron spicatum	13	.40
G	Bromus tectorum (a)	240	1.45

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Oryzopsis hymenoides</i>	13	.40
G	<i>Poa secunda</i>	23	.45
G	<i>Sitanion hystrix</i>	7	.07
G	<i>Vulpia octoflora</i> (a)	13	.08
Total for Annual Grasses		253	1.53
Total for Perennial Grasses		84	1.62
Total for Grasses		337	3.15
F	<i>Arabis</i> spp.	4	.04
F	<i>Arenaria</i> spp.	1	.00
F	<i>Astragalus</i> spp.	6	.04
F	<i>Astragalus utahensis</i>	3	.03
F	<i>Calochortus nuttallii</i>	8	.01
F	<i>Chaenactis douglasii</i>	5	.04
F	<i>Cordylanthus</i> spp. (a)	37	.29
F	<i>Cryptantha</i> spp.	11	.05
F	<i>Descurainia pinnata</i> (a)	100	.87
F	<i>Draba</i> spp. (a)	10	.01
F	<i>Eriogonum</i> spp.	7	.07
F	<i>Eriogonum ovalifolium</i>	31	.18
F	<i>Erigeron pumilus</i>	1	.00
F	<i>Eriogonum umbellatum</i>	16	.33
F	<i>Gayophytum ramosissimum</i> (a)	7	.01
F	<i>Gilia</i> spp. (a)	108	.91
F	<i>Lappula occidentalis</i> (a)	14	.02
F	<i>Lactuca serriola</i>	7	.03
F	<i>Penstemon</i> spp.	2	.01
F	<i>Phlox austromontana</i>	14	.16
F	<i>Phlox longifolia</i>	4	.03
F	<i>Ranunculus testiculatus</i> (a)	65	.33
F	<i>Streptanthus cordatus</i>	26	.12
Total for Annual Forbs		341	2.47
Total for Perennial Forbs		146	1.19
Total for Forbs		487	3.66

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

BROWSE TRENDS --

Management unit 01R, Study no: 7

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia nova	67	7.55
B	Chrysothamnus viscidiflorus	6	.01
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Eriogonum microthecum	3	.03
B	Gutierrezia sarothrae	7	.01
B	Juniperus osteosperma	20	5.97
B	Leptodactylon pungens	13	.24
B	Opuntia spp.	3	-
Total for Browse		119	13.81

CANOPY COVER, LINE INTERCEPT --

Management unit 01R, Study no: 7

Species	Percent Cover
	'05
Artemisia nova	9.21
Chrysothamnus viscidiflorus	.10
Gutierrezia sarothrae	.10
Juniperus osteosperma	14.98
Leptodactylon pungens	.08

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 01R, Study no: 7

Species	Average leader growth (in)
	'05
Artemisia nova	1.2

POINT-QUARTER TREE DATA --

Management unit 01R, Study no: 7

Species	Trees per Acre	Average diameter (in)
	'05	'05
Juniperus osteosperma	472	4.2

**BASIC COVER --**

Management unit 01R, Study no: 7

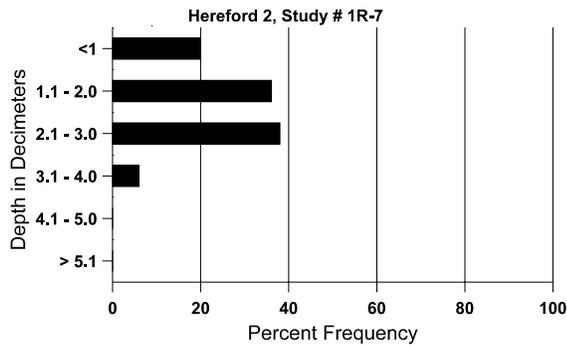
Cover Type	Average Cover %
	'05
Vegetation	19.14
Rock	2.54
Pavement	32.43
Litter	23.65
Cryptogams	2.41
Bare Ground	33.67

**SOIL ANALYSIS DATA --**

Management unit 1R, Study no: 7, Study Name: Hereford 2

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
13.7	53.0 (14.9)	7.4	37.2	40.0	22.8	1.9	6.9	243.2	0.5

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 01R, Study no: 7

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	64	-
Deer	6	-
Cattle	1	3 (7)

BROWSE CHARACTERISTICS --  
 Management unit 01R, 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>												
05	<b>3220</b>	5120	320	1580	1320	720	0	0	41	17	17	11/24
<i>Chrysothamnus viscidiflorus</i>												
05	<b>140</b>	-	40	100	-	-	29	29	-	-	0	6/9
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	8/15
<i>Eriogonum microthecum</i>												
05	<b>80</b>	-	-	60	20	-	50	50	25	25	25	4/7
<i>Gutierrezia sarothrae</i>												
05	<b>140</b>	200	20	120	-	-	0	0	-	-	0	6/8
<i>Juniperus osteosperma</i>												
05	<b>440</b>	40	220	120	100	-	0	0	23	9	9	-/-
<i>Leptodactylon pungens</i>												
05	<b>500</b>	-	-	440	60	-	0	0	12	-	0	5/9
<i>Opuntia spp.</i>												
05	<b>60</b>	-	20	40	-	-	0	0	-	-	0	4/10

Trend Study 1R-8-05

Study site name: Coldwater 3.

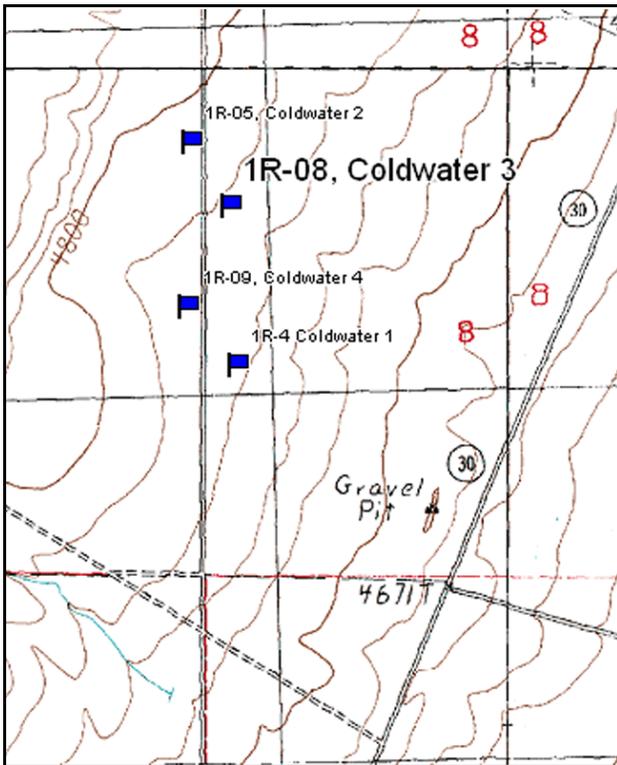
Vegetation type: Burn, Spray, Seeded.

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).

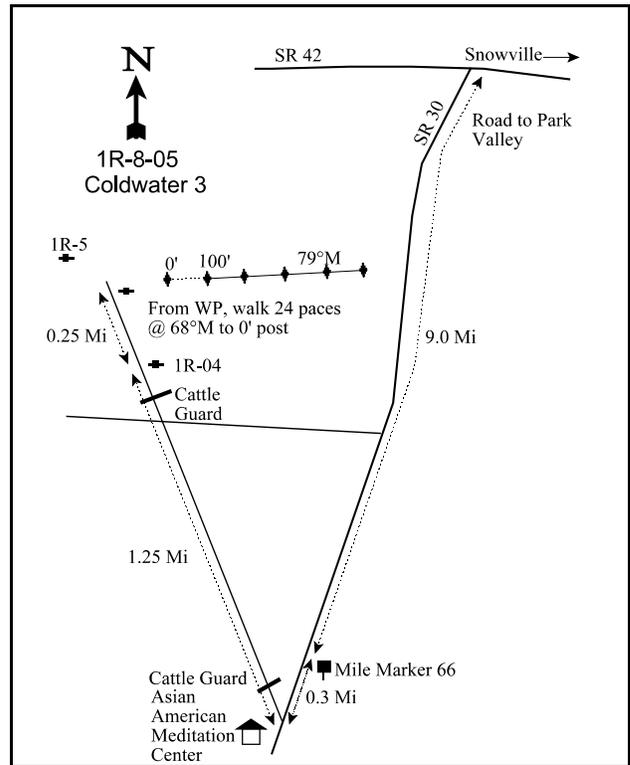
LOCATION DESCRIPTION

Head west on SR-42 from Snowville, UT to Curlew Junction and turn south (left) onto SR-30 and drive toward Park Valley, UT. Drive to mile marker 66 and proceed another 0.3 miles to the Asian American Meditation Center on the right and turn right. Drive north on this dirt road 1.25 miles to the witness post of 1R-4 on the east (right) side of the road. Continue 0.25 miles to the witness post on the east (right) of the road. From the witness post, walk 24 paces at 68°M to the 0' stake. The 0' stake is marked with browse tag #60.



Map Name: Black Butte

Township 13 N, Range 11 W, Section 8



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4637484 N, 322878 E

## DISCUSSION

### Coldwater 3 – 1R-08

The Coldwater 3 study was established to monitor a two-treatment project to test the effectiveness of Plateau on cheatgrass. Three other monitoring studies were established to compare the results. The treatment areas are located approximately 10 miles northeast of Park Valley, Utah.

The study is located on an eastern aspect with a 2% slope at 4,800 feet. In 2005, estimated pellet group data was 6 cow days use/acre (14 cdu/ha). Cattle pats were recent and cows were spotted from the study site.

The soil is a shallow loam with an effective rooting depth of 12 inches. In 2004, 6% of the soil surface was covered with rock and pavement. A high rock percentage is found in the profile. The phosphorus concentration is 6.6 ppm, values less than 6 ppm may hinder normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is moderately alkaline (7.9). Bare ground cover was 37% in 2005. The 2005 soil erosion condition measurement determined the soil to be stable.

Wyoming big sagebrush was the key browse species, but appears to have been treated to improve grazing. It provided no cover in 2005 and no living plants were sampled in density measurements. Dead plant density was 5,600 plants/acre.

Seven species of grasses were sampled in 2005, 2 of which were annuals. Cheatgrass is the dominant grass. It provided 27% cover in 2005 with 100% quadrat frequency. Sandberg bluegrass provided 1% cover with 19% quadrat frequency. Squirreltail bottlebrush provided nearly 2% cover and 24% quadrat frequency. Crested wheatgrass is present, but was only sampled in 10% of the quadrats.

Fourteen species of forbs were sampled in 2005, 9 of which were perennials. Burr buttercup was the dominant forb with 9% cover and 95% quadrat frequency. Prickly lettuce provided 8% cover and 100% quadrat frequency. Russian thistle provided 2% cover with a quadrat frequency of 88%. Western salsify provided 1% cover and 24% quadrat frequency.

### 2005 Pretreatment Assessment

The site is dominated by cheatgrass. The browse and native herbaceous understory components are being out-competed by the cheatgrass. It could be difficult and costly to remove the weeds in this area. The Desirable Components Index score is very poor due to the lack of browse, low perennial grass cover, and very high annual grass cover.

2005 winter range condition (DC Index) –very poor (-3) Lower potential scale

HERBACEOUS TRENDS --  
Management unit 01R, Study no: 8

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	18	.42
G	Agropyron smithii	9	.34
G	Bromus tectorum (a)	478	27.31
G	Oryzopsis hymenoides	5	.04

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Poa secunda</i>	33	1.02
G	<i>Sitanion hystrix</i>	50	1.54
G	<i>Vulpia octoflora</i> (a)	55	.64
Total for Annual Grasses		533	27.95
Total for Perennial Grasses		115	3.37
Total for Grasses		648	31.32
F	<i>Allium</i> spp.	-	.00
F	<i>Chaenactis douglasii</i>	6	.13
F	<i>Descurainia pinnata</i> (a)	7	.02
F	<i>Erodium cicutarium</i> (a)	45	.89
F	<i>Lappula occidentalis</i> (a)	2	.00
F	<i>Lactuca serriola</i>	388	7.57
F	<i>Machaeranthera canescens</i>	2	.30
F	<i>Melilotus officinalis</i>	3	.00
F	<i>Medicago sativa</i>	1	.15
F	<i>Phlox longifolia</i>	39	.32
F	<i>Ranunculus testiculatus</i> (a)	383	8.79
F	<i>Salsola iberica</i> (a)	272	1.74
F	<i>Sphaeralcea coccinea</i>	8	.12
F	<i>Tragopogon dubius</i>	48	1.28
Total for Annual Forbs		709	11.46
Total for Perennial Forbs		495	9.90
Total for Forbs		1204	21.36

BROWSE TRENDS--

Management unit 01R, Study no: 8

Species	Strip Frequency	Average Cover %
	'05	'05
<i>Artemisia tridentata wyomingensis</i>	0	-
<i>Chrysothamnus nauseosus hololeucus</i>	0	-
<i>Chrysothamnus viscidiflorus</i>	0	-
<i>Kochia prostrata</i>	0	-

BASIC COVER --

Management unit 01R, Study no: 8

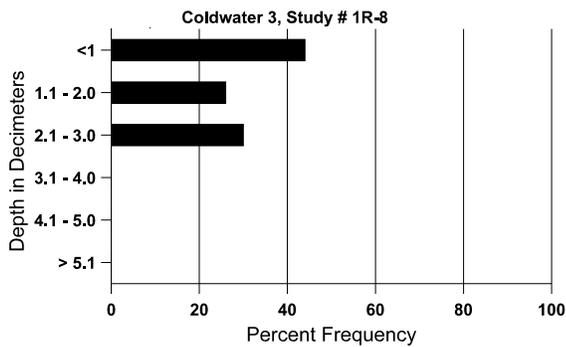
Cover Type	Average Cover %
	'05
Vegetation	45.65
Rock	1.66
Pavement	4.65
Litter	22.14
Cryptogams	.58
Bare Ground	36.66

SOIL ANALYSIS DATA --

Management unit 1R, Study no: 8, Study Name: Coldwater 3

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.0	57.0 (12.8)	7.9	45.2	32.0	22.8	1.0	6.6	732.8	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 01R, Study no: 8

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	4	-
Cattle	4	6 (14)

BROWSE CHARACTERISTICS --  
 Management unit 01R, Study no: 8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
05	0	-	-	-	-	5600	0	0	-	-	0	19/19
<i>Chrysothamnus nauseosus hololeucus</i>												
05	0	-	-	-	-	20	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus</i>												
05	0	-	-	-	-	-	0	0	-	-	0	11/19
<i>Kochia prostrata</i>												
05	0	-	-	-	-	-	0	0	-	-	0	10/21

Trend Study 1R-9-05

Study site name: Coldwater 4.

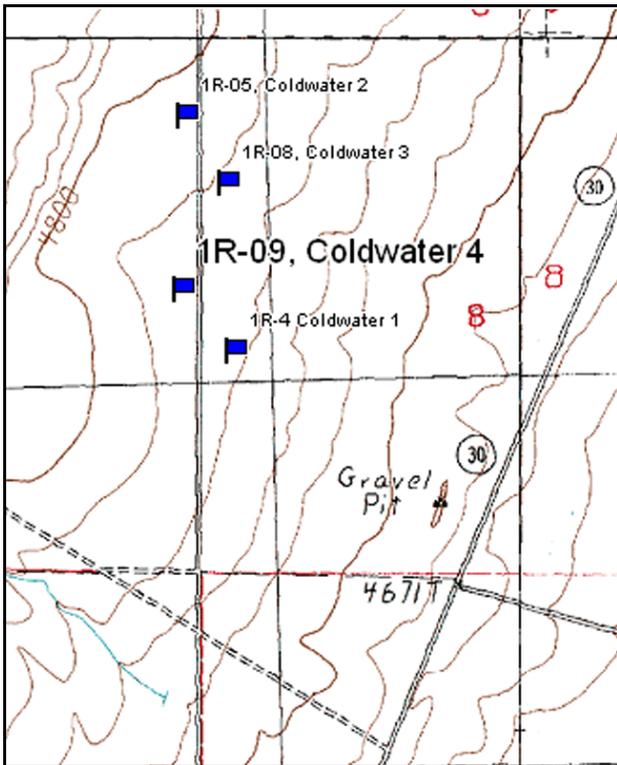
Vegetation type: Burn, Spray, Seeded.

Compass bearing: frequency baseline 243 degrees magnetic.

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

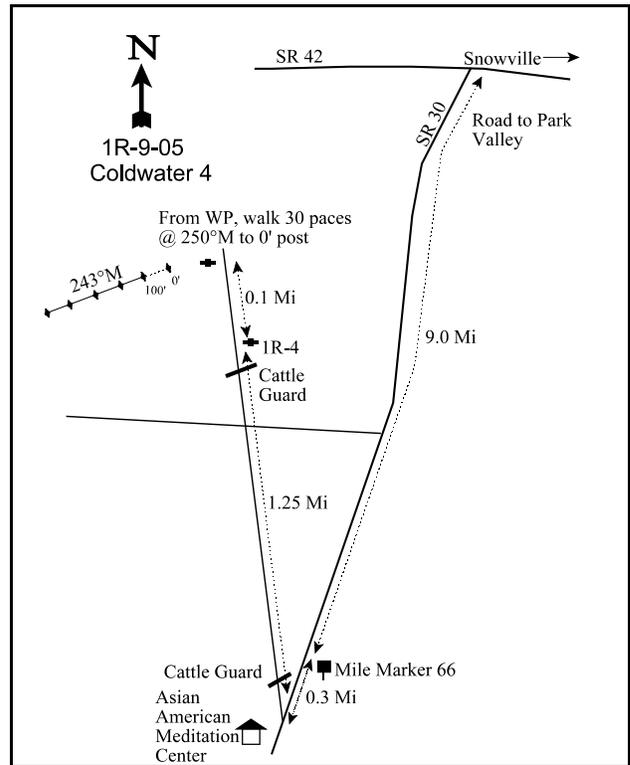
LOCATION DESCRIPTION

Head west on SR-42 from Snowville, UT to Curlew Junction and turn south (left) onto SR-30 and drive toward Park Valley, UT. Drive to mile marker 66 and proceed another 0.3 miles to the Asian American Meditation Center on the right and turn right. Drive north on this dirt road 1.25 miles to the witness post of 1R-4 on the east (right) side of the road. Continue 0.1 miles to the witness post on the west (left) of the road. The witness post is behind two boulders off the road. From the witness post, walk 30 paces at 250°M to the 0' stake. The 0' stake is marked with browse tag #61.



Map Name: Black Butte

Township 13 N, Range 11 W, Section 7



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4637210 N, 322757 E

## DISCUSSION

### Coldwater 4 – 1R-09

The Coldwater 4 study was established to monitor a two-treatment project to test the effectiveness of Plateau on cheatgrass. Three other monitoring studies were established to compare the results. The treatment areas are located approximately 10 miles northeast of Park Valley, Utah.

The study is located on a slightly southeastern aspect with a 2% slope at 4,800 feet. In 2005, estimated pellet group data was 27 cow days use/acre (66 cdu/ha). Cattle pats were recent and cows were spotted from the study site.

The soil is a shallow loam with an effective rooting depth of 10 inches. In 2004, 7% of the soil surface was covered with rock and pavement. A high rock percentage is found in the profile. The phosphorus concentration is 5.8 ppm, values less than 6 ppm may hinder normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.6). Bare ground cover was 22% in 2005. The 2005 soil erosion condition measurement determined the soil to be stable.

Wyoming big sagebrush was the key browse species, but appears to have been treated to improve grazing. It provided no cover in 2005 and no living plants were sampled in density measurements. Dead plant density was 6,020 plants/acre.

Six species of grasses were sampled in 2005, 2 of which were annuals. Cheatgrass is the dominant grass. It provided 36% cover in 2005 with 98% quadrat frequency. Sandberg bluegrass provided 2% cover with 33% quadrat frequency. Sixweeks fescue provided 3% cover and 56% quadrat frequency. Crested wheatgrass is present, but was only sampled in 1% of the quadrats.

Fourteen species of forbs were sampled in 2005, 8 of which were perennials. Prickly lettuce was the dominant forb with 11% cover and 97% quadrat frequency. Russian thistle provided 7% cover with a quadrat frequency of 98%. Burr uttercup provided 3% cover and 66% quadrat frequency.

### 2005 Pretreatment Assessment

The site is dominated by cheatgrass. The browse and native herbaceous understory components are being out-competed by the cheatgrass. It could be difficult and costly to remove the weeds in this area. The Desirable Components Index score is very poor due to the lack of browse, low perennial grass cover, and very high annual grass cover.

2005 winter range condition (DC Index) –very poor (-7) Lower potential scale

HERBACEOUS TRENDS --  
Management unit 01R, Study no: 9

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	2	.03
G	Bromus tectorum (a)	475	36.02
G	Oryzopsis hymenoides	1	.00
G	Poa secunda	77	1.53

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Sitanion hystrix</i>	2	.03
G	<i>Vulpia octoflora</i> (a)	183	2.57
Total for Annual Grasses		658	38.60
Total for Perennial Grasses		82	1.61
Total for Grasses		740	40.22
F	<i>Astragalus utahensis</i>	1	.03
F	<i>Cardaria draba</i>	6	.06
F	<i>Chaenactis douglasii</i>	6	.04
F	<i>Descurainia pinnata</i> (a)	3	.00
F	<i>Erodium cicutarium</i> (a)	-	.03
F	<i>Lappula occidentalis</i> (a)	2	.01
F	<i>Lactuca serriola</i>	403	10.59
F	<i>Malcolmia africana</i>	13	.62
F	<i>Phlox longifolia</i>	6	.09
F	<i>Ranunculus testiculatus</i> (a)	201	2.72
F	<i>Salsola iberica</i> (a)	421	7.49
F	<i>Sisymbrium altissimum</i> (a)	3	.18
F	<i>Sphaeralcea coccinea</i>	-	.00
F	<i>Tragopogon dubius</i>	24	.49
Total for Annual Forbs		630	10.44
Total for Perennial Forbs		459	11.94
Total for Forbs		1089	22.38

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

#### BROWSE TRENDS --

Management unit 01R, Study no: 9

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	0	-
B	<i>Chrysothamnus nauseosus</i>	1	-
B	<i>Kochia prostrata</i>	0	-
B	<i>Leptodactylon pungens</i>	6	.06
B	<i>Opuntia</i> spp.	0	-
Total for Browse		7	0.06

**BASIC COVER --**

Management unit 01R, Study no: 9

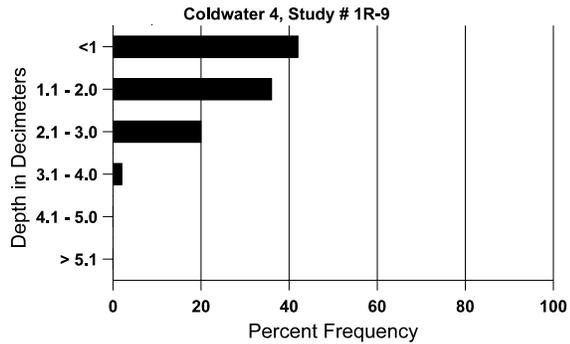
Cover Type	Average Cover % '05
Vegetation	59.45
Rock	2.03
Pavement	5.03
Litter	19.63
Cryptogams	.18
Bare Ground	21.98

**SOIL ANALYSIS DATA --**

Management unit 1R, Study no: 9, Study Name: Coldwater 4

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.8	59.2 (10.5)	7.6	39.2	39.0	21.8	1.6	5.8	649.6	0.7

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 01R, Study no: 9

Type	Quadrat Frequency '05	Days use per acre (ha) '05
Deer	2	-
Cattle	6	27 (66)

**BROWSE CHARACTERISTICS --**

Management unit 01R, Study no: 9

Year	Plants per Acre (excluding seedlings)	Age class distribution (plants per acre)					Utilization			Average Height Crown (in)	
		Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent		% dying
Artemisia tridentata wyomingensis											

		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)
05	<b>0</b>	-	-	-	-	6020	0	0	-	-	0	24/25
<i>Chrysothamnus nauseosus</i>												
05	<b>20</b>	-	20	-	-	-	0	0	-	-	0	12/24
<i>Kochia prostrata</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	6/16
<i>Leptodactylon pungens</i>												
05	<b>200</b>	-	-	200	-	-	0	0	-	-	0	6/10
<i>Opuntia spp.</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	7/13

Trend Study 1R-10-05

Study site name: Chokecherry .

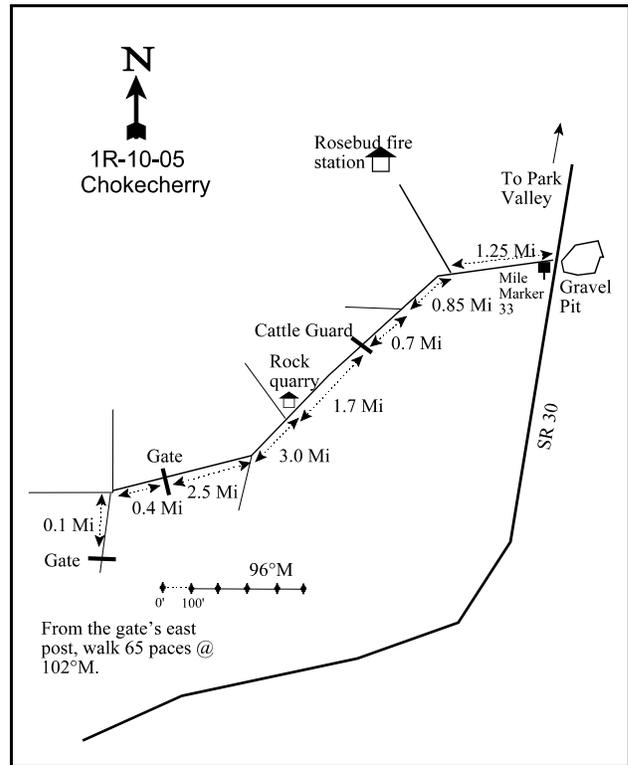
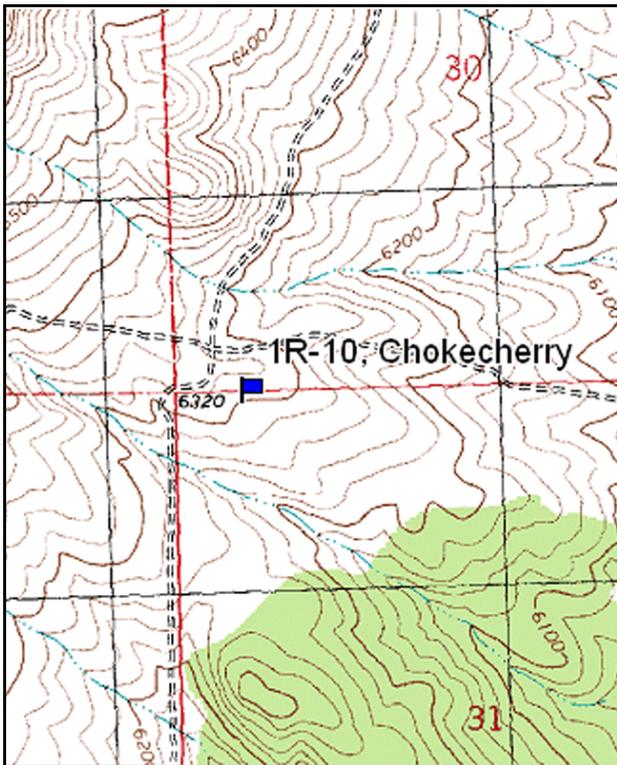
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 96 degrees magnetic.

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

LOCATION DESCRIPTION

Head west on SR-42 from Snowville, UT to Curlew Junction and turn south (left) onto SR-30 and drive past Park Valley, UT. Turn right (west) just before mile marker 33. On the road is a mailbox for the Rosebud fire station. Drive on the main road for 1.25 miles to a fork. Stay left at the fork. Drive 0.85 miles to a large fork in the road and go left after a man-made ditch. Drive another 0.7 miles to a cattle guard. Continue for 1.7 miles to a fork in the road before a rock quarry. Stay left and drive southwest for 3.0 miles to a fork. Turn right (east) at the fork and proceed 2.5 miles to a gate. Continue past the gate for 0.4 miles to a cross road. Turn left and drive south for 0.1 miles to a gate. From the gate's east most post, walk 65 paces at 102°M to the 0' stake. The 0' stake is marked with browse tag #62.



Map Name: Emigrant Pass

Diagrammatic Sketch

Township 10N, Range 16W, Section 31

GPS: NAD 27, UTM 12T 4603476 N, 272349 E

## DISCUSSION

### Chokecherry Bullhog - 1R-10

The Chokecherry Springs Bullhog treatment is located on BLM land about 27 miles southwest of Park Valley, Utah. In June of 2005, seed was aerially applied to 550 acres of Wyoming big sagebrush type. The juniper was bullhogged the following fall. The study site is located on a 4% slope with an eastern aspect at 6,300 feet. It is located within the BLM Cycle Spring grazing allotment which grazes 132 cattle from the beginning of June to the end of August. Pretreatment pellet group estimates in 2005 were 2 elk, 27 deer, and 7 cow days use/acre (5 edu/ha, 68 ddu/ha, and 18 cdu/ha). Deer pellets were from the previous fall and winter, elk was from the early spring, and cow was recent.

The soil is a shallow sandy loam with an effective rooting depth of 19 inches. Phosphorus and potassium concentrations are above the necessary requirements for normal plant growth and development (Tiedemann and Lopez 2004). The pH is mildly alkaline (7.7). The rock bed/hard pan layer is located at around 19 inches with a high percentage of rock and pavement in the upper 8 inches of the soil profile. The relative cover of pavement was 16% in the 2005 pretreatment sampling. The 2005 soil erosion condition measurement determined the soil to be stable.

Wyoming big sagebrush is the key browse species in the treatment study area. Sagebrush provided nearly 20% cover and 67% of the browse cover in 2005. It was a mostly mature stand of sagebrush (65%). Decadent individuals made up 29% of the population with 13% of the individuals classified as dying. Recruitment of young individuals was lower (6%) than the dying, although there were a high number of seedlings. Sagebrush browse leader growth was 1.2 inches. A small number of bitterbrush were also sampled in 2005, all of which were mature. Other browse species include: black sagebrush, rubber rabbitbrush, stickyleaf low rabbitbrush, granite prickly phlox, and snowberry.

During the 2005 pretreatment sampling, Utah juniper line intercept cover was 8%. Based on the point-center quarter method, 2005 juniper density was 69 trees/acre with an average trunk diameter of 7.3 inches.

The pretreatment grasses included 7 perennial and 2 annual species. Of these, bluebunch wheatgrass, cheatgrass, Sandberg's bluegrass, and needle-and-thread grass were the dominant species. Perennial grasses provided 12% cover and annuals provided 4% in 2005. Sandberg's bluegrass provided nearly 8% cover and 79% quadrat frequency in 2005. Cheatgrass provided 4% cover and 85% quadrat frequency. With good timing of precipitation and low competition with perennials, cheatgrass cover and frequency could increase substantially.

Forb diversity is moderate with 23 total species. Ten species of annual and 13 perennials were sampled in 2005. The native annual littleflower collinsia provided nearly 6% cover in 2005, all other species provided 1% or less.

Grasses and forbs were seeded on the treatment in June of 2005. The following table illustrates the bulk pounds/acre, number of live seeds/square foot, and pure live seed pounds/acre for each species:

Species seeded	Bulk lbs in mix	Bulk lbs/acre
Canby Bluegrass	300	0.5
Sandberg Bluegrass 'SID MT'	50	0.1
Indian Ricegrass	550	1.0
Orchardgrass 'Paiute'	550	1.0
Snake River Wheatgrass 'Secar'	950	1.7
Alfalfa 'Ladak+'	1150	2.1
Sainfoin 'Eski'	1700	3.1
Small Burnet 'Delar'	1150	2.1
Blue Flax 'Appar'	300	0.5
Western Yarrow	50	0.1
Sandberg Bluegrass 'SID OR'	250	0.5
Indian Ricegrass 'Rimrock'	6	0.0
Snake River Wheatgrass 'Secar'	186	0.3
<b>Total</b>	<b>7192</b>	<b>13.1</b>
PLS lbs/acre		12.1

#### 2005 Pretreatment Site Assessment

The soil condition is stable with minor erosion in the interspaces between shrubs and perennial species. The Wyoming big sagebrush provides adequate cover and browse for big game. The moderate decadence and dying will likely improve with the increase of canopy cover after the bullhog treatment. If the seeding is successful, grass and forb diversity should increase. The Desirable Components Index score was excellent due to excellent browse cover and good perennial grass cover.

2005 winter range condition (DC Index) – excellent (66) Lower potential scale

#### HERBACEOUS TRENDS -- Management unit 01R, Study no: 10

T y p e	Species	Nested Frequency		Average Cover %	
		'05	'05	'05	'05
G	Agropyron smithii	64		.70	
G	Agropyron spicatum	40		1.40	
G	Bromus tectorum (a)	296		4.21	
G	Carex spp.	3		.03	
G	Oryzopsis hymenoides	10		.22	
G	Poa secunda	241		7.51	
G	Sitanion hystrix	28		.38	
G	Stipa columbiana	43		1.75	
G	Vulpia octoflora (a)	25		.08	
<b>Total for Annual Grasses</b>		<b>321</b>		<b>4.30</b>	

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
Total for Perennial Grasses		429	12.01
Total for Grasses		750	16.31
F	Agoseris glauca	2	.00
F	Allium spp.	101	.84
F	Androsace septentrionalis (a)	2	.00
F	Unknown apiaceae	2	.01
F	Astragalus spp.	17	.32
F	Astragalus utahensis	5	.03
F	Chaenactis douglasii	4	.01
F	Collomia linearis (a)	1	.00
F	Comandra pallida	2	.06
F	Collinsia parviflora (a)	229	5.84
F	Crepis acuminata	2	.00
F	Cryptantha spp.	76	.38
F	Delphinium nuttallianum	5	.10
F	Gayophytum ramosissimum(a)	38	.18
F	Gilia spp. (a)	13	.05
F	Lappula occidentalis (a)	1	.00
F	Lupinus argenteus	9	.56
F	Lygodesmia spp.	1	.03
F	Microsteris gracilis (a)	133	1.12
F	Navarretia intertexta (a)	16	.05
F	Phlox longifolia	54	.26
F	Ranunculus testiculatus (a)	2	.00
F	Unknown forb-annual (a)	9	.04
Total for Annual Forbs		444	7.31
Total for Perennial Forbs		280	2.62
Total for Forbs		724	9.94

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

BROWSE TRENDS --

Management unit 01R, Study no: 10

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia nova	1	-
B	Artemisia tridentata wyomingensis	88	19.52
B	Chrysothamnus nauseosus	0	-
B	Chrysothamnus viscidiflorus viscidiflorus	29	2.21
B	Juniperus osteosperma	2	5.35
B	Leptodactylon pungens	11	.22
B	Opuntia spp.	7	.00
B	Purshia tridentata	4	1.24
B	Symphoricarpos oreophilus	3	.63
Total for Browse		145	29.18

CANOPY COVER, LINE INTERCEPT --

Management unit 01R, Study no: 10

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	19.53
Chrysothamnus viscidiflorus viscidiflorus	3.08
Juniperus osteosperma	8.25
Purshia tridentata	1.75
Symphoricarpos oreophilus	1.10

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 01R, Study no: 10

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	1.2
Purshia tridentata	0.8

POINT-QUARTER TREE DATA --  
Management unit 01R, Study no: 10

Species	Trees per Acre
	'05
Juniperus osteosperma	69

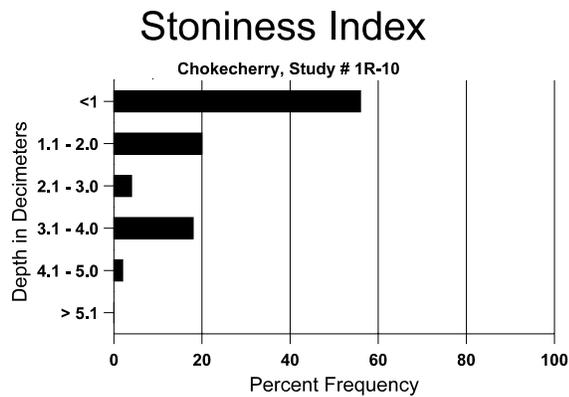
Average diameter (in)
'05
7.3

BASIC COVER --  
Management unit 01R, Study no: 10

Cover Type	Average Cover %
	'05
Vegetation	50.80
Rock	.47
Pavement	19.16
Litter	32.20
Cryptogams	.12
Bare Ground	14.99

SOIL ANALYSIS DATA --  
Management unit 1R, Study no: 10, Study Name: Chokecherry

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
19.3	45.4 (16.4)	7.7	58.2	24.0	17.8	1.1	11.5	297.6	0.6



PELLET GROUP DATA --

Management unit 01R, Study no: 10

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	32	-
Elk	-	2 (5)
Deer	21	27 (68)
Cattle	6	7 (18)

BROWSE CHARACTERISTICS --

Management unit 01R, 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 nova</i>												
05	<b>20</b>	60	-	20	-	-	0	0	-	-	0	-/-
<i>Artemisia tridentata wyomingensis</i>												
05	<b>3940</b>	1960	220	2580	1140	860	12	4	29	13	14	25/37
<i>Chrysothamnus nauseosus</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	19/17
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>960</b>	-	-	900	60	-	2	0	6	4	4	11/20
<i>Juniperus osteosperma</i>												
05	<b>40</b>	40	20	20	-	-	0	0	-	-	0	-/-
<i>Leptodactylon pungens</i>												
05	<b>380</b>	-	-	360	20	-	0	0	5	-	0	8/10
<i>Opuntia spp.</i>												
05	<b>140</b>	-	-	140	-	-	0	0	-	-	0	4/9
<i>Purshia tridentata</i>												
05	<b>80</b>	-	-	80	-	20	50	50	-	-	0	33/56
<i>Symphoricarpos oreophilus</i>												
05	<b>60</b>	-	20	40	-	-	0	0	-	-	0	29/66



## DISCUSSION

### Rattlesnake Knoll East – 2R-11

The Rattlesnake Knoll East study was established on Hardware Ranch to monitor a prescribed grazing project. The purpose of the project was to control cheatgrass and improve shrubs and beneficial grasses. The area will be intensely grazed from 10 April to 10 September. Comparison sites, grazed and ungrazed, were established in areas previously grazed by cattle to measure the treatment impacts. After this study site was established, an enclosure was to be built around it to prevent cattle from grazing it. The comparison site, Rattlesnake Knoll West (2R-12), was established about 750 feet northwest of this site. Both are located within Hardware Ranch about ½ mile west of ranch cabins and just north of SR 101. This study is located on an 18-20% slope with a southwest aspect at 5,600 feet. Estimated pellet group data in 2005 was 3 elk and 42 deer days use/acre (8 edu/ha and 104 ddu/ha). Deer and elk pellets were left in winter and early spring.

The soil is a shallow sandy loam with an effective rooting depth of 16 inches. Phosphorus and potassium levels are adequate for normal plant growth and development (Tiedemann and Lopez 2004). The soil pH is neutral (6.7). The majority of rock measured in the soil profile was in the upper 8 inches. Rock covered 23% of the ground and bare ground 16% in 2005. Herbaceous cover (58%) is high and prevents much erosion. Very little signs of erosion were noticed in 2005.

Wyoming big sagebrush and bitterbrush are the key browse species. Sagebrush density was 1,180 plants/acre in 2005, but provided less than 1% cover. These shrubs were very small, an average of 8 inches tall, and 93% of sampled shrubs showed heavy use. Mature individuals made up 71% of the population, decadents made up 22%, and young made up 7%. Bitterbrush provided nearly 5% cover with 1,080 plants/acre. These shrubs averaged 21 inches tall and were all heavily used. All individuals sampled were mature. Low rabbitbrush was also sampled.

Little grass diversity was measured in 2005. Three perennial grasses and one annual grass were sampled. The perennial grasses were western wheatgrass, bluebunch wheatgrass, and mutton bluegrass. Cheatgrass provided the highest cover (8%) and quadrat frequency (69%). Bluebunch wheatgrass provided the next highest cover at 7%. Overall, perennial grasses provided slightly more cover than cheatgrass.

Forbs showed little diversity as well. Eight perennial forb species were sampled in 2005. Annual forb species were not differentiated due to the difficulty of identifying annual forbs in April. Annual forbs provided nearly 25% cover and perennials provided nearly 5%, much of which was a species of spring parsley.

### 2005 Pretreatment Assessment

An increase of browse cover, density, and size are desired for wildlife at this location. The herbaceous understory is dominated by annuals and would provide better forage for wildlife and cattle if perennial species increased and annuals decreased. The Desirable Components Index score was good due to moderate browse cover, fair perennial grass cover, and excellent perennial forb cover.

2005 winter range condition (DC Index) - good (52) Lower potential scale

HERBACEOUS TRENDS --

Management unit 02R, Study no: 11

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron smithii	1	.03
G	Agropyron spicatum	179	7.15
G	Bromus tectorum (a)	241	8.17
G	Poa fendleriana	139	3.35
Total for Annual Grasses		241	8.17
Total for Perennial Grasses		319	10.54
Total for Grasses		560	18.71
F	Achillea millefolium	6	.01
F	Agoseris glauca	23	.19
F	Annual forbs (a)	427	24.53
F	Artemisia ludoviciana	9	.51
F	Crepis acuminata	4	.00
F	Cymopterus spp.	99	2.27
F	Eriogonum umbellatum	1	.03
F	Tragopogon dubius	40	.64
F	Wyethia amplexicaulis	60	.92
Total for Annual Forbs		427	24.53
Total for Perennial Forbs		242	4.60
Total for Forbs		669	29.13

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

BROWSE TRENDS --

Management unit 02R, Study no: 11

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata vaseyana	13	.87
B	Chrysothamnus viscidiflorus	17	.15
B	Purshia tridentata	23	4.84
Total for Browse		53	5.86

CANOPY COVER, LINE INTERCEPT --  
 Management unit 02R, Study no: 11

Species	Percent Cover
	'05
Artemisia tridentata vaseyana	.30
Chrysothamnus viscidiflorus	.26
Purshia tridentata	6.56

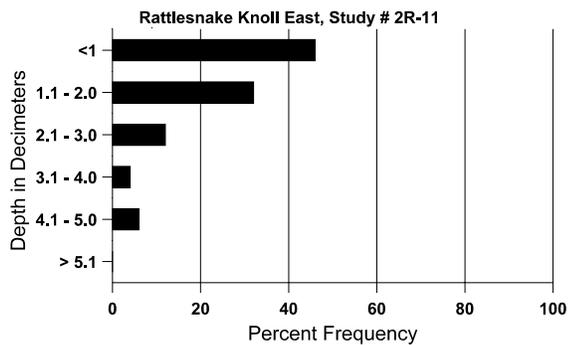
BASIC COVER --  
 Management unit 02R, Study no: 11

Cover Type	Average Cover %
	'05
Vegetation	58.30
Rock	23.45
Pavement	2.81
Litter	11.89
Cryptogams	.68
Bare Ground	15.90

SOIL ANALYSIS DATA --  
 Management unit 2R, Study no: 11, Study Name: Rattlesnake Knoll East

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
16.0	36.8 (15.5)	6.7	52.2	28.0	19.8	1.4	7.8	182.4	0.5

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 02R, Study no: 11

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Elk	4	3 (8)
Deer	18	42 (104)

BROWSE CHARACTERISTICS --  
 Management unit 02R, Study no: 11

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
05	<b>1180</b>	-	80	840	260	140	7	93	22	-	0	8/24
<i>Chrysothamnus viscidiflorus</i>												
05	<b>800</b>	-	-	680	120	40	0	0	15	5	5	3/7
<i>Purshia tridentata</i>												
05	<b>1080</b>	-	-	1080	-	-	0	100	-	-	0	21/41

Trend Study 2R-12-05

Study site name: Rattlesnake Knoll West.

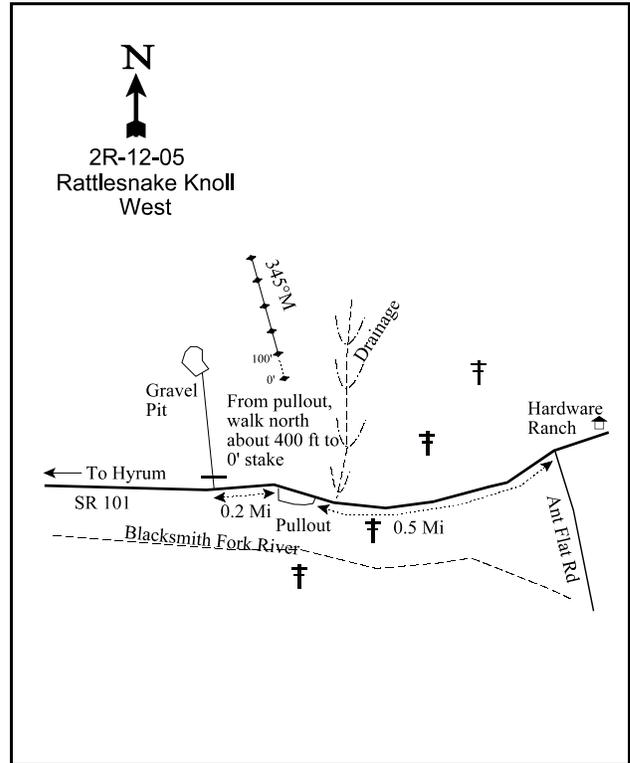
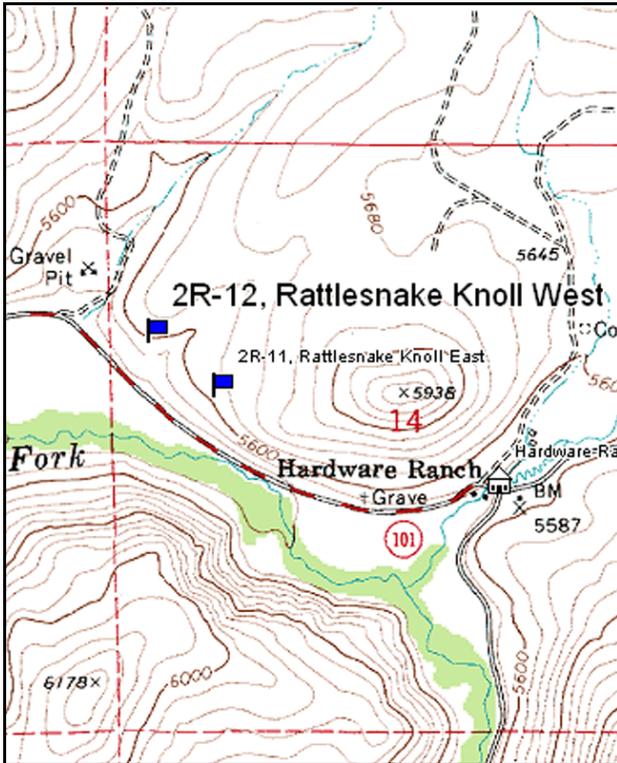
Vegetation type: Mountain Big Sagebrush.

Compass bearing: frequency baseline 345 degrees magnetic.

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

LOCATION DESCRIPTION

From Hardware Ranch, drive west for 0.5 miles on SR 101 to a pullout on the south side of the road. Walk about 500 feet at 0°M to the 0' stake. The 0' stake is marked with browse tag #189.



Map Name: Hardware Ranch

Diagrammatic Sketch

Township 10N, Range 3E, Section 14

GPS: NAD 27, UTM 12T 4605926 N, 451926 E

## DISCUSSION

### Rattlesnake Knoll West – 2R-12

The Rattlesnake Knoll West study was established as a comparison study to Rattlesnake Knoll East (2R-11). This site is located in an area that will be intensely grazed from 10 April to 10 September to control cheatgrass and other annual weeds as well as improve shrub and beneficial grass growth. A cattle enclosure was to be built surrounding the comparison study, Rattlesnake Knoll East. This study was established in 2005 about 750 feet northwest of the East site on an area with similar topography and plant community. It is located on a 20-22% slope with a southwest aspect at 5,585 feet. Estimated animal use in 2005, based on pellet group data, was 4 elk and 19 deer days use/acre (10 edu/ha and 48 ddu/ha). A moose and a grouse pellet were identified in quadrat measurements.

The soil is a shallow sandy loam with an effective rooting depth of 19 inches. Phosphorus and potassium levels are moderate, but adequate for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is slightly acidic (6.4). Rock and pavement provide around 9% cover and bare ground is high at nearly 39%. There is little erosion due to the high vegetation cover (46%), much of the bare ground is located on animal trails.

Wyoming big sagebrush is the key browse species. Before the grazing treatment in 2005, 1,560 plants/acre provided 5% cover. Decadence was high at 51% and dying was very high at 35%. Heavy use was identified on 68% of the individuals and moderate use on 28%. Forty-nine percent of the individuals measured were mature, the other 51% were decadent. It is likely that the heavy use in the area has prevented young recruitment. They averaged 13 inches tall, taller than those on Rattlesnake Knoll East. True mountain mahogany, low rabbitbrush, slender buckwheat, Wood's rose, bitterbrush, and snowberry were also sampled in small numbers.

Only 3 grasses were sampled in before the treatment in 2005: Bluebunch wheatgrass, cheatgrass, and mutton bluegrass. Cheatgrass nested frequency and frequency was the highest for the grasses, but not mutton bluegrass cover was higher. Cheatgrass cover was nearly 4% and was sampled in 81% of the quadrats. Mutton bluegrass cover was 5% and was in 67% of the quadrats.

Forb diversity was very low. Only 8 perennial forbs were sampled, mulesear provided the highest cover, nested frequency, and quadrat frequency. Annual forb species were not differentiated due to the difficulty of identifying annual forbs in April. Like the comparison, annual forbs provided 25% cover.

### 2005 Pretreatment Assessment

An increase of browse cover, density, and size are desired for wildlife at this location. The herbaceous understory is dominated by annuals and would provide better forage for wildlife and cattle if perennial species increased and annuals decreased. The Desirable Components Index score was fair due to poor browse cover, high browse decadence, moderate perennial grass cover, and good perennial forb cover.

2005 winter range condition (DC Index) - fair (25) Lower potential scale

HERBACEOUS TRENDS --

Management unit 02R, Study no: 12

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron spicatum	41	1.40
G	Bromus tectorum (a)	252	3.61
G	Poa fendleriana	186	5.03
Total for Annual Grasses		252	3.61
Total for Perennial Grasses		227	6.44
Total for Grasses		479	10.06
F	Agoseris glauca	7	.06
F	Annual forbs (a)	449	24.95
F	Astragalus spp.	8	.24
F	Calochortus nuttallii	8	.01
F	Crepis acuminata	5	.06
F	Cymopterus spp.	36	.86
F	Lomatium spp.	73	.65
F	Tragopogon dubius	2	.00
F	Wyethia amplexicaulis	109	1.78
Total for Annual Forbs		449	24.95
Total for Perennial Forbs		248	3.69
Total for Forbs		697	28.64

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

BROWSE TRENDS --

Management unit 02R, Study no: 12

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata vaseyana	38	4.93
B	Cercocarpus montanus	1	-
B	Chrysothamnus viscidiflorus	13	.25
B	Eriogonum microthecum	2	-
B	Juniperus osteosperma	1	.15
B	Purshia tridentata	1	-
B	Rosa woodsii	1	-
B	Symphoricarpos oreophilus	1	-
Total for Browse		58	5.33

CANOPY COVER, LINE INTERCEPT --  
 Management unit 02R, Study no: 12

Species	Percent Cover
	'05
Artemisia tridentata vaseyana	5.05
Chrysothamnus viscidiflorus	.20

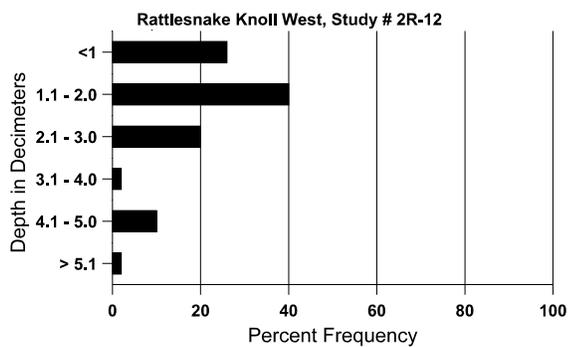
BASIC COVER --  
 Management unit 02R, Study no: 12

Cover Type	Average Cover %
	'05
Vegetation	46.75
Rock	6.75
Pavement	2.50
Litter	15.20
Cryptogams	.15
Bare Ground	38.76

SOIL ANALYSIS DATA --  
 Management unit 2R, Study no: 12, Study Name: Rattlesnake Knoll West

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
18.8	34.0 (17.1)	6.4	75.2	13.0	11.8	0.6	7.8	80.0	0.4

### Stoniness Index



PELLET GROUP DATA --

Management unit 02R, Study no: 12

Type	Quadrat Frequency	Days use per acre (ha)
	'05	
Moose	1	-
Grouse	1	-
Elk	-	4 (10)
Deer	13	19 (48)

BROWSE CHARACTERISTICS --

Management unit 02R, Study no: 12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata vaseyana</i>												
05	<b>1560</b>	-	-	760	800	420	28	68	51	35	38	13/28
<i>Cercocarpus montanus</i>												
05	<b>40</b>	20	-	40	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus</i>												
05	<b>300</b>	-	20	180	100	80	0	0	33	7	20	4/7
<i>Eriogonum microthecum</i>												
05	<b>40</b>	-	20	20	-	-	0	0	-	-	0	1/9
<i>Juniperus osteosperma</i>												
05	<b>20</b>	-	20	-	-	-	100	0	-	-	0	-/-
<i>Purshia tridentata</i>												
05	<b>20</b>	-	20	-	-	-	0	100	-	-	0	-/-
<i>Rosa woodsii</i>												
05	<b>60</b>	-	-	60	-	-	0	0	-	-	0	-/-
<i>Symphoricarpos oreophilus</i>												
05	<b>40</b>	-	40	-	-	-	0	0	-	-	0	-/-

Trend Study 2R-13-05

Study site name: Black Mtn East .

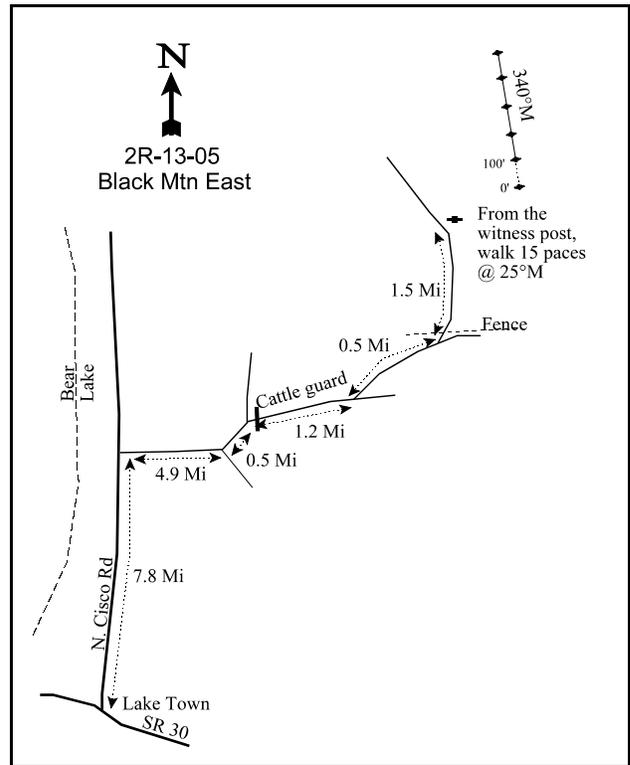
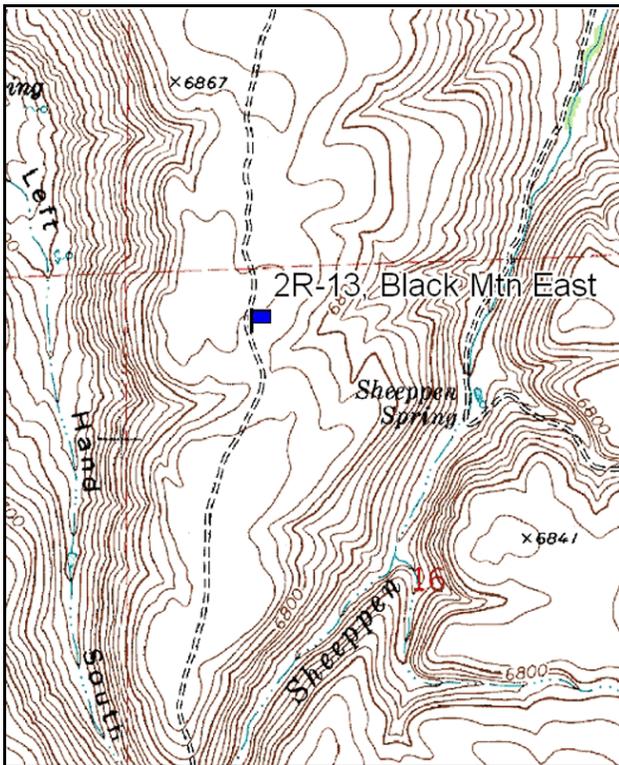
Vegetation type: Wyoming Big Sagebrush .

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 the junction of main street in Laketown and SR 30, drive north for 7.8 miles to a road off to the right (east). Turn here and drive 4.9 miles to a fork. Stay left at the fork and continue 0.5 miles to another fork with a cattle guard. At the fork, turn right and drive 1.2 miles to a fork. Turn left at the fork and drive 0.5 miles to another fork. Turn left and drive 1.5 to the witness post on right (east) side of the road. From the witness post, walk 15 paces at 25°M to the 0' stake. The 0' stake is marked with browse tag #97.



Map Name: Sheppen Creek

Diagrammatic Sketch

Township 14N, Range 7E, Section 16

GPS: NAD 27, UTM 12T 4645236 N, 486545 E

HERBACEOUS TRENDS --

Management unit 02R, Study no: 13

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	1	.15
G	Agropyron smithii	171	1.72
G	Bromus tectorum (a)	76	.91
G	Carex spp.	3	.00
G	Koeleria cristata	7	.22
G	Poa fendleriana	246	4.77
G	Poa secunda	6	.01
G	Sitanion hystrix	55	1.16
G	Stipa columbiana	1	.03
G	Stipa lettermani	2	.06
Total for Annual Grasses		76	0.91
Total for Perennial Grasses		492	8.15
Total for Grasses		568	9.07
F	Agoseris glauca	91	.47
F	Allium spp.	60	.71
F	Arabis spp.	4	.01
F	Astragalus convallarius	2	.06
F	Astragalus spp.	31	.64
F	Calochortus nuttallii	3	.00
F	Collinsia parviflora (a)	125	.45
F	Cordylanthus spp. (a)	36	.77
F	Cymopterus spp.	2	.01
F	Delphinium nuttallianum	6	.02
F	Descurainia pinnata (a)	73	.35
F	Draba spp. (a)	3	.00
F	Erigeron eatonii	74	3.55
F	Gayophytum ramosissimum(a)	26	.05
F	Haplopappus acaulis	15	.39
F	Hymenoxys acaulis	26	1.11
F	Lomatium spp.	2	.03
F	Microsteris gracilis (a)	19	.09
F	Navarretia intertexta (a)	86	.34
F	Orthocarpus spp. (a)	5	.03
F	Phlox hoodii	50	1.37
F	Phlox longifolia	145	1.36
F	Polygonum douglasii (a)	12	.03

Type	Species	Nested Frequency	Average Cover %
		'05	'05
F	Schoenocrambe linifolia	12	.05
F	Senecio integerrimus	49	.53
F	Trifolium spp.	18	.04
F	Veronica biloba (a)	6	.01
Total for Annual Forbs		391	2.14
Total for Perennial Forbs		590	10.40
Total for Forbs		981	12.55

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

#### BROWSE TRENDS --

Management unit 02R, Study no: 13

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata wyomingensis	98	17.43
B	Chrysothamnus viscidiflorus viscidiflorus	42	3.31
B	Eriogonum microthecum	3	.09
Total for Browse		143	20.84

#### CANOPY COVER, LINE INTERCEPT --

Management unit 02R, Study no: 13

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	20.96
Chrysothamnus viscidiflorus viscidiflorus	3.75
Eriogonum microthecum	.08

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 02R, Study no: 13

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	1.5

BASIC COVER --

Management unit 02R, Study no: 13

Cover Type	Average Cover %
	'05
Vegetation	37.56
Rock	.76
Pavement	8.53
Litter	34.10
Cryptogams	1.81
Bare Ground	28.12

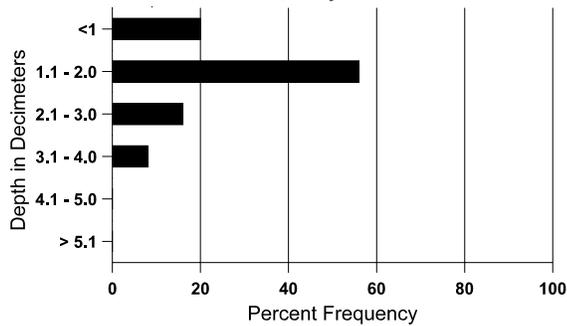
SOIL ANALYSIS DATA --

Management unit 2R, Study no: 13, Study Name: Black Mtn East

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.9	54.0 (11.7)	7.1	26.2	51.0	22.8	3.0	11.3	156.8	0.6

### Stoniness Index

Black Mtn East, Study # 2R-13



PELLET GROUP DATA --

Management unit 02R, Study no: 13

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	9	-
Grouse	1	-
Deer	1	-
Cattle	2	26 (65)
Antelope	1	-

BROWSE CHARACTERISTICS --  
 Management unit 02R, 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>												
05	<b>6840</b>	440	320	4180	2340	780	0	0	34	16	16	18/24
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>2040</b>	-	20	1940	80	-	5	5	4	.98	.98	12/19
<i>Eriogonum microthecum</i>												
05	<b>80</b>	20	-	80	-	-	0	0	-	-	0	7/12

Trend Study 2R-14-05

Study site name: Black Mountain West.

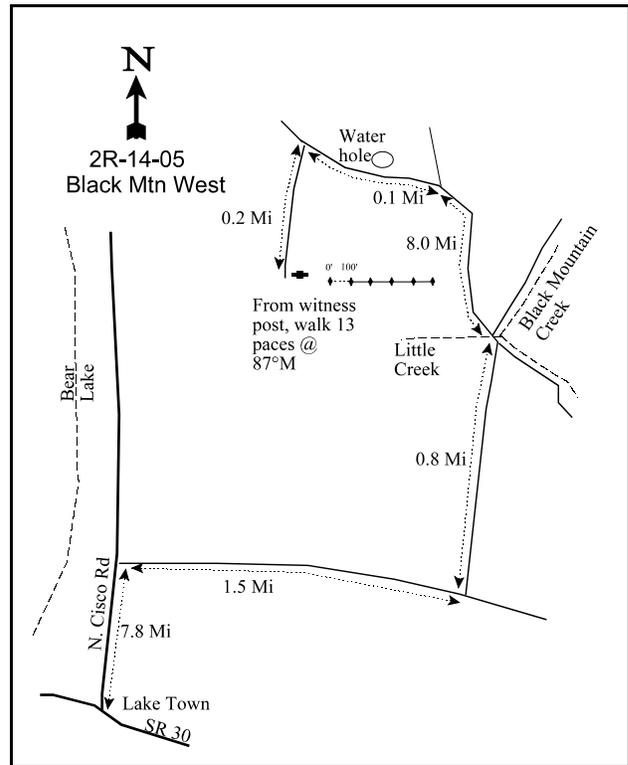
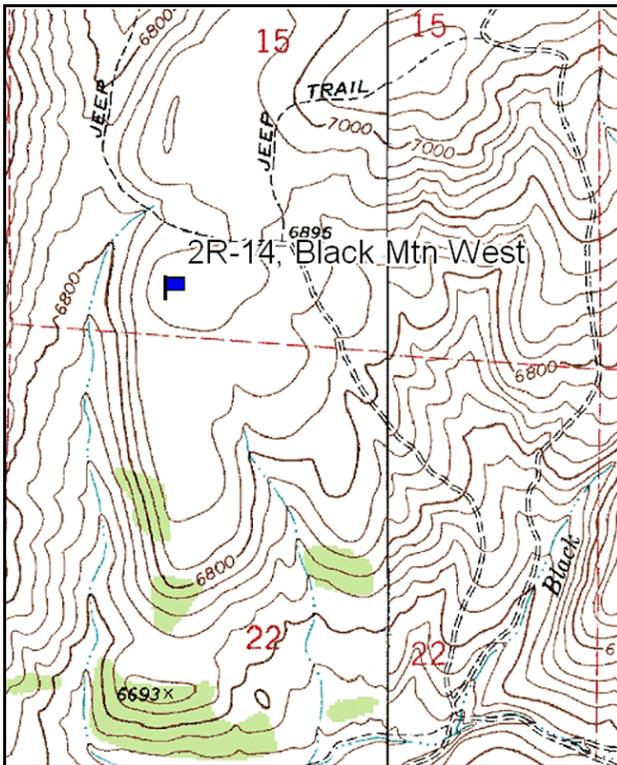
Vegetation type: Mountain and Basin Big Sagebrush

Compass bearing: frequency baseline 99 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of main street in Laketown and SR 30, drive north for 7.8 miles to a road off to the right (east). Turn right (east) and drive 1.5 miles to a road on the left (north) side of the road. Turn left and drive 0.8 miles to a gate. Continue another 0.4 miles to a crossroads. Continue on the main road and drive 0.8 miles to fork. Stay left at fork and drive 0.1 miles to another fork. Turn left and drive 0.2 miles to the witness post on the left (east) side of the road. From the witness post, walk 13 paces at 87°M to the 0' stake. The 0' stake is marked with browse tag #98.



Map Name: Bear Lake South

Diagrammatic Sketch

Township 14N, Range 6E, Section 15

GPS: NAD 27, UTM 12T 4643892 N, 478689 E

HERBACEOUS TRENDS --  
Management unit 02R, Study no: 14

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron smithii	229	2.42
G	Agropyron spicatum	64	1.44
G	Bromus tectorum (a)	34	.45
G	Poa fendleriana	36	.85
G	Poa secunda	117	1.83
G	Sitanion hystrix	53	.90
Total for Annual Grasses		34	0.45
Total for Perennial Grasses		499	7.45
Total for Grasses		533	7.90
F	Achillea millefolium	7	.19
F	Agoseris glauca	22	.07
F	Antennaria rosea	4	.18
F	Astragalus convallarius	44	.40
F	Balsamorhiza sagittata	83	2.50
F	Camelina microcarpa (a)	3	.00
F	Calochortus nuttallii	16	.04
F	Chaenactis douglasii	2	.03
F	Cirsium spp.	10	.18
F	Collomia linearis (a)	77	.19
F	Comandra pallida	20	.12
F	Collinsia parviflora (a)	60	.15
F	Cordylanthus spp. (a)	2	.01
F	Crepis acuminata	-	.01
F	Delphinium nuttallianum	2	.01
F	Descurainia pinnata (a)	5	.01
F	Eriogonum umbellatum	18	.47
F	Ipomopsis aggregata	31	.22
F	Lithospermum spp.	3	.09
F	Lupinus argenteus	14	.58
F	Microsteris gracilis (a)	9	.02
F	Orthocarpus spp. (a)	3	.00
F	Penstemon spp.	7	.06
F	Phlox hoodii	18	.45
F	Phlox longifolia	118	.50
F	Senecio multilobatus	2	.00
Total for Annual Forbs		159	0.40

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
	Total for Perennial Forbs	421	6.16
	Total for Forbs	580	6.57

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

#### BROWSE TRENDS --

Management unit 02R, Study no: 14

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Amelanchier utahensis	6	.18
B	Artemisia tridentata tridentata	2	-
B	Artemisia tridentata vaseyana	77	13.12
B	Chrysothamnus viscidiflorus viscidiflorus	78	5.64
B	Eriogonum microthecum	21	.42
B	Juniperus osteosperma	7	3.20
B	Purshia tridentata	1	.03
B	Symphoricarpos oreophilus	0	-
B	Tetradymia canescens	11	.56
	Total for Browse	203	23.17

#### CANOPY COVER, LINE INTERCEPT --

Management unit 02R, Study no: 14

Species	Percent Cover
	'05
Amelanchier utahensis	.28
Artemisia tridentata vaseyana	17.86
Chrysothamnus viscidiflorus viscidiflorus	8.03
Eriogonum microthecum	1.28
Juniperus osteosperma	5.38
Purshia tridentata	.11
Tetradymia canescens	.71

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 02R, Study no: 14

Species	Average leader growth (in)
	'05
Artemisia tridentata vaseyana	1.7

POINT-QUARTER TREE DATA --  
Management unit 02R, Study no: 14

Species	Trees per Acre	Average diameter (in)
	'05	'05
Juniperus osteosperma	55	3.1

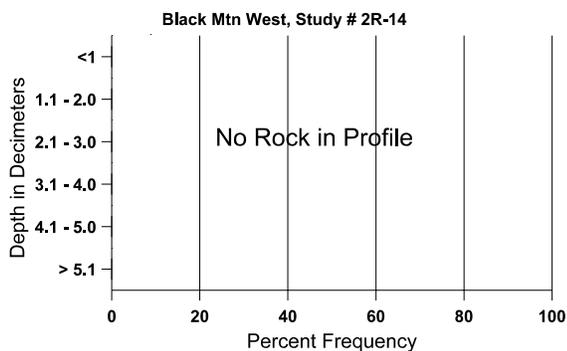
BASIC COVER --  
Management unit 02R, Study no: 14

Cover Type	Average Cover %
	'05
Vegetation	34.47
Rock	.72
Pavement	1.67
Litter	43.37
Cryptogams	1.12
Bare Ground	33.29

SOIL ANALYSIS DATA --  
Management unit 2R, Study no: 14, Study Name: Black Mtn West

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.8	51.6 (11.2)	6.9	34.2	36.0	29.8	3.6	34.8	198.4	0.9

### Stoniness Index



PELLET GROUP DATA --

Management unit 02R, Study no: 14

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	5	-
Elk	3	-
Deer	21	32 (79)
Cattle	20	38 (95)

BROWSE CHARACTERISTICS --

Management unit 02R, 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>Amelanchier utahensis</i>												
05	<b>140</b>	-	60	60	20	-	0	43	14	-	0	20/25
<i>Artemisia tridentata tridentata</i>												
05	<b>40</b>	-	-	-	40	-	0	0	100	50	50	49/49
<i>Artemisia tridentata vaseyana</i>												
05	<b>3040</b>	-	40	960	2040	1180	1	0	67	34	34	30/40
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>4900</b>	-	80	4640	180	20	4	.81	4	2	2	12/18
<i>Eriogonum microthecum</i>												
05	<b>680</b>	-	-	680	-	-	12	0	-	-	0	11/15
<i>Juniperus osteosperma</i>												
05	<b>180</b>	20	60	120	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
05	<b>20</b>	-	-	-	20	-	100	0	100	-	0	29/53
<i>Symphoricarpos oreophilus</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	12/19
<i>Tetradymia canescens</i>												
05	<b>280</b>	-	-	220	60	-	0	0	21	14	14	14/23

Trend Study 8R-1-05

Study site name: Browns Park DB Drum .

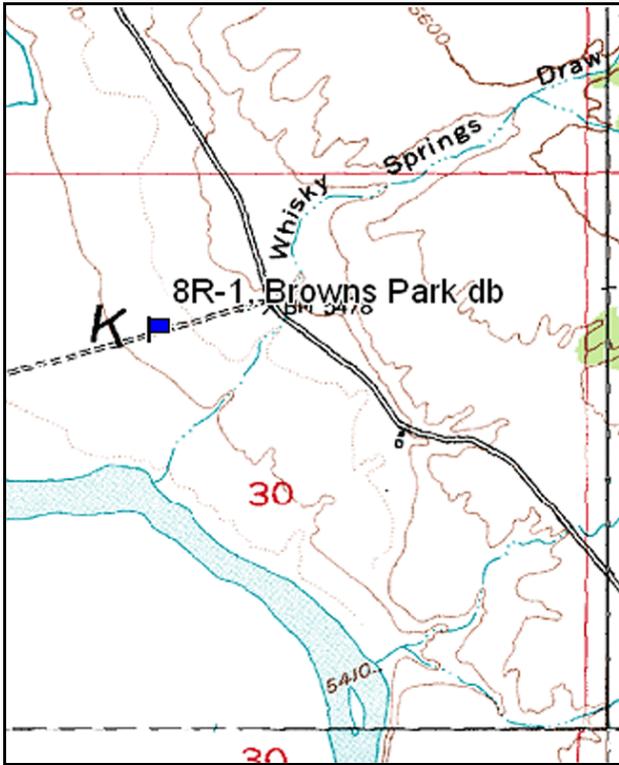
Vegetation type: Greasewood .

Compass bearing: frequency baseline 160 degrees magnetic.

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

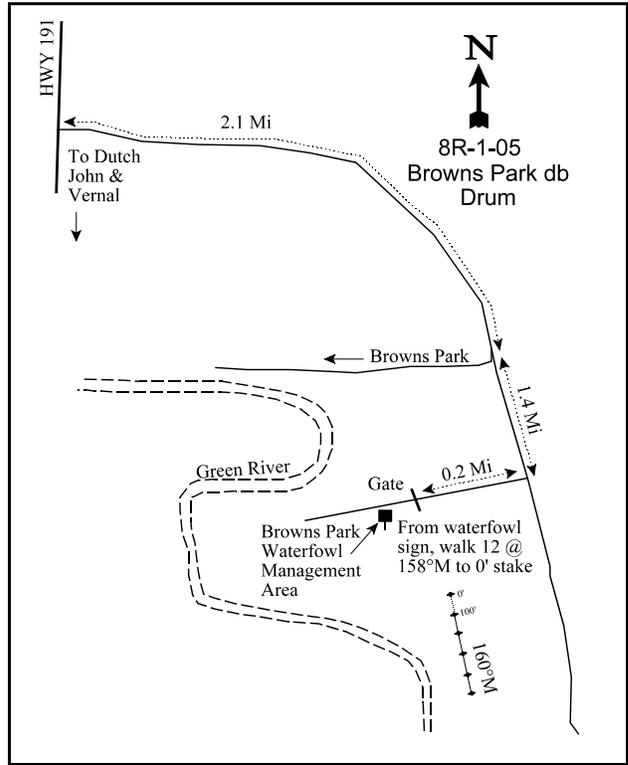
LOCATION DESCRIPTION

From Dutch John, proceed north towards Antelope Flat on Highway U.S. 191 for approximately 8 miles. Before the Wyoming border, turn east on the Antelope Flat Road towards Goslin Mountain. Drive for 21 miles to a fork. Continue south on the main road for 1.4 miles to a fork. Turn right (west) and drive 0.2 miles to a DWR gate. From the southern-most post of the gate, walk 12 paces at 158°M to the 0' stake. The 0' stake is marked with browse tag #84.



Map Name: Clay Basin

Township 2N, Range 25E, Section 30



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4527325 N, 656813 E

## DISCUSSION

### Brown's Park Double Drum – 8R-01

The Brown's Park Double Drum treatment is located in the Utah Division of Wildlife Resources Brown's Park Waterfowl Management Area. The Brown's Park area is a critical winter range. The area was dominated by black greasewood and the purpose of the treatment was to improve big game winter habitat by replacing the greasewood with better winter forage. To prevent greasewood from competing with desired seeded species, the greasewood was sprayed with a mixture of 2,4-D and Tordon on June 23-24, 2005. The greasewood and soil were then treated with a double-drum Lawson aerator in September of 2005 and seeded. In the winter of 2005-2006, forage kochia was then aerially seeded over the treatment. The study site was located around 35 feet south of the Waterfowl Management Area gate. It is located on a 3% slope with a southwest aspect at 5,450 feet. Pretreatment (2005) pellet group data estimates were 44 elk and 5 deer days use/acre (107 edu/ha and 13 ddu/ha).

The soil is a shallow sandy loam with an effective rooting depth of 12 inches. Phosphorus and potassium concentrations are high (Tiedemann and Lopez 2004). The soil pH is moderately alkaline (7.9). Bare ground cover was moderate to low at only 21% cover in 2005. Surface rock and pavement cover were low and no rock was measured in the soil profile. The high vegetation and litter cover prevent erosion. The erosion index measurement in 2005 was stable.

The dominant browse species was black greasewood during the pretreatment sampling of the study. Greasewood provided nearly 29% cover and a density of 2,700 plants/acre. The area had been sprayed with a mixture of the herbicides 2,4-D and Escort. Therefore, nearly every greasewood individual was yellow and dying, probably dead. However, each yellow shrub measured was considered alive, but of poor vigor. Sixty-one percent of the population was classified as decadent and 10% were classified as dying based on the crown die-off. Young recruitment was low (2%), all of which were yellow. Basin big sagebrush and shadscale were sampled, but in very low numbers. The shadscale appeared to be affected by the herbicide; 55% of the population showed poor vigor.

Only two grass species were sampled on the study in 2005: Squirreltail bottlebrush and sixweeks fescue. Both of these species provided nearly no cover and were only sampled in 2 quadrats each.

Eight forb species were sampled during in 2005. All of which were annual species with the exception of broadleaf pepperplant. Annuals provided 5% cover and the pepperplant provided slightly more than ½ percent.

The following table shows the seed mix and the bulk seed rate for the treatment:

Species seeded	Bulk lbs in mix	Bulk lbs/acre
Crested Wheatgrass 'Douglas'	300	2
Russian Wildrye	300	2
Great Basin Wildrye 'Trailhead'	300	2
Forage Kochia--Beaver UT	225	1.5
Thickspike Wheatgrass 'Critana'	300	2
Alfalfa 'Ladak+'	150	1
Small Burnet 'Delar'	300	2
Fourwing Saltbush--Emery UT	300	2
<b>Total</b>	<b>2175</b>	<b>14.5</b>
PLS lbs/acre		11.3

2005 Pretreatment Assessment

The site was dominated by greasewood and little else grew there. Without removing the greasewood, no other species would have successfully established. Some other browse species were sampled on the last 200 feet of the baseline transect, but they were sparse. The herbaceous understory was dominated by annual species. The seeding will definitely improve the winter range. The Desirable Components Index rating was very poor due to no preferred browse, perennial grass, or perennial for cover.

2005 winter range condition (DC Index) – very poor (2) Lower potential scale

HERBACEOUS TRENDS --

Management unit 08R, Study no: 1

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Sitanion hystrix	3	.01
G	Vulpia octoflora (a)	5	.01
Total for Annual Grasses		5	0.00
Total for Perennial Grasses		3	0.00
Total for Grasses		8	0.01
F	Chenopodium album (a)	66	1.55
F	Chenopodium leptophyllum(a)	6	.04
F	Descurainia pinnata (a)	17	.24
F	Eriogonum cernuum (a)	6	.06
F	Kochia scoparia (a)	65	2.42
F	Lepidium latifolium	14	.64
F	Lepidium spp. (a)	63	1.03
F	Salsola iberica (a)	2	.00
Total for Annual Forbs		225	5.36
Total for Perennial Forbs		14	0.64
Total for Forbs		239	6.00

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

BROWSE TRENDS --

Management unit 08R, Study no: 1

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata tridentata	0	-
B	Atriplex confertifolia	9	.66
B	Chrysothamnus nauseosus	0	.15
B	Chrysothamnus viscidiflorus viscidiflorus	5	.03
B	Gutierrezia sarothrae	5	.01
B	Opuntia spp.	2	.15
B	Sarcobatus vermiculatus	71	28.56
Total for Browse		92	29.58

CANOPY COVER, LINE INTERCEPT --

Management unit 08R, Study no: 1

Species	Percent Cover
	'05
Atriplex confertifolia	.43
Chrysothamnus viscidiflorus viscidiflorus	.50
Gutierrezia sarothrae	.21
Opuntia spp.	.08
Sarcobatus vermiculatus	38.98

BASIC COVER --

Management unit 08R, Study no: 1

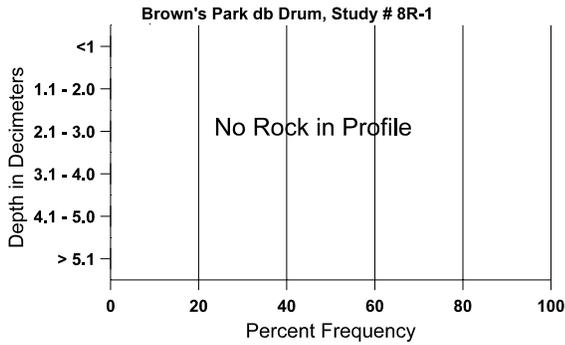
Cover Type	Average Cover %
	'05
Vegetation	33.61
Rock	.16
Pavement	.06
Litter	66.20
Cryptogams	3.62
Bare Ground	20.72

SOIL ANALYSIS DATA --

Management unit 8R, Study no: 1, Study Name: Browns Park db Drum

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.9	50.0 (15.6)	7.9	60.2	24.0	15.8	0.4	11.5	761.6	1.3

# Stoniness Index



## PELLET GROUP DATA --

Management unit 08R, Study no: 1

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	40	-
Elk	3	44 (107)
Deer	10	5 (13)

## BROWSE CHARACTERISTICS --

Management unit 08R, 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 tridentata</i>												
05	<b>0</b>	-	-	-	-	20	0	0	-	-	0	26/22
<i>Atriplex confertifolia</i>												
05	<b>220</b>	20	-	160	60	-	0	0	27	18	55	14/20
<i>Chrysothamnus nauseosus</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	26/35
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>120</b>	-	-	80	40	120	17	0	33	33	33	16/21
<i>Gutierrezia sarothrae</i>												
05	<b>400</b>	-	260	120	20	-	0	0	5	-	5	10/11
<i>Opuntia spp.</i>												
05	<b>120</b>	-	-	120	-	-	0	0	-	-	0	4/16
<i>Sarcobatus vermiculatus</i>												
05	<b>2700</b>	-	60	980	1660	700	1	0	61	10	100	48/61

Trend Study 9R-8-05

Study site name: Marshall Draw.

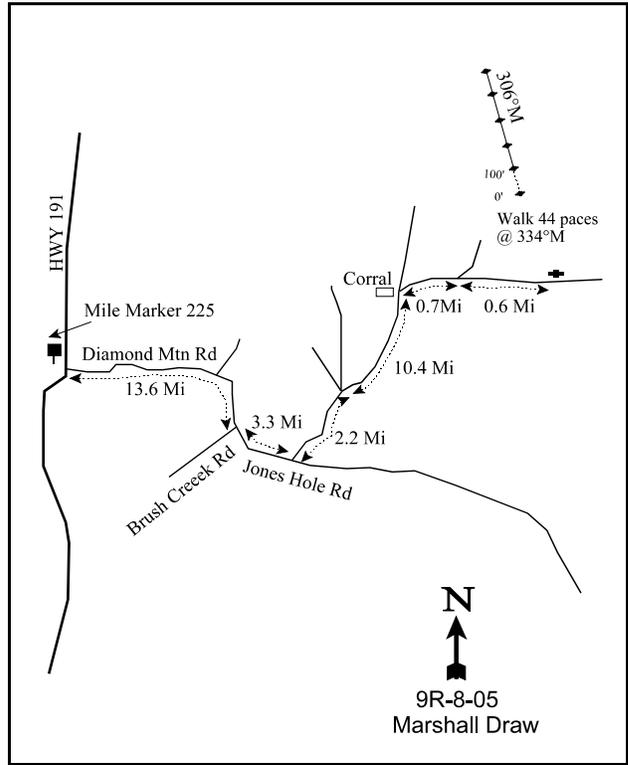
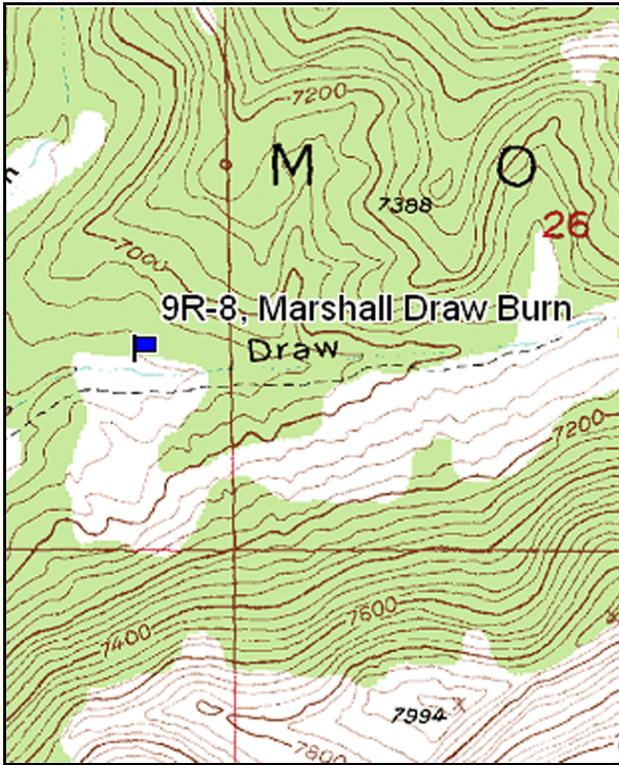
Vegetation type: Pinyon-Juniper.

Compass bearing: frequency baseline 306 degrees magnetic.

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

LOCATION DESCRIPTION

From Vernal, drive north on US 191 to mile marker 225. Turn right (east) on to Diamond Mountain road. Drive for 13.6 miles to a fork. Take the left fork and drive east on Jones Hole Rd for 3.3 miles to a fork. Take the left fork and drive 2.2 miles to a fork. Take the left fork and drive 10.4 miles crossing several cattle guards to a two-track on the right (east). Drive 0.75 miles on the two-track road to a fork. Continue right (east) for 0.6 miles to the witness post on the left side of the road. From the witness post, walk 44 paces at 334°M to the 0' stake. The 0' stake is marked with browse tag #81.



Map Name: Swallow Canyon

Diagrammatic Sketch

Township 1N, Range 25E, Section 27

GPS: NAD 27, UTM 12T 4517042 N, 662857 E

HERBACEOUS TRENDS --  
Management unit 09R, Study no: 8

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Agropyron intermedium</i>	1	.00
G	<i>Bromus tectorum</i> (a)	53	.49
G	<i>Carex</i> spp.	22	.26
G	<i>Koeleria cristata</i>	12	.34
G	<i>Oryzopsis hymenoides</i>	11	.05
G	<i>Poa fendleriana</i>	11	.04
G	<i>Poa secunda</i>	241	4.78
G	<i>Sitanion hystrix</i>	38	.18
G	<i>Stipa comata</i>	38	.26
Total for Annual Grasses		53	0.49
Total for Perennial Grasses		374	5.92
Total for Grasses		427	6.42
F	<i>Allium</i> spp.	7	.02
F	<i>Antennaria rosea</i>	12	.10
F	<i>Arabis</i> spp.	22	.05
F	<i>Astragalus convallarius</i>	5	.06
F	<i>Balsamorhiza hookeri</i>	18	.29
F	<i>Collomia linearis</i> (a)	-	.00
F	<i>Comandra pallida</i>	14	.11
F	<i>Collinsia parviflora</i> (a)	113	.42
F	<i>Crepis acuminata</i>	8	.05
F	<i>Descurainia pinnata</i> (a)	16	.04
F	<i>Draba</i> spp. (a)	60	.22
F	<i>Erigeron eatonii</i>	7	.05
F	<i>Gayophytum ramosissimum</i> (a)	12	.02
F	<i>Gilia</i> spp. (a)	47	.19
F	<i>Lithospermum arvense</i> (a)	1	.03
F	<i>Lomatium</i> spp.	12	.06
F	<i>Lupinus</i> spp.	3	.06
F	<i>Mentzelia</i> spp.	1	.00
F	<i>Microsteris gracilis</i> (a)	115	.38
F	<i>Petradoria pumila</i>	1	.03
F	<i>Phlox austromontana</i>	104	2.86
F	<i>Phlox longifolia</i>	3	.00
F	<i>Polygonum douglasii</i> (a)	6	.01
F	<i>Senecio multilobatus</i>	1	.03

Type	Species	Nested Frequency	Average Cover %
		'05	'05
F	<i>Sphaeralcea coccinea</i>	1	.01
Total for Annual Forbs		370	1.34
Total for Perennial Forbs		219	3.82
Total for Forbs		589	5.16

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

#### BROWSE TRENDS --

Management unit 09R, Study no: 8

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia nova</i>	0	-
B	<i>Artemisia tridentata wyomingensis</i>	20	.85
B	<i>Chrysothamnus nauseosus</i>	1	-
B	<i>Chrysothamnus viscidiflorus</i>	0	-
B	<i>Gutierrezia sarothrae</i>	3	.03
B	<i>Juniperus osteosperma</i>	13	3.84
B	<i>Opuntia</i> spp.	2	-
B	<i>Pediocactus simpsonii</i>	1	-
B	<i>Pinus edulis</i>	19	12.24
Total for Browse		59	16.97

#### CANOPY COVER, LINE INTERCEPT --

Management unit 09R, Study no: 8

Species	Percent Cover
	'05
<i>Artemisia tridentata wyomingensis</i>	1.31
<i>Gutierrezia sarothrae</i>	.10
<i>Juniperus osteosperma</i>	10.75
<i>Pinus edulis</i>	36.04

POINT-QUARTER TREE DATA --  
 Management unit 09R, Study no: 8

Species	Trees per Acre	Average diameter (in)
	'05	'05
Juniperus osteosperma	299	8.5
Pinus edulis	350	6.4

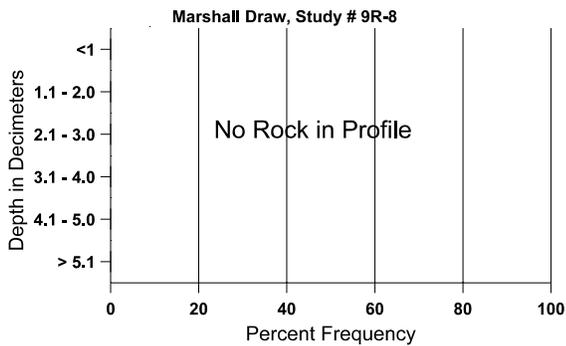
BASIC COVER --  
 Management unit 09R, Study no: 8

Cover Type	Average Cover %
	'05
Vegetation	27.24
Rock	8.98
Pavement	.80
Litter	53.65
Cryptogams	15.80
Bare Ground	12.51

SOIL ANALYSIS DATA --  
 Management unit 9R, Study no: 8, Study Name: Marshall Draw

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.1	49.8 (10.7)	6.3	62.2	21.0	16.8	0.8	13.3	153.6	0.4

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 09R, Study no: 8

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	83	-
Elk	2	2 (5)
Deer	5	5 (13)
Cattle	3	2 (4)

BROWSE CHARACTERISTICS --  
 Management unit 09R, 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>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	14/26
<i>Artemisia tridentata wyomingensis</i>												
05	<b>460</b>	60	60	20	380	1000	52	39	83	74	78	20/24
<i>Chrysothamnus nauseosus</i>												
05	<b>20</b>	-	-	-	20	-	0	100	100	-	0	20/15
<i>Chrysothamnus viscidiflorus</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	9/7
<i>Gutierrezia sarothrae</i>												
05	<b>100</b>	-	-	100	-	-	0	0	-	-	0	7/10
<i>Juniperus osteosperma</i>												
05	<b>280</b>	60	100	100	80	20	7	0	29	14	29	-/-
<i>Opuntia spp.</i>												
05	<b>60</b>	-	40	20	-	-	0	0	-	-	0	4/11
<i>Pediocactus simpsonii</i>												
05	<b>20</b>	-	-	20	-	20	0	0	-	-	0	2/2
<i>Pinus edulis</i>												
05	<b>480</b>	120	240	220	20	20	0	0	4	4	4	-/-

Trend Study 9R-9-05

Study site name: Snake John Lop and Scatter .

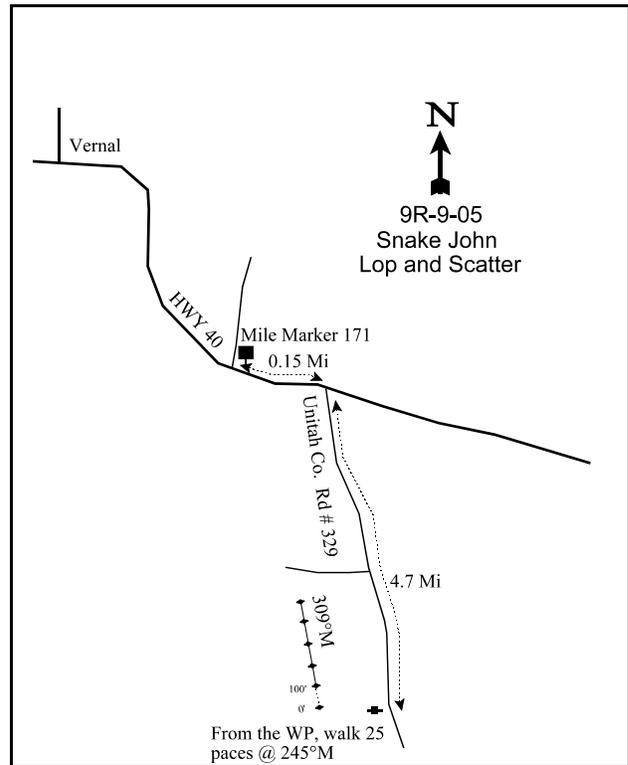
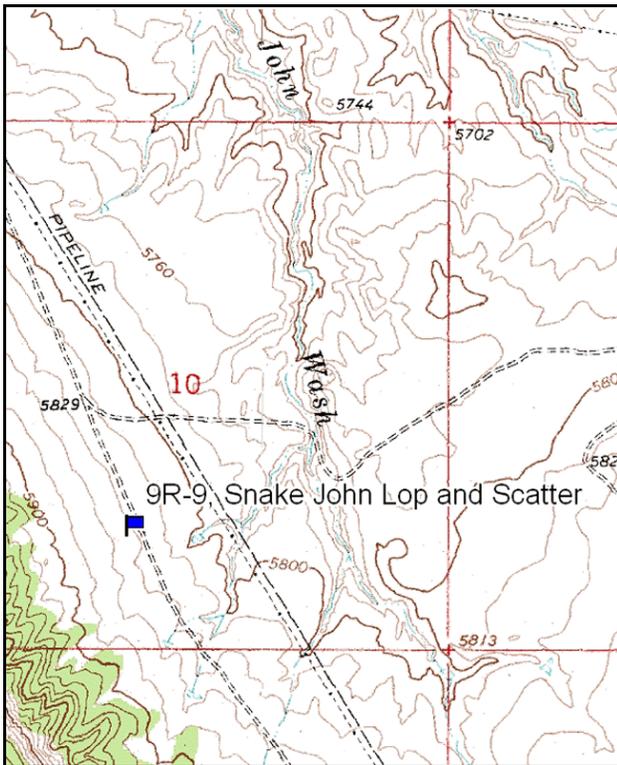
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 309 degrees magnetic.

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

LOCATION DESCRIPTION

Drive east of Vernal on US 40 to mile marker 171. Continue past the mile marker for 0.15 miles to Uintah county road #329 on the right (south). Drive on this road for 4.7 miles to the witness post on the right (west) hand side of the road. From the witness post, walk 25 paces at 245°M to the 0' stake. The 0' stake is marked with browse tag #82.



Map Name: Dinosaur

Diagrammatic Sketch

Township 7S, Range 25E, Section 10

GPS: NAD 27, UTM 12T 4453702 N, 662679 E

## DISCUSSION

### Snake John Lop and Scatter – 9R-09

The Snake John Lop and Scatter study was originally established to monitor a greenstrip establishment project on BLM land in the Snake John Valley. However, the study site was established 200 feet to the east of the greenstrip. The study site was established with the Snake John Lop and Scatter treatment area. All pinyon and juniper trees within a 500 acre area west of Snake John Wash and Raven Ridge were cut by chainsaws in the summer of 2005. The pinyon and juniper were encroaching on critical sage grouse and important mule deer habitat. It was threatening to decrease the important browse and herbaceous understory. Tausch and West (1994) showed that increases of pinyon-juniper cover are correlated to decreases in shrub and herbaceous understory cover. When pinyon and juniper cover reaches about 10%, understory cover (combined herbaceous and shrub) is reduced substantially. When pinyon-juniper cover reaches 20%, understory cover is less than 5%. By the time of the pretreatment sampling, all of the trees had been cut and scattered.

The treatment area and study site are located in a Wyoming big sagebrush flat located 28 miles southeast of Vernal and 4 miles south of Highway 40. It is located on a 2-3% slope with a northeast aspect at 5,800 feet. Pretreatment pellet group data estimates in 2005 were 7 elk, 21 deer, and 4 antelope days use/acre (18 edu/ha, 53 ddu/ha, and 10 adu/ha). All pellets appeared to be from winter use.

The soil is a shallow sandy loam with an effective rooting depth of 11 inches. The phosphorus concentration (6.1 ppm) could limit normal plant growth and development (Tiedemann and Lopez 2004). The pH is neutral (7.1). No rock was found in the soil profile and provided less than 1% cover on the soil surface. Bare ground provided 38% cover in 2005. The 2005 soil erosion condition measurement determined the soil erosion to be moderate.

Wyoming big sagebrush is the key browse species. It provided 21% cover in 2005 with a density of 4,540 plants/acre. This mature population of sagebrush was composed of 56% mature and 43% decadent individuals. This decadence is very high. Individuals classified as dying made up 15% of the population and young only 1%. With this low recruitment to dying ratio and high percent decadence, the population could die off. Perhaps the pinyon-juniper removal will positively impact the age distribution of the population. Pinyon and juniper individuals had been removed by the sampling in 2005, so pretreatment tree density is incalculable. The success of the treatment may only be gauged by improvements in the browse and herbaceous understory.

Eight species of grasses were sampled in 2005, two of which were annuals. Cheatgrass was the dominant species and provided nearly 4% cover with a quadrat frequency of 93%. None of the perennial species provided more than 1% cover. Squirreltail bottlebrush was the second-most prominent species with just less than 1% cover and a quadrat frequency of 31%.

Eight species of forbs were sampled, 5 of which were annuals. A species of pepperweed was the dominant forb. It provided 13% cover with a quadrat frequency of 100%. The other forb species were insignificant in size and distribution.

### 2005 Pretreatment Assessment

The Wyoming sagebrush, although large and dense, is old and decadent. Large-scale die-off could become a large problem in the near future. The herbaceous understory composition and distribution are poor. These problems may be a product of the pinyon-juniper cover, but it is difficult to determine after the trees had been removed. If the sagebrush does not begin to produce more young individuals after the pinyon-juniper treatment, it may be advisable to treat the decadent sagebrush and seed in more herbaceous species. The high decadence may be a product of the extended drought in this region. Further monitoring may

show improvement. The Desirable Components Index score was fair due to excellent browse cover, but low recruitment and high decadence.

2005 winter range condition (DC Index) – fair (33) Lower potential scale

HERBACEOUS TRENDS --  
Management unit 09R, Study no: 9

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	9	.62
G	Agropyron intermedium	-	.01
G	Bromus tectorum (a)	307	3.55
G	Hilaria jamesii	10	.08
G	Oryzopsis hymenoides	7	.01
G	Poa secunda	14	.11
G	Sitanion hystrix	74	.87
G	Vulpia octoflora (a)	16	.03
Total for Annual Grasses		323	3.59
Total for Perennial Grasses		114	1.71
Total for Grasses		437	5.31
F	Allium spp.	4	.01
F	Arabis spp.	1	.03
F	Descurainia pinnata (a)	11	.03
F	Lappula occidentalis (a)	19	.09
F	Lepidium spp. (a)	421	13.43
F	Plantago patagonica (a)	71	.17
F	Sisymbrium altissimum (a)	2	.15
F	Sphaeralcea coccinea	1	.00
Total for Annual Forbs		524	13.88
Total for Perennial Forbs		6	0.05
Total for Forbs		530	13.94

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

BROWSE TRENDS --

Management unit 09R, Study no: 9

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata wyomingensis	90	21.26
B	Atriplex canescens	0	-
B	Chrysothamnus nauseosus	8	.01
B	Chrysothamnus viscidiflorus viscidiflorus	6	.15
B	Grayia spinosa	1	-
B	Opuntia spp.	17	.21
Total for Browse		122	21.63

CANOPY COVER, LINE INTERCEPT --

Management unit 09R, Study no: 9

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	21.81
Chrysothamnus depressus	7.56
Chrysothamnus nauseosus	.50
Chrysothamnus viscidiflorus viscidiflorus	.18
Opuntia spp.	.48

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 09R, Study no: 9

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

BASIC COVER --

Management unit 09R, Study no: 9

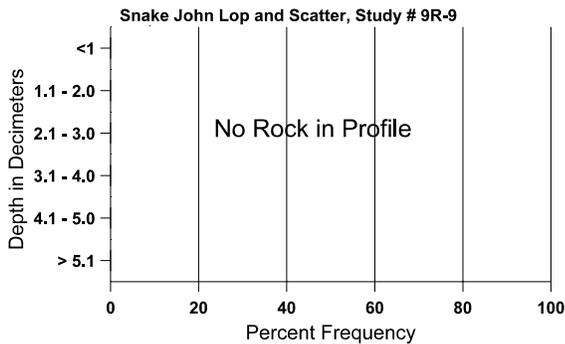
Cover Type	Average Cover %
	'05
Vegetation	36.02
Rock	.15
Pavement	.07
Litter	28.38
Cryptogams	15.10
Bare Ground	37.85

SOIL ANALYSIS DATA --

Management unit 9R, Study no: 9, Study Name: Snake John Lop and Scatter

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.8	58.2 (15.3)	7.1	74.2	14.0	11.8	0.6	6.1	86.4	0.4

### Stoniness Index



PELLET GROUP DATA --

Management unit 09R, Study no: 9

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	75	-
Elk	4	7 (18)
Deer	9	21 (53)
Antelope	1	4 (10)

BROWSE CHARACTERISTICS --  
 Management unit 09R, Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
05	<b>4540</b>	40	60	2540	1940	1080	35	3	43	15	15	27/35
<i>Atriplex canescens</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	61/55
<i>Chrysothamnus nauseosus</i>												
05	<b>160</b>	-	20	-	140	80	63	13	88	38	38	23/24
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>120</b>	-	-	60	60	20	0	33	50	17	17	15/17
<i>Grayia spinosa</i>												
05	<b>20</b>	-	-	-	20	-	0	0	100	100	100	30/29
<i>Opuntia spp.</i>												
05	<b>900</b>	-	-	640	260	300	0	0	29	22	27	4/10

Trend Study 9R-10-05

Study site name: Ruple Cabin .

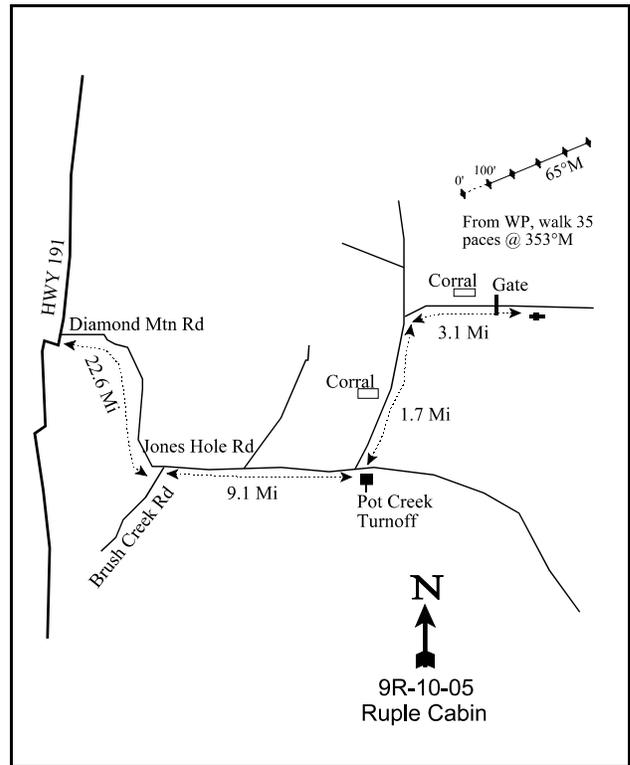
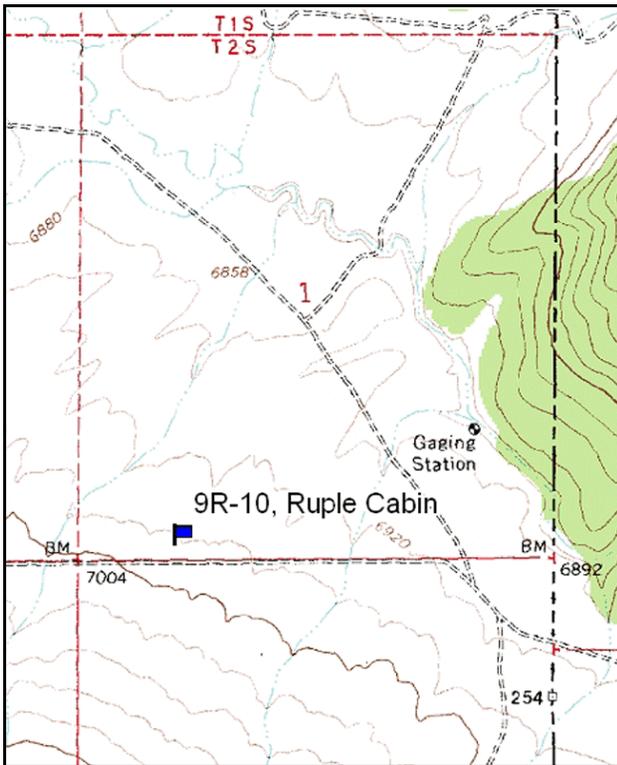
Vegetation type: Mountain Big Sagebrush .

Compass bearing: frequency baseline 65 degrees magnetic.

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

LOCATION DESCRIPTION

From Vernal, drive north on US 191 to mile marker 225. Turn right (east) on to Diamond Mountain road. Drive for 13.6 miles to a fork. Take the left fork and drive east on Jones Hole Rd for 9.1 miles to a fork to the right. There is a sign that says Pot Creek turnoff. Turn right and drive 1.7 miles to a fork. Stay right at the fork and drive 3.1 miles passing through a gate to the witness post on the right (south) side of the road. From the witness post, walk 35 paces at 353°M to the 0' stake. The 0' stake is marked with browse tag #83.



Map Name: Hoy Mountain

Diagrammatic Sketch

Township 2S, Range 25E, Section 1

GPS: NAD 27, UTM 12T 4503754 N, 663801 E

## DISCUSSION

### Ruple Cabin – 9R-10

The Ruple Cabin study site was established within the Ruple Cabin Sage Grouse Range Enhancement project area. This 3,000-acre treatment area is located 26 miles northeast of Vernal and the eastern edge of the treatment ends on the Colorado state line. It is located south of Hoy Mountain and north of Wild Mountain. The purpose of the project was to improve decadent sagebrush habitat for the greater sage grouse. The western edge of the treatment was to be burned in 2006. The western area, just east of the burn, was also to be aerated in the fall of 2006. The 1,850-acre area was seeded aurally then treated with a Lawson double drum aerator in September and October of 2005. Two seed mixes were used on the treatment area, a mix for the bottoms and an upland mix. The upland mix was applied to the area where the monitoring study was established. The project covered private, State of Utah, and BLM lands. The monitoring study site is located on the south end of the treatment in private land on a sagebrush park surrounded by pinyon-juniper forests. It is located on a 7% slope with a northern aspect at 7,000 ft. Pellet group data estimates in 2005 were 11 elk, 11 deer, and 11 cow days use/acre (26 edu/ha, 28 ddu/ha, and 27 cdu/ha). Sage grouse pellets were estimated at 26 pellets/acre.

The soil is a shallow sandy clay loam with an effective rooting depth of 12 inches. Five inches from the surface, the brown sandy clay loam layer ends and a red clay layer begins. Rock was only measured in 34% of soil profile. Phosphorus and potassium concentrations are sufficient for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The pH is neutral (6.7). In 2005, the soil erosion condition measurement was slight due to pedestals up to 1 inch tall and surface flow patterns on 2-10% of the soil surface.

Mountain big sagebrush is the key browse species. In 2005 before the treatment, it provided nearly 30% cover with a density of 8,560 plants/acre. The population was mature with 71% of the individuals classified as mature and 24% decadent. Individuals classified as dying made up only 3% of the population. Young individuals made up 6%. Utilization was moderate-heavy, with only 48% of shrubs sampled showing light use. Sagebrush leader growth averaged 1.4 inches in 2005. Bitterbrush was also sampled in 2005. It provided 1% cover with 780 plants/acre. Mature individuals made up 77% of the population, decadents 8%, and young 15%. Use was moderate-heavy with 72% of the population showing moderate or heavy use. Bitterbrush leader growth averaged 4.4 inches in 2005. Other browse species sampled in 2005 include: rubber rabbitbrush, slender buckwheat, broom snakeweed, and gray horsebrush.

Grass diversity was moderately high in 2005 with 8 species, 7 of which were perennials. Sandberg's bluegrass was the dominant grass species at nearly 10% cover and a quadrat frequency of 95%. Cheatgrass was sampled, but with a quadrat frequency of 5% and cover of much less than 1%. After the treatment, the cheatgrass could easily explode with the disturbance and decrease of competition from the sagebrush. The other species combined provide less than 2% cover.

Forb diversity was also moderate in 2005 with 33 species, 6 of which were annuals. Perennial forbs provided nearly 6% cover while annuals provided less than 1%. Every species provided less than 1% individually. Of the 33 forb species sampled on the study in 2005, 15 are species used by greater sage grouse. These species include: pale agoseris, rose pussytoes, aster, timber poisonvetch, looseflower milkvetch, winged buckwheat, Eaton fleabane, desert parsley, lupine, rockcress, blue-eyed Mary, little polecat, longleaf phlox, yellow salsify, and clover (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

## 2005 Pretreatment Assessment

Although the sagebrush is mature, decadence is reasonable. The forb component, although diverse, could provide a higher density. The treatment will open up the canopy for the forbs to expand and provide more forage for the sage grouse. The treatment will also allow younger sagebrush individuals to establish. The cheatgrass is a concern. It is sparse now, but could expand with the disturbance from the treatment. The Desirable Components Index score was good due to excellent browse cover, good perennial grass cover, and excellent perennial forb cover.

2005 winter range condition (DC Index) – good (74) Mid-level potential scale

The following is the seed mix aerially applied to the uplands:

<u>Species Seeded</u>	<u>Bulk lbs in mix</u>	<u>Bulk lbs/acre</u>
Crested Wheatgrass 'Hycrest'	800	0.5
Thickspike Wheatgrass 'Critana'	1650	1.0
Bluebunch WG 'Goldar'	560	0.3
Bluebunch WG 'Anatone'	300	0.2
Orchardgrass 'Paiute'	550	0.3
Russian Wildrye	1650	1.0
Snake River Wheatgrass 'Secar'	850	0.5
Big Bluegrass 'Sherman'	450	0.3
Canby Bluegrass 'Canbar'	450	0.3
Sandberg Bluegrass 'SID OR'	450	0.3
Western Yarrow	183	0.1
Blue Flax	450	0.3
Alfalfa 'Ladak+'	900	0.5
Alfalfa 'Nomad'	900	0.5
Sainfoin 'Eski'	4950	3.0
Small Burnet 'Delar'	3150	1.9
Bitterbrush--Ada/Boise ID	150	0.1
Bitterbrush	300	0.2
<b>Total</b>	<b>18693</b>	<b>11.3</b>
PLS lbs/acre		10.4

The following is the seed mix applied to the bottoms:

Species Seeded	Bulk lbs in mix	Bulk lbs/acre
Orchardgrass 'Paiute'	100	0.5
Russian Wildrye	200	1
Sandberg Bluegrass 'SID OR'	100	0.5
Western Yarrow	20	0.1
Blue Flax	150	0.75
Yellow Sweetclover	50	0.25
Alfalfa 'Ladak+'	200	1
Alfalfa 'Nomad'	150	0.75
Alfalfa 'Spredor 4'	200	1
Sainfoin 'Eski'	600	3
Small Burnet 'Delar'	400	2
American Vetch	30	0.15
<b>Total</b>	<b>2200</b>	<b>11</b>
PLS lbs/acre		10.1

HERBACEOUS TRENDS --

Management unit 09R, Study no: 10

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron dasystachyum	56	.40
G	Bromus tectorum (a)	13	.02
G	Carex spp.	32	.13
G	Koeleria cristata	20	.15
G	Poa pratensis	10	.33
G	Poa secunda	339	9.67
G	Sitanion hystrix	39	.26
G	Stipa comata	41	.66
Total for Annual Grasses		13	0.02
Total for Perennial Grasses		537	11.62
Total for Grasses		550	11.64
F	Agoseris glauca	3	.00
F	Antennaria rosea	17	.34
F	Arabis spp.	11	.05
F	Astragalus convallarius	30	.97
F	Astragalus tenellus	14	.30
F	Aster spp.	2	.02
F	Chaenactis douglasii	1	.00
F	Collomia linearis (a)	20	.04

Type	Species	Nested Frequency	Average Cover %
		'05	'05
F	<i>Comandra pallida</i>	14	.20
F	<i>Collinsia parviflora</i> (a)	35	.14
F	<i>Cryptantha</i> spp.	2	.06
F	<i>Descurainia pinnata</i> (a)	6	.01
F	<i>Eriogonum alatum</i>	-	.00
F	<i>Erigeron eatonii</i>	12	.27
F	<i>Eriogonum umbellatum</i>	20	.28
F	<i>Gayophytum ramosissimum</i> (a)	8	.01
F	<i>Heterotheca villosa</i>	36	.99
F	<i>Linum lewisii</i>	13	.17
F	<i>Lomatium</i> spp.	5	.01
F	<i>Lupinus</i> spp.	3	.03
F	<i>Machaeranthera canescens</i>	2	.00
F	<i>Microsteris gracilis</i> (a)	37	.14
F	<i>Penstemon</i> spp.	12	.08
F	<i>Petroradia pumila</i>	46	.93
F	<i>Phlox austromontana</i>	11	.23
F	<i>Phlox longifolia</i>	55	.33
F	<i>Polygonum douglasii</i> (a)	17	.04
F	<i>Schoenocrambe linifolia</i>	2	.03
F	<i>Senecio multilobatus</i>	27	.06
F	<i>Sphaeralcea coccinea</i>	25	.15
F	<i>Tragopogon dubius</i>	1	.00
F	<i>Trifolium</i> spp.	28	.11
F	<i>Zigadenus paniculatus</i>	7	.05
Total for Annual Forbs		123	0.39
Total for Perennial Forbs		399	5.76
Total for Forbs		522	6.15

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

BROWSE TRENDS --

Management unit 09R, Study no: 10

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata vaseyana	100	29.64
B	Chrysothamnus nauseosus	3	.03
B	Eriogonum microthecum	1	-
B	Gutierrezia sarothrae	10	.12
B	Opuntia spp.	7	.03
B	Pediocactus simpsonii	0	-
B	Purshia tridentata	33	1.25
B	Tetradymia canescens	1	-
Total for Browse		155	31.08

CANOPY COVER, LINE INTERCEPT --

Management unit 09R, Study no: 10

Species	Percent Cover
	'05
Artemisia tridentata vaseyana	34.48
Gutierrezia sarothrae	.11
Purshia tridentata	1.46
Tetradymia canescens	.35

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 09R, Study no: 10

Species	Average leader growth (in)
	'05
Artemisia tridentata vaseyana	1.4
Purshia tridentata	4.4

**BASIC COVER --**

Management unit 09R, Study no: 10

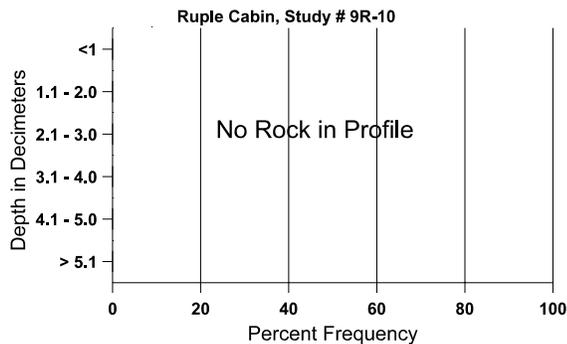
Cover Type	Average Cover %
	'05
Vegetation	45.31
Rock	2.66
Pavement	1.55
Litter	36.33
Cryptogams	2.00
Bare Ground	31.04

**SOIL ANALYSIS DATA --**

Management unit 9R, Study no: 10, Study Name: Ruple Cabin

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.0	44.2 (17.5)	6.7	51.1	27.1	21.8	2.5	13.1	137.6	0.7

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 09R, Study no: 10

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	30	-
Elk	8	11 (26)
Deer	6	11 (28)
Cattle	5	11 (27)

BROWSE CHARACTERISTICS --  
Management unit 09R, 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 vaseyana</i>												
05	<b>8560</b>	-	480	6060	2020	840	28	24	24	3	3	24/30
<i>Chrysothamnus nauseosus</i>												
05	<b>60</b>	-	20	-	40	-	33	0	67	33	33	23/31
<i>Eriogonum microthecum</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	6/6
<i>Gutierrezia sarothrae</i>												
05	<b>260</b>	-	20	240	-	40	0	0	-	-	0	9/10
<i>Opuntia spp.</i>												
05	<b>220</b>	-	40	140	40	-	0	0	18	9	9	3/10
<i>Pediocactus simpsonii</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	2/3
<i>Purshia tridentata</i>												
05	<b>780</b>	-	120	600	60	-	28	44	8	5	5	10/22
<i>Tetradymia canescens</i>												
05	<b>20</b>	-	-	20	-	-	100	0	-	-	0	12/23

Trend Study 10R-35-05

Study site name: Winter Ridge Dixie .

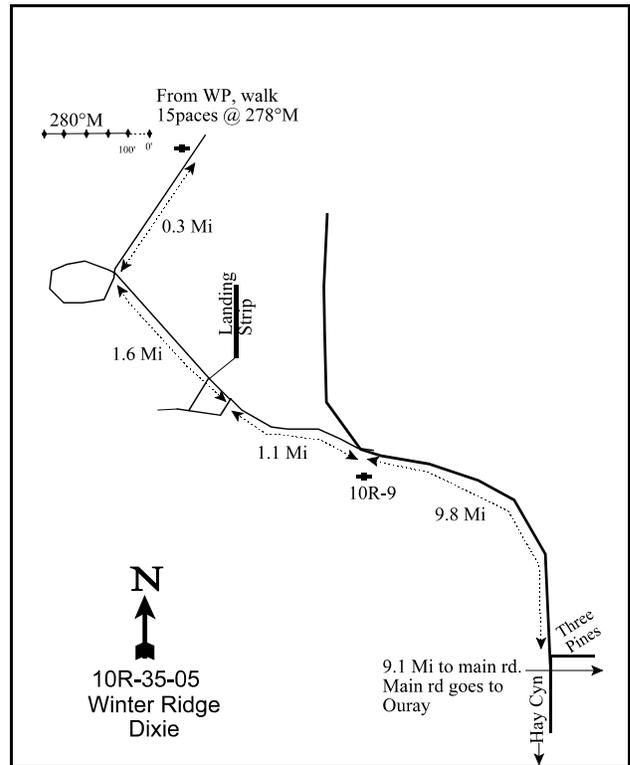
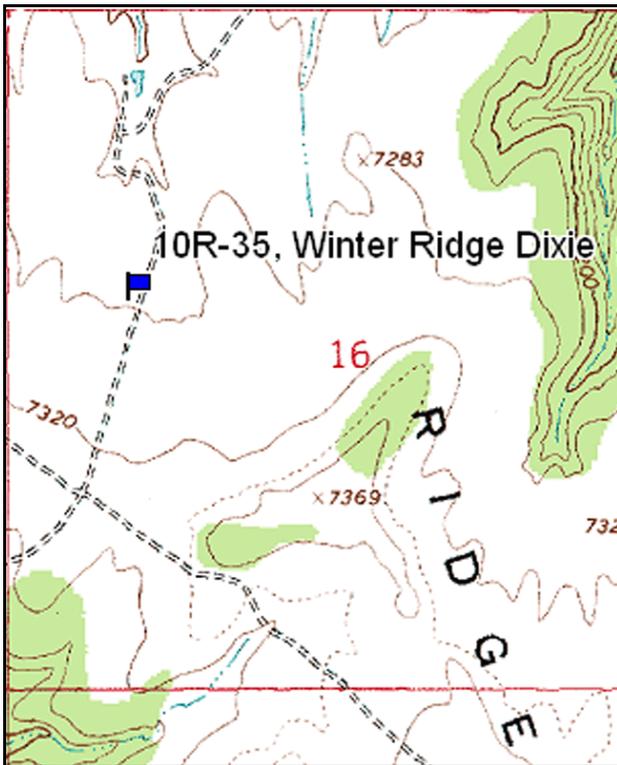
Vegetation type: Mountain Big Sagebrush .

Compass bearing: frequency baseline 280 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of the Seep Ridge and Book Cliff Divide road, proceed west along the divide for 9.4 miles to the major Three Pines - Hay Canyon intersection. Drive west along the Winter Ridge Rd for 9.8 miles to a fork. The Winter Ridge Exclosure (10R-9,10,11) is just south. Take the left fork (west) and drive 1.1 miles to a fork. Take the right fork, passing an antenna, and drive 1.6 miles to an intersection. Turn right (north) and drive 0.3 miles to the witness post on the right (west) side of the road. From the witness post, walk 15 paces at 278°M to the 0' stake. The 0' stake is marked with browse tag #87.



Map Name: Wolf Point

Diagrammatic Sketch

Township 15S, Range 21E, Section 16

GPS: NAD 27, UTM 12S 4374586 N, 622314 E

HERBACEOUS TRENDS --  
 Management unit 10R, Study no: 35

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron dasystachyum	4	.03
G	Agropyron smithii	188	1.98
G	Bouteloua gracilis	27	1.82
G	Koeleria cristata	65	1.11
G	Oryzopsis hymenoides	7	.03
G	Poa fendleriana	51	1.31
G	Poa secunda	210	2.77
G	Stipa comata	182	5.14
G	Unknown grass - annual (a)	5	.03
Total for Annual Grasses		5	0.03
Total for Perennial Grasses		734	14.21
Total for Grasses		739	14.24
F	Agoseris glauca	11	.05
F	Antennaria rosea	9	.24
F	Astragalus convallarius	10	.33
F	Astragalus utahensis	14	.08
F	Cryptantha spp.	6	.01
F	Erigeron pumilus	32	.21
F	Machaeranthera spp	22	.32
F	Phlox austromontana	152	2.19
F	Phlox longifolia	28	.10
F	Unknown scrophulariaceae	20	.07
F	Sphaeralcea coccinea	108	1.31
F	Townsendia spp.	5	.03
Total for Annual Forbs		0	0
Total for Perennial Forbs		417	4.96
Total for Forbs		417	4.96

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

BROWSE TRENDS --

Management unit 10R, Study no: 35

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata vaseyana	95	14.56
B	Ceratoides lanata	1	-
B	Chrysothamnus depressus	18	.30
B	Chrysothamnus viscidiflorus viscidiflorus	4	.18
B	Gutierrezia sarothrae	95	12.40
B	Pediocactus simpsonii	3	-
B	Physaria spp.	0	.10
B	Tetradymia canescens	2	-
Total for Browse		218	27.55

CANOPY COVER, LINE INTERCEPT --

Management unit 10R, Study no: 35

Species	Percent Cover
	'05
Artemisia tridentata vaseyana	18.71
Chrysothamnus depressus	1.00
Gutierrezia sarothrae	20.29

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 10R, Study no: 35

Species	Average leader growth (in)
	'05
Artemisia tridentata vaseyana	1.5

BASIC COVER --

Management unit 10R, Study no: 35

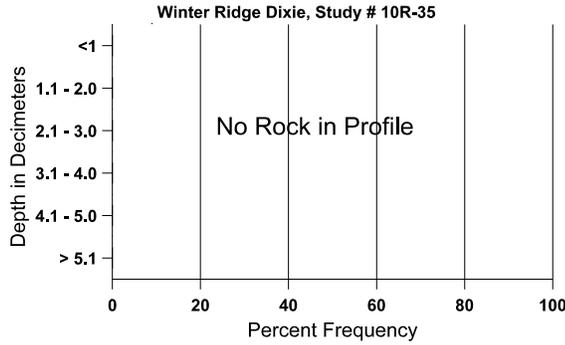
Cover Type	Average Cover %
	'05
Vegetation	40.90
Rock	1.21
Pavement	.31
Litter	22.65
Cryptogams	4.67
Bare Ground	42.78

SOIL ANALYSIS DATA --

Management unit 10R, Study no: 35, Study Name: Winter Ridge Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.9	- (-)	7.2	24.7	52.4	22.8	1.6	3.7	80.0	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 10R, Study no: 35

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	29	-
Horse	11	16 (40)
Grouse	1	-
Elk	14	14 (35)
Deer	1	6 (15)
Cattle	7	15 (36)

BROWSE CHARACTERISTICS --

Management unit 10R, Study no: 35

		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>												
05	<b>5660</b>	580	220	2980	2460	720	22	36	43	11	11	24/28
<i>Ceratoides lanata</i>												
05	<b>20</b>	-	-	20	-	-	0	100	-	-	0	14/6
<i>Chrysothamnus depressus</i>												
05	<b>960</b>	-	20	900	40	-	13	69	4	2	2	7/14
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>180</b>	-	-	180	-	-	0	0	-	-	0	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)
<i>Gutierrezia sarothrae</i>												
05	<b>7840</b>	260	2700	5140	-	-	0	0	-	-	0	9/10
<i>Pediocactus simpsonii</i>												
05	<b>80</b>	-	20	60	-	-	0	0	-	-	0	2/2
<i>Tetradymia canescens</i>												
05	<b>60</b>	-	40	20	-	-	0	33	-	-	0	7/10

Trend Study 14R-9-05

Study site name: Harts Draw Flat 1 .

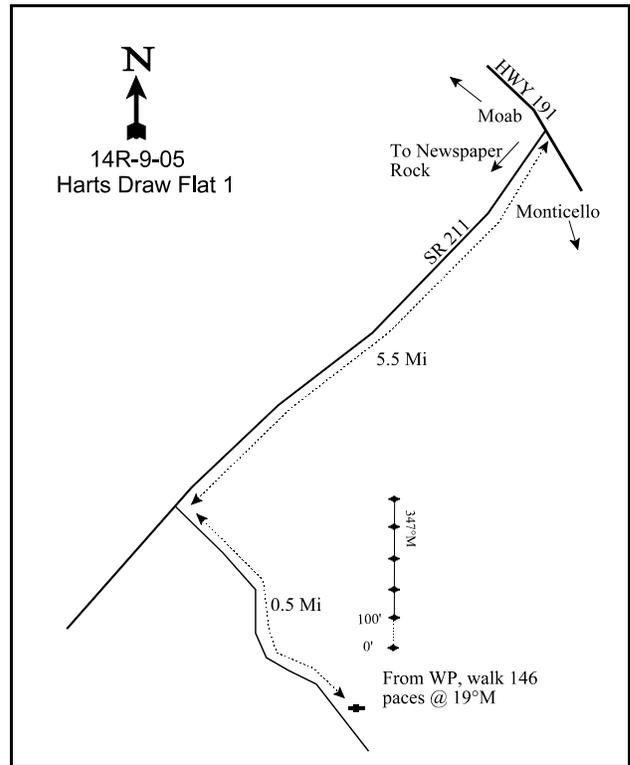
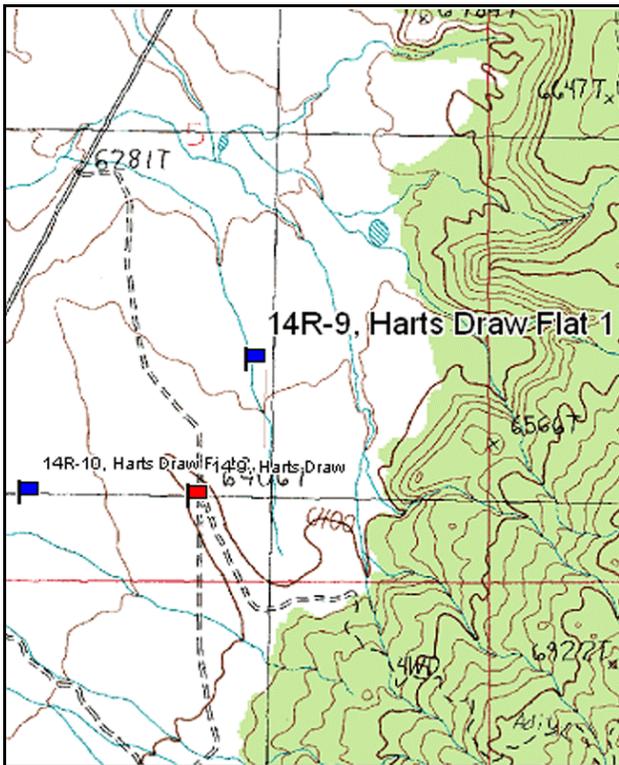
Vegetation type: Basin Big Sagebrush .

Compass bearing: frequency baseline 347 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of US 191 and SR 211, north of Monticello, drive 5.5 miles on SR 211 to a dirt road on the left (south) side of the road. Drive 0.5 miles to the witness post on the left (east) side of the road. From the witness post, walk 146 paces at 19°M to the 0' stake. The 0' stake is marked with browse tag #65.



Map Name: Photograph Gap

Diagrammatic Sketch

Township 32S , Range 23E , Section 5

GPS: NAD 27, UTM 12S 4209354 N, 638925 E

## DISCUSSION

### Harts Draw Flat 1 – 14R-09

This 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 Harts Draw Flat 1 study is located on a basin big sagebrush-black greasewood 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 single drum aerator, and seeded on top of the drum, in the fall of 2005. The Harts Draw Flat 2 (14R-10) study is within the same treatment area, but on a flat to the southwest. The Harts Draw Flat 1 monitoring site is located on a 1% slope with a north aspect at 6,340 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 4 deer, 18 cow, and 4 horse days use/acre (10 ddu/ha, 45 cdu/ha, and 10 hdu/ha).

The soil is a shallow red sandy clay loam with an effective rooting depth of 22 inches. There was very little rock in the soil profile and no hardpan in the upper 22 inches. Phosphorus concentrations are low at 3.4 ppm, values less than 6 ppm may limit plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.7). In 2005, the soil erosion condition measurement was slight due to a large gully on the east and on the west of the baseline transect, as well as moderate pedestals surrounding perennials and shrubs.

Black greasewood is the dominant browse species. In 2005, it provided nearly 5% cover, with a density of 1,360 plants/acre. Decadence was moderate at 22% and plants classified as dying constituted 6% of the population. Young individuals made up 25% of the overall population. Utilization on greasewood was moderate. Basin big sagebrush was the key browse species in 2005. It only provided 1% cover with a density of 220 plants/acre. Seventy-three percent of the population was classified as decadent and 73% was classified as dying. Another 9% of the population was classified as having poor vigor, other than dying. Utilization was mostly heavy, due to the lack of preferred browse on the site. A large sagebrush covered knoll is located to the southeast, where it is likely that more deer winter. Shadscale was also sampled on the site, but not in the density or cover measurements.

Eight species of grasses were sampled in 2005, 2 of which were annuals. Cheatgrass provided nearly 10% cover and a quadrat frequency of 92%. Galleta provided 8% cover with a quadrat frequency of 73%. The other six grass species provided 1.5% cover combined.

Eight species of forbs were also sampled in 2005, 6 of which were annuals. Burr buttercup and storksbill provided nearly 8% cover combined, nearly 6% of which was provided by the buttercup. The only perennial species were segolily and scarlet globemallow.

#### 2005 Pretreatment Assessment

The site is cheatgrass dominated with very few preferred browse species. The sagebrush scattered around the study area are very decadent and dying. The grass and forb compositions are poor and could fiercely compete with seeded species if the disturbance from the treatment is not drastic enough. The site is very dry and seed establishment may be difficult. The Desirable Components Index score is poor due to very low preferred browse cover and moderate annual grass cover.

2005 winter range condition (DC Index) – poor (13) 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: 9

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron smithii	60	.75
G	Bromus tectorum (a)	355	9.73
G	Hilaria jamesii	238	8.00
G	Hordeum glaucum	25	.41
G	Poa pratensis	5	.15
G	Sitanion hystrix	10	.04
G	Sporobolus cryptandrus	6	.06
G	Vulpia octoflora (a)	20	.12
<b>Total for Annual Grasses</b>		<b>375</b>	<b>9.85</b>
<b>Total for Perennial Grasses</b>		<b>344</b>	<b>9.42</b>
<b>Total for Grasses</b>		<b>719</b>	<b>19.27</b>
F	Calochortus nuttallii	9	.02
F	Descurainia pinnata (a)	53	.53
F	Eriogonum cernuum (a)	1	.00
F	Erodium cicutarium (a)	51	1.05
F	Gilia spp. (a)	-	.00
F	Lappula occidentalis (a)	78	.63

Type	Species	Nested Frequency	Average Cover %
		'05	'05
F	Ranunculus testiculatus (a)	326	5.70
F	Sphaeralcea coccinea	4	.03
Total for Annual Forbs		509	7.93
Total for Perennial Forbs		13	0.05
Total for Forbs		522	7.99

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

#### BROWSE TRENDS --

Management unit 14R, Study no: 9

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata tridentata	11	1.11
B	Atriplex confertifolia	0	-
B	Coryphantha vivipara arizonica	1	-
B	Gutierrezia sarothrae	0	-
B	Opuntia spp.	1	-
B	Sarcobatus vermiculatus	39	4.75
Total for Browse		52	5.86

#### CANOPY COVER, LINE INTERCEPT --

Management unit 14R, Study no: 9

Species	Percent Cover
	'05
Artemisia tridentata tridentata	1.11
Sarcobatus vermiculatus	4.75

BASIC COVER --

Management unit 14R, Study no: 9

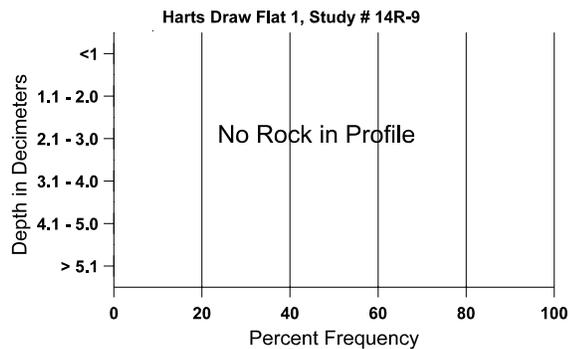
Cover Type	Average Cover %
	'05
Vegetation	28.07
Rock	.00
Pavement	.32
Litter	34.79
Cryptogams	.11
Bare Ground	51.06

SOIL ANALYSIS DATA --

Management unit 14R, Study no: 9, Study Name: Harts Draw Flat 1

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
15.5	54.8 (15.5)	7.7	50.7	23.5	25.8	0.7	3.4	131.2	0.5

### Stoniness Index



PELLET GROUP DATA --

Management unit 14R, Study no: 9

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	33	-
Deer	16	4 (10)
Cattle	12	18 (45)
Horse	-	4 (10)

BROWSE CHARACTERISTICS --  
 Management unit 14R, Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata tridentata</i>												
05	<b>220</b>	-	-	60	160	400	18	64	73	73	82	21/29
<i>Atriplex confertifolia</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	6/11
<i>Coryphantha vivipara arizonica</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	5/4
<i>Gutierrezia sarothrae</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	7/9
<i>Opuntia spp.</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	5/9
<i>Sarcobatus vermiculatus</i>												
05	<b>1360</b>	60	340	720	300	240	44	28	22	6	6	21/28

Trend Study 14R-10-05

Study site name: Harts Draw Flat 2 .

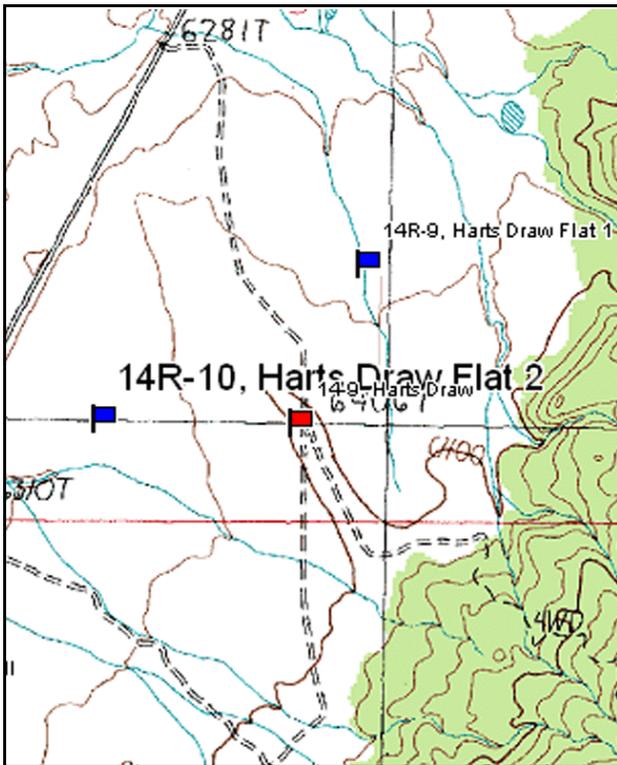
Vegetation type: Basin Big Sagebrush .

Compass bearing: frequency baseline 129 degrees magnetic.

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

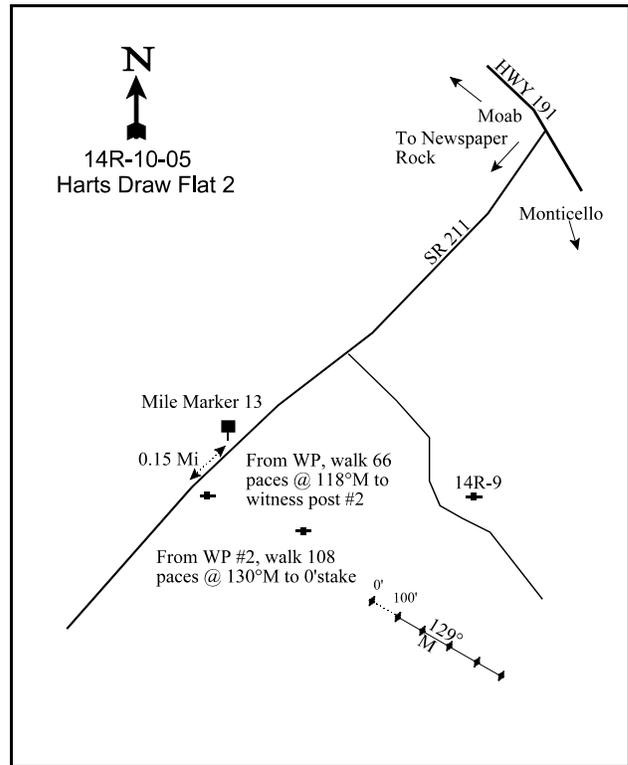
LOCATION DESCRIPTION

From the junction of US 191 and SR 211, north of Monticello, drive past 14R-9 to mile marker 13. Continue 0.15 miles to the witness post on the left (SE) side of the road (about 20 feet off the road). From the witness post, walk 66 paces at 118°M to a second witness post. From the second witness post, walk 108 paces at 130°M to the 0' stake. The 0' stake is marked with browse tag #66.



Map Name: Photograph Gap

Township 32S, Range 23E, Section 5



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 42089797 N, 638311 E

## DISCUSSION

### Harts Draw Flat 2 – 14R-10

This 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 Harts Draw Flat 2 study is located on a basin big sagebrush valley 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 single drum aerator, and seeded on top of the drum, in the fall of 2005. The Harts Draw Flat 1 (14R-09) study is within the same treatment area, but on a flat to the northeast. The Harts Draw Flat 2 monitoring site is located on a 1% slope with a southeast aspect at 6,340 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 5 deer and 41 cow days use/acre (13 ddu/ha and 100 cdu/ha). Both cow pats and deer pellets were from winter.

The soil is shallow red clay loam with an effective rooting depth of 17 inches. There was little rock in the soil profile (only 4% of the penetrometer readings sampled rock). The clay layer was compacted at 13-17 inches. The phosphorus concentration is low at 5.5 ppm, values less than 6 ppm may limit plant growth and development in wildland soils (Tiedemann and Lopez 2004). The pH is mildly alkaline (7.7). In 2005, the soil erosion condition measurement was stable.

The key browse species is basin big sagebrush. Before treatment in 2005, sagebrush provided 3% cover, with a density of 600 plants/acre. Decadence was 73% and plants classified as dying were 60% of the population. Seven percent of the population was classified as young and only 20% were mature. Utilization was moderate. Winterfat and broom snakeweed were present on the monitoring study site, but in small numbers.

Seven grass species were sampled in 2005, two of which were annuals. Cheatgrass provided nearly 12% cover and 85% quadrat frequency. Crested wheatgrass provided 7% cover and 56% quadrat frequency. The other species of grasses provided only around 1% cover combined. These species include: galleta grass, Indian ricegrass, squirreltail bottlebrush, sand dropseed, and sixweeks fescue.

Eight species of forbs were sampled in 2005, one of which was a perennial. This perennial species, scarlet globemallow, provided 1% cover and 7% quadrat frequency. Of the 7 annual species, 5 were weedy species. These include: Pinnate tansymustard, annual stickseed, burr buttercup, Russian thistle, and tumble mustard. Russian thistle provided nearly 15% cover and 94% quadrat frequency in 2005. Pinnate tansymustard provided 1% cover and 18% quadrat frequency. The other 2 annual species were lambsquarters goosefoot and Fremont goosefoot, which provided little cover.

### 2005 Pretreatment Assessment

The site is dominated by annuals and crested wheatgrass. The sagebrush is sparse, but higher in density and cover than the Harts Draw Flat 1 study. Similarly, sagebrush decadence is high and the population needs to be treated. Hopefully, the aerator treatment will cause enough disturbance to allow the seeded species to compete with the annuals. The Desirable Components Index score is poor due to very low preferred browse cover and high annual grass cover.

2005 winter range condition (DC Index) – poor (14) 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: 10

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	155	6.66
G	Bromus tectorum (a)	279	11.59
G	Hilaria jamesii	7	.18
G	Oryzopsis hymenoides	16	.17
G	Sitanion hystrix	26	.93
G	Sporobolus cryptandrus	5	.06
G	Vulpia octoflora (a)	2	.00
Total for Annual Grasses		281	11.59
Total for Perennial Grasses		209	8.01
Total for Grasses		490	19.61
F	Chenopodium album (a)	8	.01
F	Chenopodium fremontii (a)	38	.23
F	Descurainia pinnata (a)	39	1.04
F	Lappula occidentalis (a)	46	.98
F	Ranunculus testiculatus (a)	33	.09
F	Salsola iberica (a)	352	14.57
F	Sisymbrium altissimum (a)	2	.21

Type	Species	Nested Frequency	Average Cover %
		'05	'05
F	<i>Sphaeralcea coccinea</i>	25	1.27
Total for Annual Forbs		518	17.15
Total for Perennial Forbs		25	1.27
Total for Forbs		543	18.42

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

**BROWSE TRENDS --**

Management unit 14R, Study no: 10

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata tridentata</i>	20	2.91
B	<i>Ceratoides lanata</i>	0	-
B	<i>Gutierrezia sarothrae</i>	1	-
Total for Browse		21	2.91

**CANOPY COVER, LINE INTERCEPT --**

Management unit 14R, Study no: 10

Species	Percent Cover
	'05
<i>Artemisia tridentata tridentata</i>	1.39

**KEY BROWSE ANNUAL LEADER GROWTH --**

Management unit 14R, Study no: 10

Species	Average leader growth (in)
	'05
<i>Artemisia tridentata tridentata</i>	2.9

BASIC COVER --

Management unit 14R, Study no: 10

Cover Type	Average Cover %
	'05
Vegetation	36.50
Rock	.39
Pavement	.07
Litter	33.32
Cryptogams	.04
Bare Ground	38.83

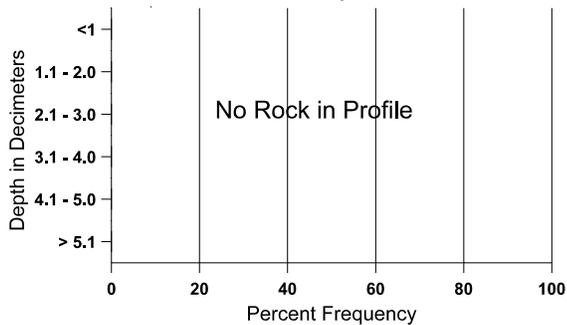
SOIL ANALYSIS DATA --

Management unit 14R, Study no: 10, Study Name: Harts Draw Flat 2

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
16.9	51.0 (16.5)	7.7	28.4	36.8	34.8	1.0	5.5	364.8	0.5

Stoniness Index

Harts Draw Flat 2, Study # 14R-10



PELLET GROUP DATA --

Management unit 14R, Study no: 10

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	52	-
Deer	10	5 (13)
Cattle	12	41 (100)

BROWSE CHARACTERISTICS --  
 Management unit 14R, 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>												
05	<b>600</b>	-	40	120	440	1760	30	23	73	60	60	25/26
<i>Ceratoides lanata</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	20/11
<i>Gutierrezia sarothrae</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	5/9

Trend Study 14R-11-05

Study site name: Harts Windmill.

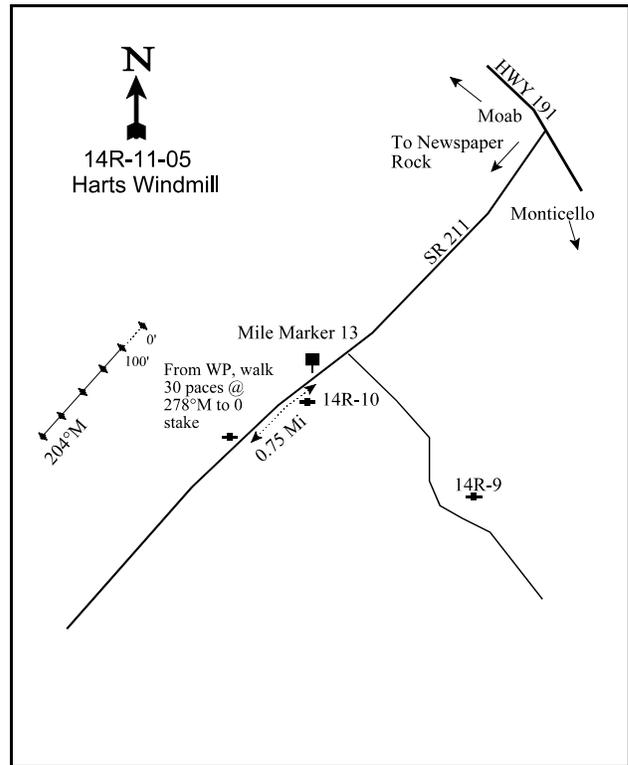
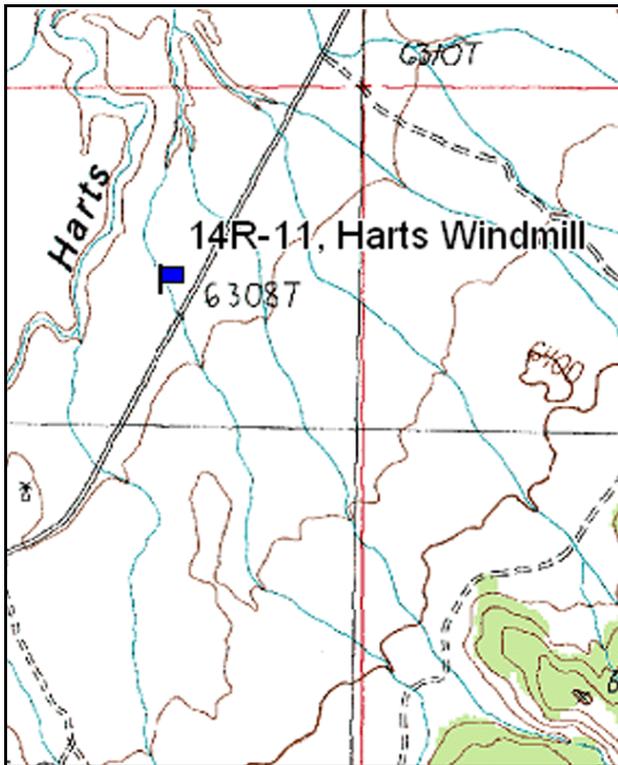
Vegetation type: Basin Big Sagebrush.

Compass bearing: frequency baseline 204 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of US 191 and SR 211, north of Monticello, drive past 14R-9 to mile marker 13. Continue 0.75 miles to the witness post on the right (NW) side of the road (about 20 feet off the road). From the witness post, walk 30 paces at 278°M to the 0' stake.



Map Name: Photograph Gap

Diagrammatic Sketch

Township 32S, Range 23E, Section 7

GPS: NAD 27, UTM 12S 4208297 N, 637560 E

## DISCUSSION

### Harts Windmill – 14R-11

This 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 Harts Windmill study is located on a flat covered with annual wheatgrass 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. This study is located southwest of the Harts Draw Flat 1 and 2 sites and northwest of SR 211. It is located on a 1% slope with a west aspect at 6,310 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 from 2005 was estimated at 23 cow days use/acre (57 cdu/ha).

The soil is shallow clay with an effective rooting depth of 16 inches. There were no rocks sampled in the profile of the soil and very minute rock and pavement cover on the surface. The phosphorus concentration is marginal at 6.8 ppm, values less than 6 ppm may limit plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.6). In 2005, the soil erosion condition measurement was stable, although there were rills up to 1.5 inches deep and a large gully (Harts Draw) is located just west of the baseline transect.

No browse species were sampled in density or cover measurements before treatment in 2005. Fourwing saltbush and broom snakeweed were measured in the height/crown measurements. Black greasewood and either Wyoming or basin big sagebrush are growing in areas surrounding the treatment area.

Three species of grasses were sampled in 2005: Annual wheatgrass, cheatgrass, and sand dropseed. Annual wheatgrass was dominant with 44% cover, 99% quadrat frequency, and nearly 100% grass cover. The other 2 species provided one-tenth of 1% cover. Crested wheatgrass was not sampled, but was present in clumps in the study area.

Only 4 species of forbs were sample in 2005: Storksbill, annual stickseed, burr buttercup, and Russian thistle. All four of which were invasive annual species. These 4 species provided nearly 3% cover; burr buttercup and Russian thistle provided 1% cover each.

### 2005 Pretreatment Assessment

As with the other Harts Draw sites, there are few native species in the treatment area. Exotic annuals dominate this area and will be tough competitors with the seed that is trying to establish. The Desirable Components Index score is very poor due to no preferred browse cover, very little perennial species cover, and very high annual grass cover.

2005 winter range condition (DC Index) – very poor (-20) 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: 11

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron triticeum	445	43.96
G	Bromus tectorum (a)	12	.07
G	Sporobolus cryptandrus	1	.03
Total for Annual Grasses		12	0.07
Total for Perennial Grasses		446	43.99
Total for Grasses		458	44.06
F	Erodium cicutarium (a)	3	.03
F	Lappula occidentalis (a)	15	.28
F	Ranunculus testiculatus (a)	47	1.24
F	Salsola iberica (a)	117	1.06
Total for Annual Forbs		182	2.61
Total for Perennial Forbs		0	0
Total for Forbs		182	2.61

**BROWSE TRENDS--**

Management unit 14R, Study no: 11

Species	Strip Frequency	Average Cover %
	'05	'05
Atriplex canescens	0	-
Gutierrezia sarothrae	0	-

**BASIC COVER --**

Management unit 14R, Study no: 11

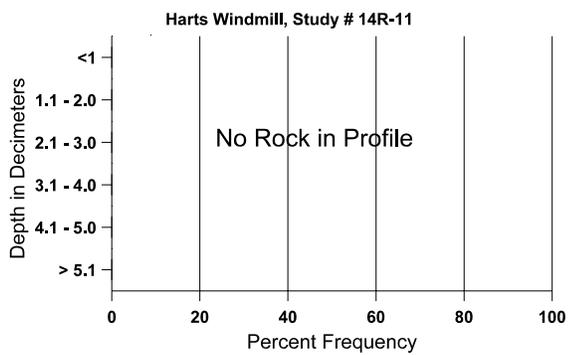
Cover Type	Average Cover %
	'05
Vegetation	45.95
Rock	.02
Pavement	.14
Litter	27.96
Cryptogams	.00
Bare Ground	40.37

**SOIL ANALYSIS DATA --**

Management unit 14R, Study no: 11, Study Name: Harts Windmill

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
16.1	63.0 (16.0)	7.6	20.7	37.5	41.8	1.3	6.8	496.0	0.5

**Stoniness Index**



PELLET GROUP DATA --

Management unit 14R, Study no: 11

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	43	-
Deer	4	-
Cattle	9	23 (57)

BROWSE CHARACTERISTICS --

Management unit 14R, 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>Atriplex canescens</i>												
05	0	-	-	-	-	-	0	0	-	-	0	28/35
<i>Gutierrezia sarothrae</i>												
05	0	-	-	-	-	-	0	0	-	-	0	4/7

Trend Study 16R-14-05

Study site name: Consumer Bench North.

Vegetation type: Wyoming Big Sagebrush.

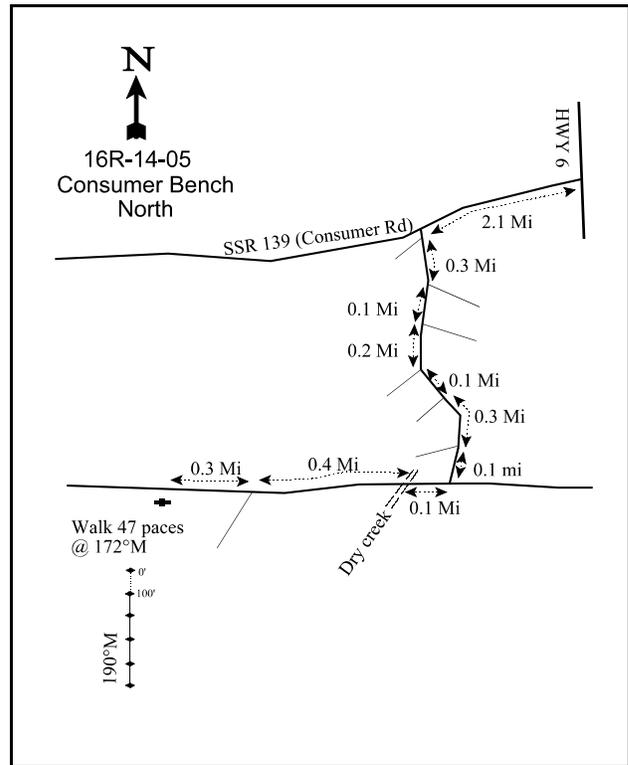
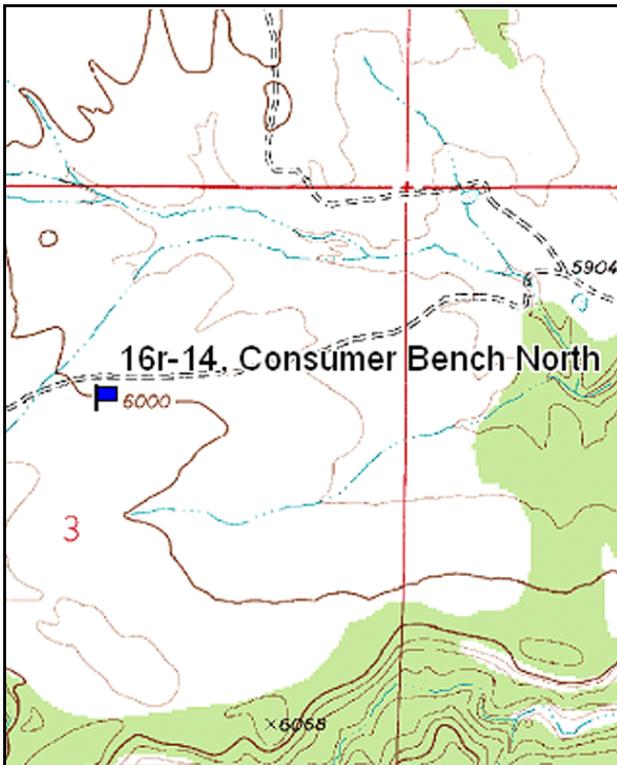
Compass bearing: frequency baseline 190 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of US 6 and SSR 139 in Price, drive west on SSR 139 for 2.1 miles to a dirt road on the left (south) side of the road. Make an immediate left and drive 0.3 miles to a fork. Take the right fork at the derrick pump and drive 0.1 miles. Stay left and drive 0.2 miles to a fork and drive another 0.1 miles to another fork. Stay left at the fork and drive 0.3 miles to a fork. Stay left at the fork and drive 0.1 miles to a better road. Turn right and drive 0.1 miles through a dry creek and gully. Proceed through the dry creek and drive 0.4 miles to a fork. Go straight and drive 0.3 miles to the witness post on the left (south) side of the road. Witness post is near a natural gas pipeline sign. From the witness post, walk 47 paces at 172°M to the 0' stake. The 0' stake is marked with browse tag #63.

(Alternative route and probably better route is to drive ~2.8 miles from the junction of US 6 and SSR 139 to a road to the right (south) just before the railroad tracks. Turn on this road and drive about a ~1.0 mile to Trestle Rd. Turn left and drive ~0.6 miles to a fork, stay left. Continue east for ~0.6 mile to the witness post on the right (south) side of the road.



Map Name: Standardville

Diagrammatic Sketch

Township 14S, Range 9E, Section 3

GPS: NAD 27, UTM 12S 4387563 N, 508623 E

## DISCUSSION

### Consumer Bench North – 16R-14

The Consumer Bench North study site was established on the Price West Bench Year 2 project area. The project plan was to restore over 3,700 acres of mule deer and possible greater sage grouse sagebrush winter habitat on BLM land. The treatment consists of 4 treatment areas. One is located north of the Price airport (about 3 miles northeast of Price), one 3 miles north of Price, and 2 about 4 miles northwest of Price (south of the Consumer's Road). The airport treatment area treated the Range Trend study site Airport (11B-3). The Consumer Bench North site is located in the north-most treatment area northwest of Price. Treatment occurred in the fall of 2005. The methods of treatment in the areas northwest of Price were Lawson double drum aerator with seeder between drums, Lawson single drum aerator with seeder over the drum, and a 12 foot Dixie pipe harrow with broadcast seeder on the tractor seeding into the harrow. Each treatment was applied in strips the width of the equipment, ultimately covering 1/4 to 1/3 of the treatment area. Following each treatment, sagebrush was aerially seeded on the soil surface. The Consumer Bench North monitoring site was treated with the Lawson double drum aerator, the seeder was positioned between the first and second drum. This site is located on a 4% slope with a northern aspect at 6,000 feet. It is within an extensive Wyoming big sagebrush flat. The treatment area is within the Consumers Wash grazing allotment, which allows 54 sheep to graze from October 1 to April 20 and 874 sheep to graze from April 21 to June 20. Pellet group data in 2005 was estimated at 28 elk and 48 deer days use/acre (69 edu/ha and 119 ddu/ha).

The soil is a shallow loam with an effective rooting depth of 14 inches. No rock was sampled in the soil profile and very little pavement was measured on the surface. Phosphorus concentrations are marginal at 6.6 ppm, values less than 6 ppm may limit plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.4). In 2005, the soil erosion condition measurement was slight due to large pedestals around shrubs and perennial species as well as rills up to 1 inch deep.

The key browse species was Wyoming big sagebrush before the treatment in 2005. It provided 17% cover (14% line intercept cover) with a density of 4,580 plants/acre. Decadence is very high at 75% of the population and plants classified as dying made up 49% of the population. Young individuals made up 2% of the population, but 4,360 seedlings/acre were sampled. The seedlings may establish quickly after the treatment when competition with more mature individuals has been decreased. Utilization was mostly light-moderate. Sagebrush leader growth was 2.5 inches in 2005. Other browse species sampled include low rabbitbrush, broom snakeweed, and cactus.

Six species of grasses were sampled in 2005, four of which were perennials. The dominant grass species was squirreltail bottlebrush, which provided 21% cover and 95% quadrat frequency. The other 5 species provided less than 2% cover combined. Other grasses sampled include: Cheatgrass, Indian ricegrass, sand dropseed, needle-and-thread, and sixweeks fescue.

Twenty species of forbs were sampled in 2005, seven of which were annuals. Only one species, scarlet globemallow, provided 1% cover, all others provided far less. Five species used by sagegrouse were sampled before the treatment. The species include: Rockcress, timber poisonvetch, sulfur buckwheat, cushion buckwheat, and longleaf phlox (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

### 2005 Pretreatment Assessment

The sagebrush is very decadent and should respond well to the treatment. There are a large number of seedlings which may establish quickly with less competition from the more establish sagebrush individuals. The squirreltail bottlebrush should keep the cheatgrass under control at such high cover and quadrat frequencies. The Desirable Components Index score is good due to good browse cover and excellent perennial grass cover, although browse decadence is very high.

2005 winter range condition (DC Index) – good (53) Lower potential scale

The following species were seeded on the treatment area in the fall of 2005:

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Fourwing Saltbush--Juab UT	2000	1.1
Russian Wildrye 'Bozoisky'	2965	1.6
Indian Ricegrass 'Nezpar'	849	0.5
Crested Wheatgrass 'Douglas'	1150	0.6
Crested Wheatgrass 'Hycrest'	1000	0.5
Western Wheatgrass	300	0.2
Alfalfa 'Ladak+'	750	0.4
Alfalfa 'Nomad'	750	0.4
Alfalfa 'Ranger'	750	0.4
Sainfoin 'Eski'	2500	1.4
Small Burnet 'Delar'	1500	0.8
Russian Wildrye	1150	0.6
Indian Ricegrass 'Rimrock'	1000	0.5
Western Wheatgrass	1550	0.8
Yellow Sweetclover	416	0.2
<b>Total</b>	<b>18630</b>	<b>10.1</b>
PLS lbs/acre		8.4

HERBACEOUS TRENDS --

Management unit 16R, Study no: 14

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Bromus tectorum (a)	2	.01
G	Oryzopsis hymenoides	21	.97
G	Sitanion hystrix	322	20.90
G	Sporobolus cryptandrus	1	.00
G	Stipa comata	1	.06
G	Vulpia octoflora (a)	38	.57
Total for Annual Grasses		40	0.58
Total for Perennial Grasses		345	21.94
Total for Grasses		385	22.52
F	Arabis spp.	2	.00
F	Astragalus convallarius	3	.44
F	Castilleja spp.	2	.03
F	Chenopodium leptophyllum(a)	88	.65
F	Descurainia pinnata (a)	29	.37
F	Eriogonum ovalifolium	5	.01

Type	Species	Nested Frequency	Average Cover %
		'05	'05
F	<i>Eriogonum umbellatum</i>	4	.03
F	<i>Gayophytum ramosissimum</i> (a)	2	.00
F	<i>Gilia</i> spp. (a)	-	.00
F	<i>Lappula occidentalis</i> (a)	11	.05
F	<i>Lepidium montanum</i>	8	.18
F	<i>Machaeranthera grindelioides</i>	3	.15
F	<i>Penstemon</i> spp.	-	.01
F	<i>Phlox longifolia</i>	2	.00
F	<i>Plantago patagonica</i> (a)	1	.00
F	<i>Ranunculus testiculatus</i> (a)	1	.00
F	<i>Schoenocrambe linifolia</i>	5	.04
F	<i>Senecio integerrimus</i>	5	.01
F	<i>Sphaeralcea coccinea</i>	59	1.29
F	<i>Townsendia</i> spp.	2	.00
Total for Annual Forbs		132	1.09
Total for Perennial Forbs		100	2.22
Total for Forbs		232	3.31

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

#### BROWSE TRENDS --

Management unit 16R, Study no: 14

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata wyomingensis</i>	86	17.22
B	<i>Chrysothamnus viscidiflorus</i>	8	.48
B	<i>Gutierrezia sarothrae</i>	14	.50
B	<i>Opuntia</i> spp.	11	.77
Total for Browse		119	18.97

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

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	14.43
Chrysothamnus viscidiflorus	.25
Gutierrezia sarothrae	1.01
Opuntia spp.	.26

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

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	2.3

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

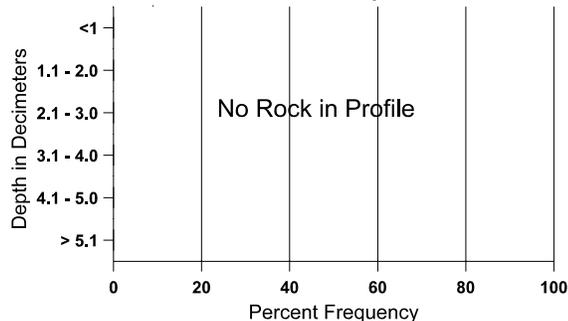
Cover Type	Average Cover %
	'05
Vegetation	37.09
Pavement	.01
Litter	29.22
Cryptogams	3.65
Bare Ground	43.91

SOIL ANALYSIS DATA --  
 Management unit 16R, Study no: 14, Study Name: Consumer Bench North

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	PPM P	PPM K	ds/m
13.6	51.8 (12.1)	7.4	28.0	45.2	26.8	1.3	6.6	118.4	0.4

### Stoniness Index

Consumer Bench North, Study # 16R-14



PELLET GROUP DATA --

Management unit 16R, Study no: 14

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	15	-
Elk	11	28 (69)
Deer	38	48 (119)

BROWSE CHARACTERISTICS --

Management unit 16R, Study no: 14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
05	<b>4580</b>	4360	100	1060	3420	3400	38	21	75	49	50	23/30
<i>Chrysothamnus viscidiflorus</i>												
05	<b>320</b>	-	-	320	-	40	0	38	-	-	0	11/15
<i>Gutierrezia sarothrae</i>												
05	<b>1100</b>	140	140	960	-	-	0	0	-	-	0	11/12
<i>Opuntia spp.</i>												
05	<b>360</b>	-	-	360	-	-	0	0	-	-	11	5/16

Trend Study 16R-15-05

Study site name: Consumer Bench 2 .

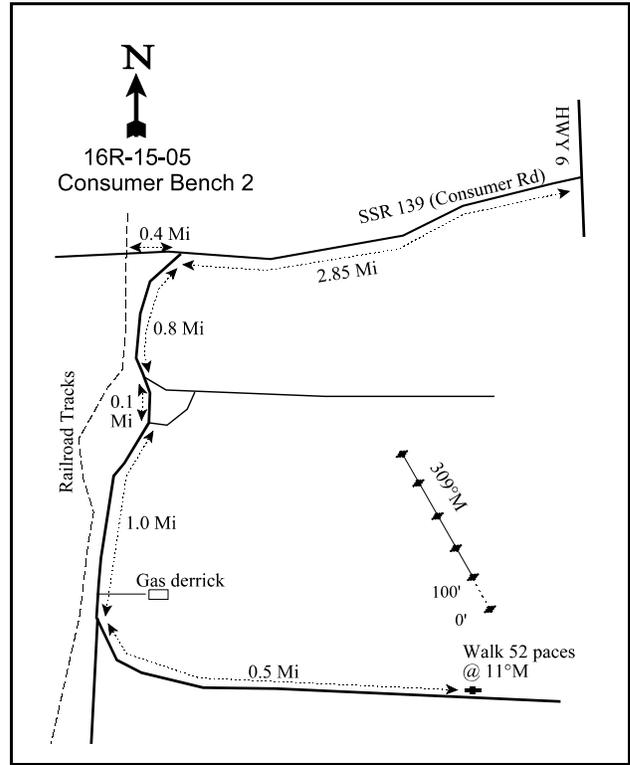
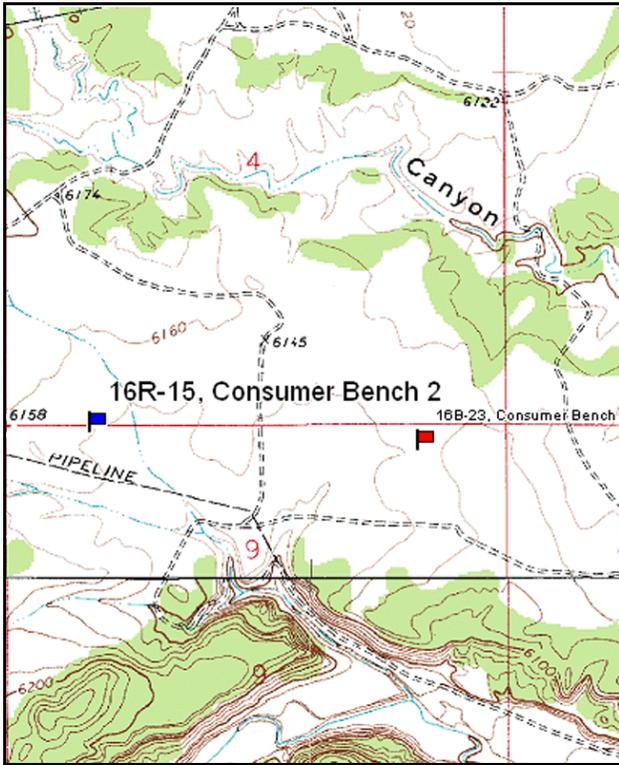
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 309 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of US 6 and SSR 139 in Price, drive west on SSR 139 for 2.8 miles to a dirt road on the left (south) side of the road. Drive 0.8 miles on this road that parallels the railroad tracks to a two-track road on the left. Continue straight another 0.1 miles to another side road on the right and left. Continue straight (south) for 1.0 miles passing through a wash and a gas derrick road on the left to fork. Stay left at the fork and drive 0.5 miles to the witness post left (north) side of the road. From the witness post, walk 52 paces at 11°M to the 0' stake. The 0' stake is marked with browse tag #64. (Road to site are not shown or have changed from Topo USA).



Map Name: Standardville

Diagrammatic Sketch

Township 14S , Range 9E , Section 9

GPS: NAD 27, UTM 12S 4386399 N, 506444 E

## DISCUSSION

### Consumer Bench 2 – 16R-15

The Consumer Bench 2 study site was established on the Price West Bench Year 2 project area. The project plan was to restore over 3,700 acres of mule deer and possible greater sage grouse sagebrush winter habitat on BLM land. The treatment consists of 4 treatment areas. One is located north of the Price airport (about 3 miles northeast of Price), one 3 miles north of Price, and 2 about 4 miles northwest of Price (south of the Consumer's Road). The airport treatment area treated the Range Trend study site Airport (11B-3). The Consumer Bench 2 site is located in the southern treatment area northwest of Price. Treatment occurred in the fall of 2005. The methods of treatment in the areas northwest of Price were either Lawson double drum aerator with seeder between drums, Lawson single drum aerator with seeder over the drum, or a 12 foot Dixie pipe harrow with broadcast seeder on the tractor seeding into the harrow. Each treatment was applied in strips the width of the equipment, ultimately covering 1/4 to 1/3 of the treatment area. Following the treatment, sagebrush was aerially seeded on the soil surface. The Consumer Bench 2 monitoring site was treated with the Lawson single drum aerator, the seeder was positioned over drum, and allowed most of the seed to fall on the front of and go under the drum. This site was placed in a community similar in topography, and plant composition, to the Consumer Bench North monitoring site. It is located on a 2% slope with a northeastern aspect at 6,100 feet. It is within an extensive Wyoming big sagebrush flat. The treatment area is within the Consumers Wash grazing allotment, which allows 54 sheep to graze from October 1 to April 20 and 874 sheep to graze from April 21 to June 20. Pellet group data in 2005 was estimated at 3 elk and 113 deer days use/acre (8 edu/ha and 279 ddu/ha). Deer pellets appeared to be from late fall, winter, and spring. Elk pellets appeared to be from late spring.

The soil is a shallow clay loam with an effective rooting depth of 15 inches. There is no rock in the profile and a very small percent cover of pavement on the soil surface. Phosphorus concentrations are low at 5.1 ppm, values less than 6 ppm may limit plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.6). Bare ground cover was high in 2005 at 51%, but erosion is minimal due to the shallow slope. In 2005, the soil erosion condition measurement was stable.

Wyoming big sagebrush was the key browse species before the treatment. It provided 10% cover and a density of 3,420 plants/acre. Decadence was high at 71% and individuals classified as dying made up 47% of the population. Young individuals only made up 1% of the population, but there were a large number of seedlings at 4,760 plants/acre. This high seedling density could help improve the sagebrush population after the treatment. Utilization on sagebrush was light-moderate. Average sagebrush leader growth was 2.4 inches in 2005. Other browse species found in low numbers include: low rabbitbrush, broom snakeweed, and cactus.

Five grass species were sampled in 2005, 4 of which were perennial species. Slender wheatgrass, blue grama, cheatgrass, Indian ricegrass, and squirreltail bottlebrush were identified in 2005. Bottlebrush provided the most cover with nearly 2% and a quadrat frequency of 49%, much lower than the bottlerush on the Consumers Bench North site (which provided 21% cover and 95% quadrat frequency). Cheatgrass was sampled on the study, but provided an un-measurable amount of cover and was not rooted within any quadrats.

Fifteen species of forbs were sampled in 2005, 7 of which were annuals. Forbs provided 26% cover, 16% by annuals alone. The dominant forb species included: Fremont goosefoot, pinnate tansymustard, annual stickseed, mountain pepperweed, and scarlet globemallow. Globemallow provided nearly 9% cover, the goosefoot 5% cover, tansymustard nearly 5% cover, pepperweed 4% cover, and stickseed 3% cover. All other species provided much less cover individually. Sulfur buckwheat, prickly lettuce, and western salsify are species sampled in 2005 which may be used by sagegrouse (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

2005 Pretreatment Assessment

The sagebrush is very decadent and should respond well to the treatment. There are a large number of seedlings which may establish quickly with less competition from the more establish sagebrush individuals. Cheatgrass is not currently a problem on the site, but the seedbank may contain a large number of cheatgrass seeds. The cheatgrass may then increase in numbers. The Desirable Components Index score is poor to fair due to moderate browse cover, high browse decadence, and poor perennial grass cover.

2005 winter range condition (DC Index) – poor to fair (24) Lower potential scale

The following species were seeded on the treatment area in the fall of 2005:

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Fourwing Saltbush--Juab UT	2000	1.1
Russian Wildrye 'Bozoisky'	2965	1.6
Indian Ricegrass 'Nezpar'	849	0.5
Crested Wheatgrass 'Douglas'	1150	0.6
Crested Wheatgrass 'Hycrest'	1000	0.5
Western Wheatgrass	300	0.2
Alfalfa 'Ladak+'	750	0.4
Alfalfa 'Nomad'	750	0.4
Alfalfa 'Ranger'	750	0.4
Sainfoin 'Eski'	2500	1.4
Small Burnet 'Delar'	1500	0.8
Russian Wildrye	1150	0.6
Indian Ricegrass 'Rimrock'	1000	0.5
Western Wheatgrass	1550	0.8
Yellow Sweetclover	416	0.2
<b>Total</b>	<b>18630</b>	<b>10.1</b>
PLS lbs/acre		8.4

HERBACEOUS TRENDS --

Management unit 16R, Study no: 15

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron trachycaulum	2	.15
G	Bouteloua gracilis	3	.00
G	Bromus tectorum (a)	-	.00
G	Oryzopsis hymenoides	52	.35
G	Sitanion hystrix	107	1.96
Total for Annual Grasses		0	0.00
Total for Perennial Grasses		164	2.47
Total for Grasses		164	2.48
F	Chenopodium fremontii (a)	360	5.23

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
F	<i>Chenopodium leptophyllum</i> (a)	71	.18
F	<i>Collomia linearis</i> (a)	4	.03
F	<i>Comandra pallida</i>	3	.18
F	<i>Cryptantha</i> spp.	14	.12
F	<i>Descurainia pinnata</i> (a)	193	4.76
F	<i>Eriogonum ovalifolium</i>	104	.33
F	<i>Lappula occidentalis</i> (a)	147	2.61
F	<i>Lactuca serriola</i>	1	.03
F	<i>Lepidium montanum</i>	68	3.62
F	<i>Salsola iberica</i> (a)	5	.01
F	<i>Schoenocrambe linifolia</i>	22	.25
F	<i>Sisymbrium altissimum</i> (a)	2	.01
F	<i>Sphaeralcea coccinea</i>	178	8.61
F	<i>Tragopogon dubius</i>	2	.03
Total for Annual Forbs		782	12.84
Total for Perennial Forbs		392	13.19
Total for Forbs		1174	26.04

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

#### BROWSE TRENDS --

Management unit 16R, Study no: 15

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	79	9.97
B	<i>Chrysothamnus viscidiflorus</i>	16	1.39
B	<i>Gutierrezia sarothrae</i>	16	.38
B	<i>Opuntia</i> spp.	7	.03
Total for Browse		118	11.78

CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 15

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	10.35
Chrysothamnus viscidiflorus	.61
Gutierrezia sarothrae	.65
Opuntia spp.	-

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 16R, Study no: 15

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	2.4

BASIC COVER --

Management unit 16R, Study no: 15

Cover Type	Average Cover %
	'05
Vegetation	29.83
Pavement	.06
Litter	27.04
Cryptogams	6.06
Bare Ground	51.23

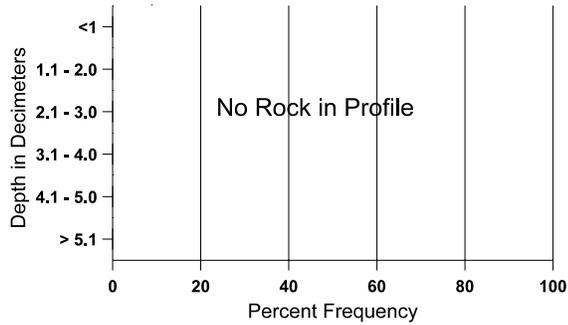
SOIL ANALYSIS DATA --

Management unit 16R, Study no: 15, Study Name: Consumer Bench 2

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	PPM P	PPM K	ds/m
15.0	47.6 (14.3)	7.6	24.4	47.4	28.2	1.0	5.1	86.4	0.4

# Stoniness Index

Consumer Bench 2, Study # 16R-15



## PELLET GROUP DATA --

Management unit 16R, Study no: 15

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	36	-
Elk	4	3 (8)
Deer	62	113 (279)

## BROWSE CHARACTERISTICS --

Management unit 16R, Study no: 15

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
05	<b>3420</b>	4760	20	960	2440	4100	39	19	71	47	49	24/27
<i>Chrysothamnus viscidiflorus</i>												
05	<b>740</b>	780	380	340	20	-	0	0	3	-	0	11/16
<i>Gutierrezia sarothrae</i>												
05	<b>420</b>	680	40	360	20	-	0	0	5	5	5	12/15
<i>Opuntia spp.</i>												
05	<b>180</b>	-	20	140	20	20	0	0	11	11	11	4/16

Trend Study 16R-16-05

Study site name: Wildcat Push .

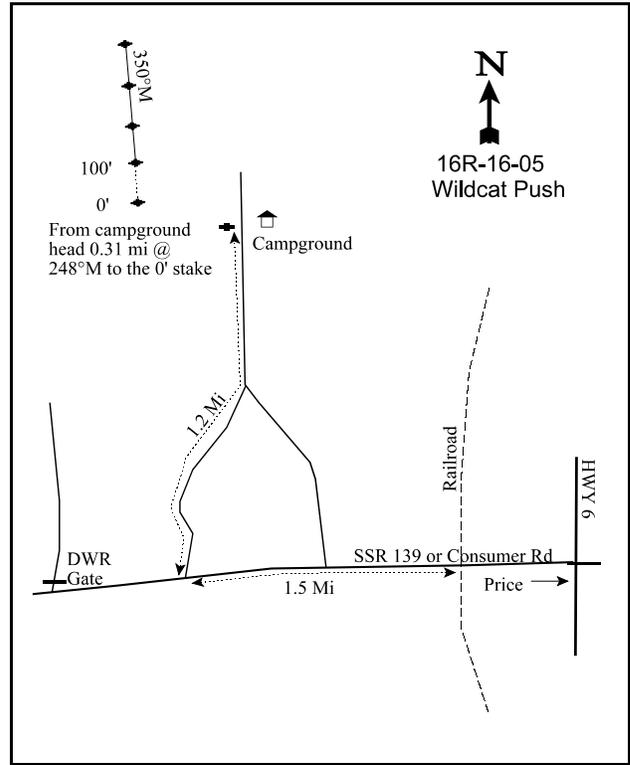
Vegetation type: Pinyon Juniper .

Compass bearing: frequency baseline 350 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of US 6 and SSR 139 in Price, drive west on SSR 139 for 3.2 miles to a railroad crossing. Drive over the railroad tracks and continue 1.5 miles to road on the right (north). Turn right on this road and drive 1.2 miles to a campground on the right (east) side of the road. Park at the campground and from the west side of the road, walk 0.31 mile at 248°M to the 0' stake. The 0' stake is marked with browse tag #80.



Map Name: Standardville

Diagrammatic Sketch

Township 13S, Range 9E, Section 30

GPS: NAD 27, UTM 12S 4390845 N, 503449 E

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

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron intermedium	12	.18
G	Bouteloua gracilis	21	.43
G	Bromus tectorum (a)	3	.00
G	Elymus salina	50	1.25
G	Oryzopsis hymenoides	15	.07
G	Poa secunda	3	.01
G	Sitanion hystrix	44	1.07
G	Stipa comata	3	.04
Total for Annual Grasses		3	0.00
Total for Perennial Grasses		148	3.07
Total for Grasses		151	3.07
F	Arabis spp.	11	.09
F	Astragalus convallarius	15	.57
F	Chenopodium fremontii (a)	43	.18
F	Chenopodium leptophyllum(a)	5	.01
F	Cordylanthus spp. (a)	60	2.30
F	Descurainia pinnata (a)	44	.20
F	Eriogonum cernuum (a)	14	.05
F	Gayophytum ramosissimum(a)	46	.11
F	Gilia spp. (a)	127	1.46
F	Lappula occidentalis (a)	50	1.95
F	Lactuca serriola	41	.82
F	Lepidium spp. (a)	6	.04
F	Mentzelia spp.	4	.06
F	Pedicularis centranthera	8	.33
F	Penstemon spp.	3	.04
F	Sisymbrium altissimum (a)	-	.00
Total for Annual Forbs		395	6.34
Total for Perennial Forbs		82	1.92
Total for Forbs		477	8.26

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

BROWSE TRENDS --

Management unit 16R, Study no: 16

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia nova	4	.03
B	Ephedra viridis	1	.15
B	Gutierrezia sarothrae	1	-
B	Juniperus osteosperma	10	3.28
B	Opuntia spp.	8	.01
B	Pediocactus simpsonii	0	.04
B	Pinus edulis	3	.21
B	Sclerocactus sp.	2	-
Total for Browse		29	3.72

CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 16

Species	Percent Cover
	'05
Artemisia nova	.13
Juniperus osteosperma	15.25
Opuntia spp.	.58
Pediocactus simpsonii	.03
Pinus edulis	1.06

POINT-QUARTER TREE DATA --

Management unit 16R, Study no: 16

Species	Trees per Acre	Average diameter (in)
	'05	
Juniperus osteosperma	223	5.7
Pinus edulis	31	1.6

BASIC COVER --

Management unit 16R, Study no: 16

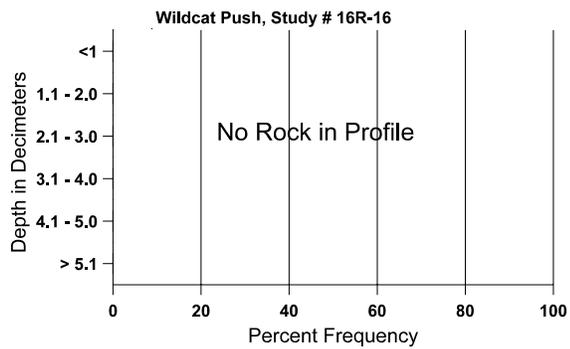
Cover Type	Average Cover %
	'05
Vegetation	15.64
Rock	.83
Pavement	2.85
Litter	41.31
Cryptogams	.75
Bare Ground	46.87

SOIL ANALYSIS DATA --

Management unit 16R, Study no: 16, Study Name: Wildcat Push

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
14.3	59.0 (16.3)	7.2	42.4	28.4	29.2	1.9	5.5	83.2	0.5

### Stoniness Index



PELLET GROUP DATA --

Management unit 16R, Study no: 16

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	59	-
Elk	3	12 (30)
Deer	8	3 (7)
Cattle	1	-

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

		Age class distribution (plants per acre)					Utilization					
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
05	<b>240</b>	40	200	20	20	260	0	0	8	8	8	8/14
<i>Ephedra viridis</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	40/50
<i>Gutierrezia sarothrae</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	10/12
<i>Juniperus osteosperma</i>												
05	<b>220</b>	-	60	140	20	80	0	0	9	-	0	-/-
<i>Opuntia spp.</i>												
05	<b>220</b>	-	-	200	20	-	0	0	9	9	9	4/14
<i>Pediocactus simpsonii</i>												
05	<b>0</b>	20	-	-	-	-	0	0	-	-	0	1/2
<i>Pinus edulis</i>												
05	<b>60</b>	40	20	40	-	60	0	0	-	-	0	-/-
<i>Sclerocactus sp.</i>												
05	<b>40</b>	-	20	20	-	-	0	0	-	-	0	5/5

Trend Study 16R-17-05

Study site name: Cedar Mountain Brush Saw .

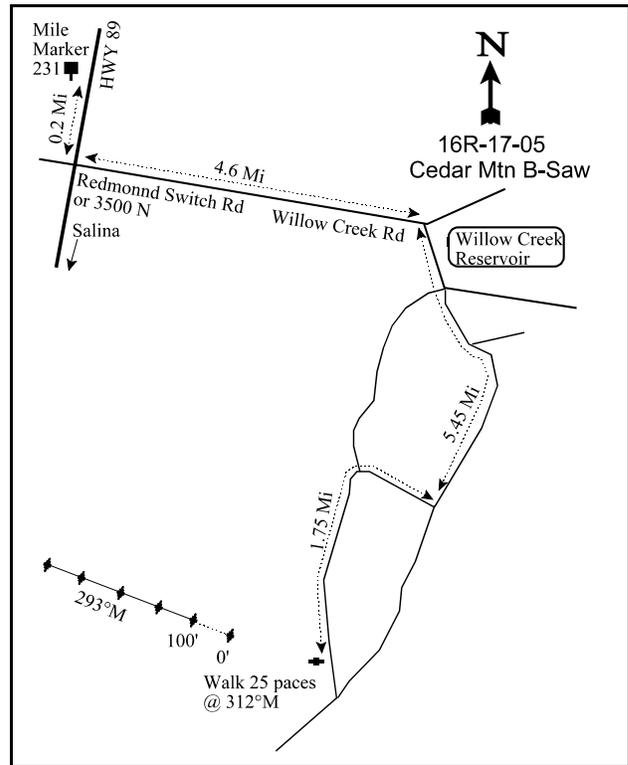
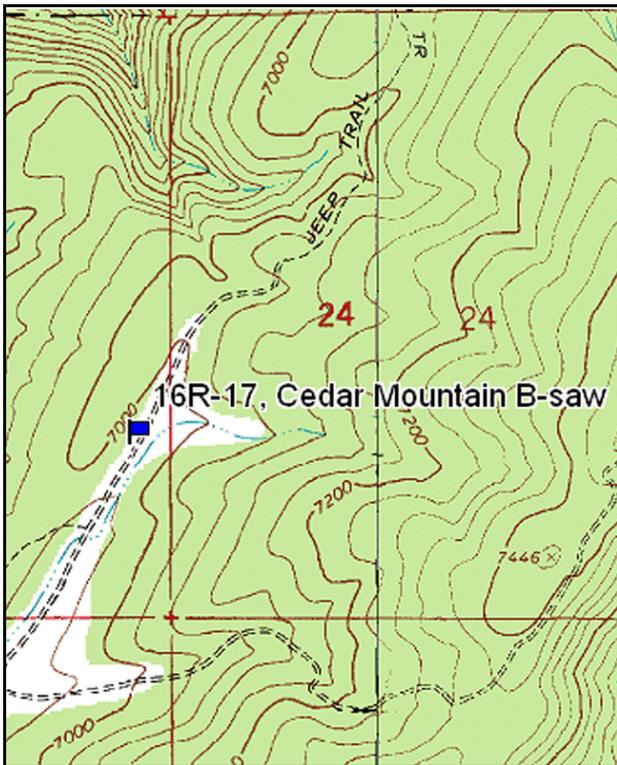
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 293 degrees magnetic.

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

LOCATION DESCRIPTION

Just north of Salina, drive north on US 89 and 0.2 miles before mile marker 231 is Redmond Switch Rd to the right (east). Turn right on this road and drive 4.6 miles to a road on the right (south) just before Willow Creek Reservoir. Turn on this road and drive 5.5 miles to a road to the right (north). Turn right and drive 1.7 miles to the witness post on the right hand side of the road. From the witness post, walk 25 paces at 312°M to the 0' stake. The 0' stake is marked with browse tag #88.



Map Name: Salina

Diagrammatic Sketch

Township 21S, Range 1E, Section 23

GPS: NAD 27, UTM 12S 4312937 N, 434359 E

HERBACEOUS TRENDS --  
Management unit 16R, Study no: 17

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	181	7.39
G	Agropyron intermedium	177	3.06
G	Agropyron spicatum	1	.00
G	Bromus tectorum (a)	26	.31
G	Oryzopsis hymenoides	3	.15
G	Poa fendleriana	3	.03
G	Poa secunda	27	.33
Total for Annual Grasses		26	0.31
Total for Perennial Grasses		392	10.96
Total for Grasses		418	11.27
F	Arenaria spp.	2	.00
F	Astragalus utahensis	1	.00
F	Caulanthus crassicaulis	6	.06
F	Calochortus nuttallii	3	.00
F	Collinsia parviflora (a)	15	.02
F	Descurainia pinnata (a)	22	.08
F	Ipomopsis congesta	7	.01
F	Lepidium spp. (a)	33	.13
F	Microsteris gracilis (a)	41	.16
F	Phlox austromontana	1	.00
F	Phlox longifolia	4	.06
F	Ranunculus testiculatus (a)	192	1.85
F	Trifolium spp.	1	.00
F	Veronica biloba (a)	1	.00
Total for Annual Forbs		304	2.25
Total for Perennial Forbs		25	0.16
Total for Forbs		329	2.41

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

BROWSE TRENDS --

Management unit 16R, Study no: 17

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Amelanchier utahensis	1	.03
B	Artemisia nova	8	.59
B	Artemisia tridentata vaseyana	0	-
B	Cercocarpus montanus	0	-
B	Chrysothamnus depressus	1	-
B	Chrysothamnus nauseosus	0	-
B	Ephedra viridis	0	-
B	Gutierrezia sarothrae	0	-
B	Juniperus osteosperma	17	5.23
B	Pinus edulis	7	4.40
B	Purshia tridentata	0	.15
B	Quercus gambelii	3	1.23
B	Symphoricarpos oreophilus	2	.44
Total for Browse		39	12.08

CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 17

Species	Percent Cover
	'05
Artemisia nova	.38
Juniperus osteosperma	7.08
Pinus edulis	8.96
Quercus gambelii	2.36
Symphoricarpos oreophilus	.91

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 16R, Study no: 17

Species	Average leader growth (in)
	'05
Artemisia nova	1.3

POINT-QUARTER TREE DATA --  
 Management unit 16R, Study no: 17

Species	Trees per Acre
	'05
Juniperus osteosperma	194
Pinus edulis	166

Average diameter (in)
'05
4.4
5.6

BASIC COVER --  
 Management unit 16R, Study no: 17

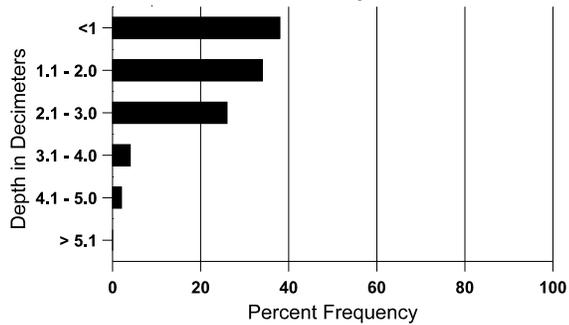
Cover Type	Average Cover %
	'05
Vegetation	21.29
Rock	9.22
Pavement	22.17
Litter	37.58
Cryptogams	.40
Bare Ground	19.92

SOIL ANALYSIS DATA --  
 Management unit 16R, Study no: 17, Study Name: Cedar Mtn Brush Saw

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.46	- (-)	7.6	30.0	56.4	13.6	5.0	8.4	236.8	0.7

**Stoniness Index**

Cedar Mtn Brushsaw, Study # 16R-17



PELLET GROUP DATA --

Management unit 16R, Study no: 17

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	70	-
Elk	10	5 (12)
Deer	11	15 (38)

BROWSE CHARACTERISTICS --

Management unit 16R, Study no: 17

		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>												
05	20	-	-	20	-	-	0	100	-	-	0	-/-
<i>Artemisia nova</i>												
05	280	-	40	120	120	60	21	36	43	36	36	14/20
<i>Artemisia tridentata vaseyana</i>												
05	0	-	-	-	-	-	0	0	-	-	0	19/28
<i>Cercocarpus montanus</i>												
05	0	-	-	-	-	60	0	0	-	-	0	13/18
<i>Chrysothamnus depressus</i>												
05	20	-	-	20	-	-	0	100	-	-	0	4/9
<i>Chrysothamnus nauseosus</i>												
05	0	-	-	-	-	-	0	0	-	-	0	19/13
<i>Ephedra viridis</i>												
05	0	-	-	-	-	-	0	0	-	-	0	24/24
<i>Gutierrezia sarothrae</i>												
05	0	-	-	-	-	-	0	0	-	-	0	10/11
<i>Juniperus osteosperma</i>												
05	400	-	200	200	-	120	0	0	-	-	0	-/-
<i>Pinus edulis</i>												
05	140	40	40	100	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
05	0	-	-	-	-	-	0	0	-	-	0	18/51
<i>Quercus gambelii</i>												
05	500	-	80	380	40	40	0	64	8	-	0	36/27
<i>Symphoricarpos oreophilus</i>												
05	80	-	-	80	-	-	0	0	-	-	0	12/18

Trend Study 16R-18-05

Study site name: Cedar Mountain Dixie.

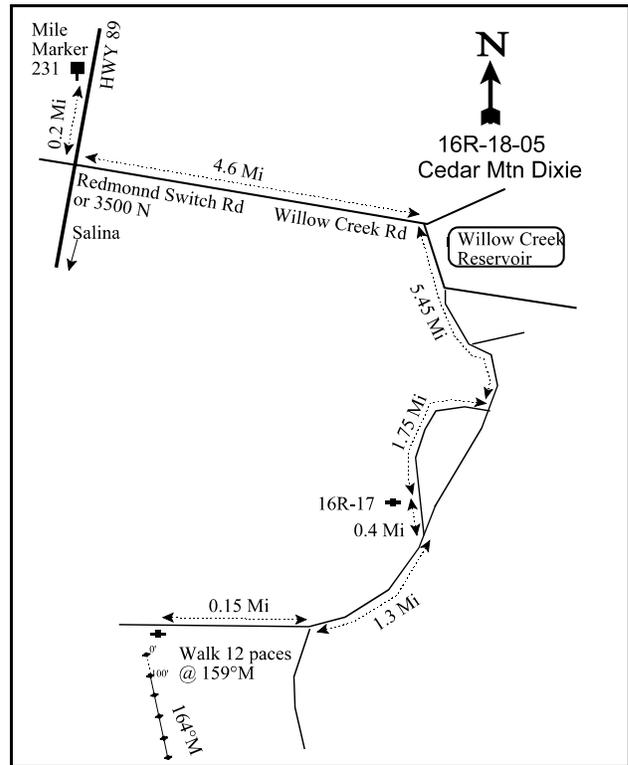
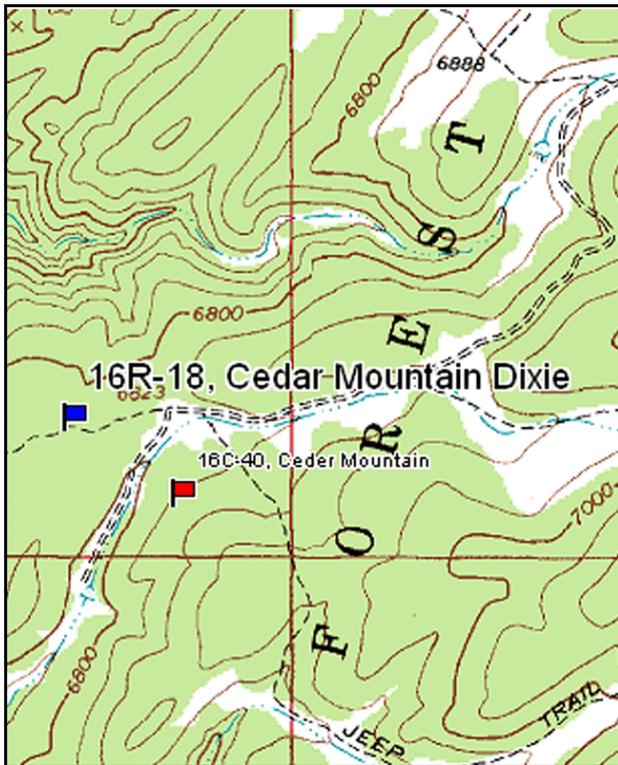
Vegetation type: Pinyon-Juniper.

Compass bearing: frequency baseline 164 degrees magnetic.

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

LOCATION DESCRIPTION

Just north of Salina, drive north on US 89 and 0.2 miles before mile marker 231 is Redmond Switch Rd to the right (east). Turn right on this road and drive 4.6 miles to a road on the right (south) just before Willow Creek Reservoir. Turn on this road and drive 5.5 miles to a road to the right (north). Turn right and drive 1.7 miles to the witness post of 16R-17 on the right hand side of the road. Continue driving another 0.4 miles to a fork. Turn right and drive 1.3 miles to another fork. Stay right at the fork and drive 0.15 miles to the witness post on the left (south) side of the road. From the witness post, walk 12 paces at 159°M to the 0' stake. The 0' stake is marked with browse tag #89.



Map Name: Salina

Diagrammatic Sketch

Township 21S, Range 1E, Section 27

GPS: NAD 27, UTM 12S 4311169 N, 432319 E

HERBACEOUS TRENDS --

Management unit 16R, Study no: 18

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	158	6.84
G	Agropyron intermedium	253	9.39
G	Agropyron spicatum	7	.41
G	Bromus inermis	77	.62
G	Bromus tectorum (a)	15	.32
G	Elymus junceus	2	.33
G	Poa fendleriana	-	.00
G	Poa secunda	29	.44
Total for Annual Grasses		15	0.31
Total for Perennial Grasses		526	18.05
Total for Grasses		541	18.37
F	Descurainia pinnata (a)	38	.49
F	Lepidium spp. (a)	336	4.67
F	Microsteris gracilis (a)	2	.03
F	Phlox austromontana	11	.27
F	Ranunculus testiculatus (a)	254	3.89
F	Trifolium spp.	3	.00
Total for Annual Forbs		630	9.09
Total for Perennial Forbs		14	0.28
Total for Forbs		644	9.37

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

BROWSE TRENDS --

Management unit 16R, Study no: 18

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia nova	3	.00
B	Artemisia tridentata vaseyana	0	-
B	Chrysothamnus nauseosus	0	-
B	Ephedra viridis	0	-
B	Juniperus osteosperma	9	3.87
B	Pinus edulis	4	3.23
B	Purshia tridentata	0	-
Total for Browse		16	7.12

CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 18

Species	Percent Cover
	'05
Artemisia nova	.35
Juniperus osteosperma	4.40
Pinus edulis	5.73

POINT-QUARTER TREE DATA --

Management unit 16R, Study no: 18

Species	Trees per Acre
	'05
Juniperus osteosperma	293
Pinus edulis	45

Average diameter (in)
'05
6.3
5.7

BASIC COVER --

Management unit 16R, Study no: 18

Cover Type	Average Cover %
	'05
Vegetation	32.23
Rock	1.98
Pavement	16.88
Litter	36.46
Cryptogams	.20
Bare Ground	26.15

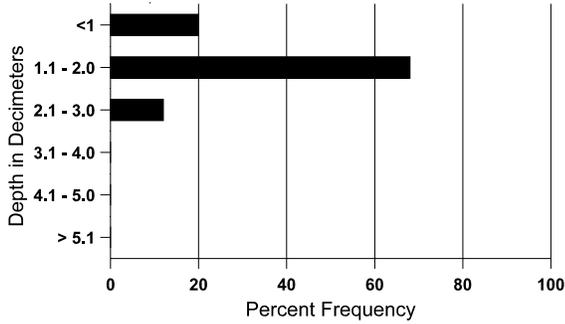
SOIL ANALYSIS DATA --

Management unit 16R, Study no: 18, Study Name: Cedar Mtn Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.7	- (-)	7.7	32.0	45.4	22.6	5.1	15.1	233.6	0.6

# Stoniness Index

Cedar Mtn Dixie, Study # 16R-18



## PELLET GROUP DATA --

Management unit 16R, Study no: 18

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	72	-
Elk	48	12 (30)
Deer	15	15 (38)
Cattle	7	-

## BROWSE CHARACTERISTICS --

Management unit 16R, Study no: 18

		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>													
05	<b>60</b>	-	-	20	40	60	0	0	67	-	0	17/31	
<i>Artemisia tridentata vaseyana</i>													
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	16/23	
<i>Chrysothamnus nauseosus</i>													
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	33/33	
<i>Ephedra viridis</i>													
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	26/27	
<i>Juniperus osteosperma</i>													
05	<b>200</b>	60	100	80	20	20	0	0	10	10	10	-/-	
<i>Pinus edulis</i>													
05	<b>80</b>	-	-	80	-	20	0	0	-	-	0	-/-	
<i>Purshia tridentata</i>													
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	26/57	

Trend Study 16R-19-05

Study site name: Clear Creek Dixie.

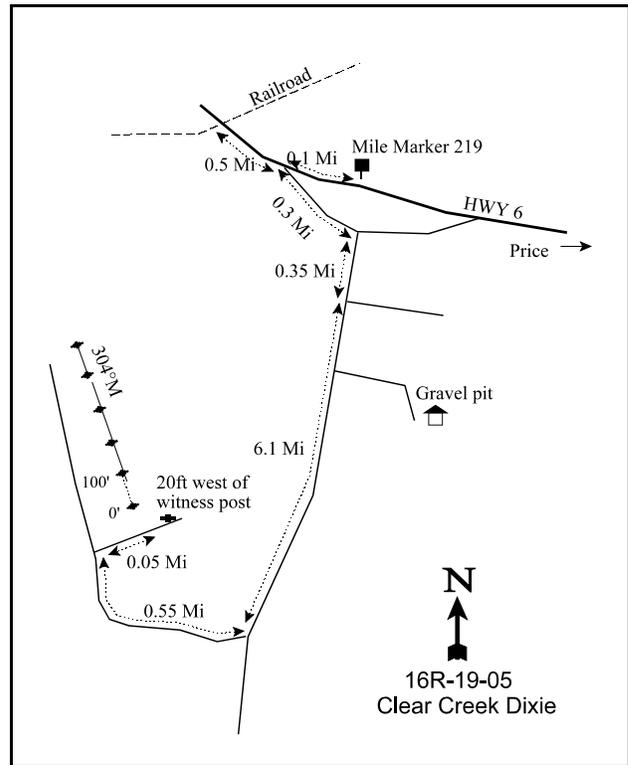
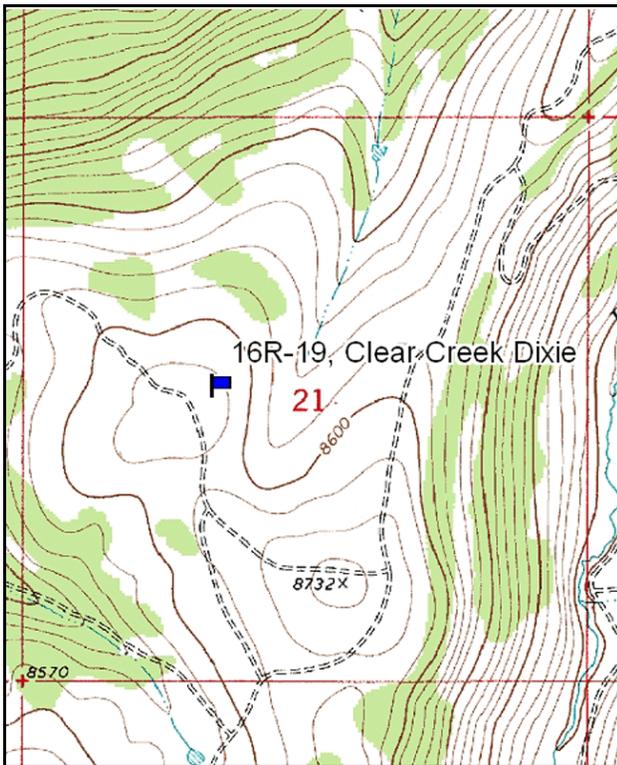
Vegetation type: Mountain Big Sagebrush.

Compass bearing: frequency baseline 304 degrees magnetic.

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

LOCATION DESCRIPTION

Driving north on US 6 from Price, drive to mile marker 219 and continue 0.1 miles to a road on the left (SW) side of the road. Turn left and drive 0.3 miles to a road on the right (south). Turn right and drive 6.1 miles to a fork. Take the right fork and drive 0.5 miles to a two-track on the right (east) side of the road. Turn right on the two-track and drive 0.05 miles to the witness post. From the witness post, walk 20 feet in a westward direction to the 0' stake. The 0' stake is marked with browse tag #92.



Map Name: Colton

Diagrammatic Sketch

Township 12S, Range 8E, Section 21

GPS: NAD 27, UTM 12S 4401778 N, 497013 E

HERBACEOUS TRENDS --  
Management unit 16R, Study no: 19

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Agropyron dasystachyum</i>	178	2.75
G	<i>Agropyron trachycaulum</i>	32	.67
G	<i>Bromus anomalus</i>	40	.64
G	<i>Carex</i> spp.	8	.22
G	<i>Festuca ovina</i>	4	.03
G	<i>Koeleria cristata</i>	8	.09
G	<i>Poa pratensis</i>	233	7.92
G	<i>Poa secunda</i>	18	.45
G	<i>Sitanion hystrix</i>	2	.06
G	<i>Stipa columbiana</i>	96	2.31
Total for Annual Grasses		0	0
Total for Perennial Grasses		619	15.17
Total for Grasses		619	15.17
F	<i>Achillea millefolium</i>	2	.00
F	<i>Antennaria rosea</i>	1	.00
F	<i>Androsace septentrionalis</i> (a)	5	.01
F	<i>Aquilegia</i> spp.	-	.00
F	<i>Arabis</i> spp.	3	.01
F	<i>Astragalus convallarius</i>	41	.22
F	<i>Aster</i> spp.	5	.05
F	<i>Astragalus</i> spp.	88	3.75
F	<i>Astragalus utahensis</i>	11	.10
F	<i>Castilleja flava</i>	13	.36
F	<i>Chaenactis douglasii</i>	6	.07
F	<i>Erigeron eatonii</i>	11	.13
F	<i>Eriogonum umbellatum</i>	30	1.07
F	<i>Geranium</i> spp.	54	.49
F	<i>Gilia</i> spp. (a)	3	.00
F	<i>Helenium hoopesii</i>	14	.16
F	<i>Ipomopsis aggregata</i>	3	.03
F	<i>Lupinus argenteus</i>	118	7.91
F	<i>Orthocarpus</i> spp. (a)	32	1.04
F	<i>Penstemon</i> spp.	1	.03
F	<i>Penstemon watsonii</i>	122	2.87
F	<i>Phlox longifolia</i>	60	.21
F	<i>Polygonum douglasii</i> (a)	7	.03

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
F	Potentilla gracilis	3	.15
F	Senecio multilobatus	3	.15
F	Swertia radiata	89	3.82
F	Taraxacum officinale	31	.65
F	Tragopogon dubius	3	.00
F	Trifolium spp.	1	.00
F	Veronica biloba (a)	1	.00
F	Vicia americana	48	.63
Total for Annual Forbs		48	1.09
Total for Perennial Forbs		761	22.92
Total for Forbs		809	24.01

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

#### BROWSE TRENDS --

Management unit 16R, Study no: 19

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Amelanchier utahensis	2	-
B	Artemisia tridentata vaseyana	88	13.73
B	Chrysothamnus viscidiflorus viscidiflorus	88	17.24
B	Ribes spp.	2	.18
B	Rosa woodsii	10	.24
B	Symphoricarpos oreophilus	39	4.80
B	Tetradymia canescens	0	-
Total for Browse		229	36.19

CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 19

Species	Percent Cover
	'05
Artemisia tridentata vaseyana	18.58
Chrysothamnus viscidiflorus viscidiflorus	24.78
Ribes spp.	.21
Rosa woodsii	.06
Symphoricarpos oreophilus	9.83

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 16R, Study no: 19

Species	Average leader growth (in)
	'05
Artemisia tridentata vaseyana	2.3

BASIC COVER --

Management unit 16R, Study no: 19

Cover Type	Average Cover %
	'05
Vegetation	65.77
Rock	.21
Pavement	.02
Litter	58.90
Cryptogams	.03
Bare Ground	3.90

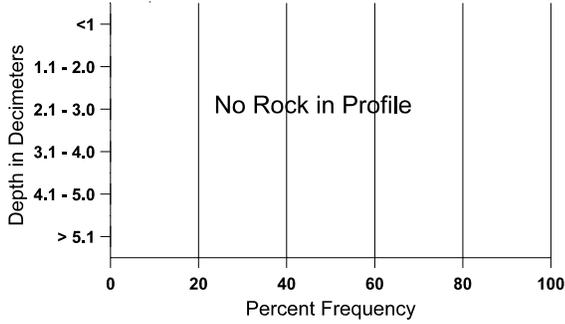
SOIL ANALYSIS DATA --

Management unit 16R, Study no: 19, Study Name: Clear Creek Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
18.0	52.6 (18.1)	6.8	16.0	41.4	42.6	5.9	18.5	268.8	0.8

# Stoniness Index

Clear Creek Dixie, Study # 16R-19



## PELLET GROUP DATA --

Management unit 16R, Study no: 19

Type	Quadrat Frequency '05	Days use per acre (ha) '05
Rabbit	1	-
Elk	9	31 (760)
Deer	9	23 (56)
Cattle	4	21 (52)
Grouse	-	9/acre

## BROWSE CHARACTERISTICS --

Management unit 16R, Study no: 19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>												
05	<b>40</b>	20	-	40	-	-	50	50	-	-	0	25/20
<i>Artemisia tridentata vaseyana</i>												
05	<b>4400</b>	220	180	1320	2900	2840	20	4	66	40	41	28/29
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>7280</b>	60	120	7160	-	-	0	0	-	-	0	13/18
<i>Ribes</i> spp.												
05	<b>40</b>	-	-	40	-	-	0	0	-	-	0	23/22
<i>Rosa woodsii</i>												
05	<b>480</b>	-	120	360	-	-	0	0	-	-	0	9/7
<i>Symphoricarpos oreophilus</i>												
05	<b>1480</b>	-	100	1360	20	20	0	0	1	-	0	24/32
<i>Tetradymia canescens</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	10/13

Trend Study 16R-20-05

Study site name: Howerton's.

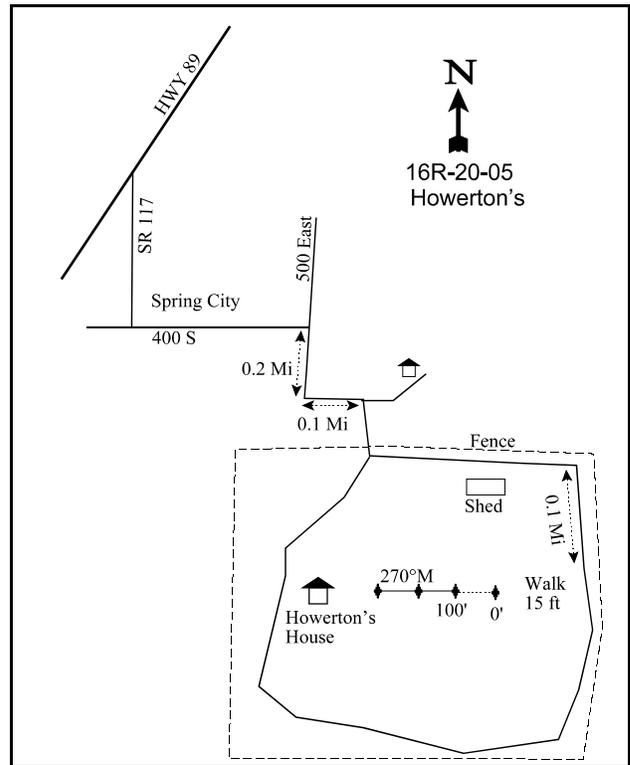
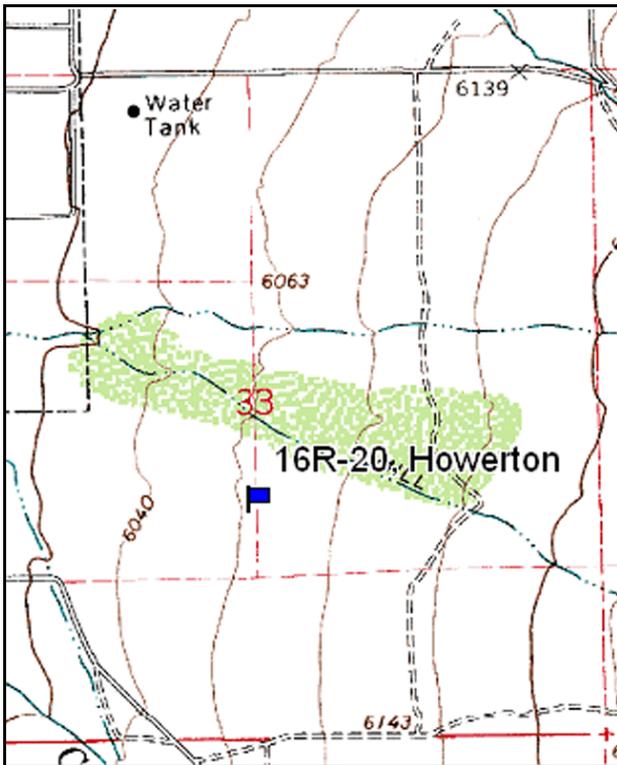
Vegetation type: Cheatgrass / P-J.

Compass bearing: frequency baseline 270 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of US 89 and SR 117, take SR 117 (Main St) in to Spring City. Drive to 400 S and turn left (east) and drive to 500 E. Turn right on 500 E and drive 0.2 miles to an intersection. Turn left and drive 0.1 miles to the drive way of Howerton's property. Before the house the road will split, take the left fork paralleling a fence and drive until the road turns right (south). From the turn, drive 0.1 miles and park. Walk 15 feet westward to the 0' stake. The 0' stake is marked with browse tag #96.



Map Name: Spring City

Diagrammatic Sketch

Township 15S, Range 4E, Section 33

GPS: NAD 27, UTM 12S 4368551 N, 458949 E

## DISCUSSION

### Howerton's – 16R-20

This study was established on the private land of Mike Howerton to treat his cheatgrass-infested land with Plateau, disturb the ground, and seed with beneficial species. The purpose of the treatment was to benefit local deer and elk herds through habitat improvements as well as a Plateau demonstration for private landowners. The Howerton's own 50 acres of pinyon-juniper and cheatgrass invaded land on the southeast corner of Spring City. After removing a few juniper trees, the Howerton property was disked to decrease cheatgrass cover. The areas between trees were drill seeded. Areas under trees were spike harrowed with an ATV then hand seeded. Then the property was sprayed with Plateau at a rate of 4 ounces active ingredient/acre. The single-nozzle sprayer was mounted to a pickup truck and sprayed 10 feet to each side of the truck. Two other properties were treated. These included 29 acres to the east of Howerton's, owned by Ed Packer, and 98 acres ¾ mile to the northeast owned by Chad Beck. The Beck property was treated similar to the Howerton property, although more pinyon and juniper trees were removed by bulldozer. The Packer property was more rocky than the other two properties, so a 12' Dixie pipe harrow was pulled around the property to remove the cheatgrass cover rather than a disk. The monitoring study site was established on the east portion of Howerton's property. It is located on a 4% slope with a western aspect at an elevation of 6,100 feet. Pellet group data estimates were 10 deer days use/acre (25 ddu/ha), most of which were from winter and early spring.

The soil is a shallow sandy loam with an effective rooting depth of 11 inches. Rock was only measured in soil profile during 41% of the penetrometer readings, three-fourths of which was at a depth of 4-8 inches. The soil pH is mildly alkaline (7.7). Vegetation cover was high (58%) because of high cheatgrass cover, so erosion was low. In 2005, the soil erosion condition measurement was stable.

No browse species were sampled in the pretreatment data sampled in 2005. However, fourwing saltbush, bitterbrush, and forage kochia were planted in the treatment. Juniper line intercept cover was 5% provided by an estimated 20 trees/acre in 2005. All of the junipers had been highlined by cattle.

Eight grass species were sampled in 2005, 3 of which were annuals. Cheatgrass was the only species with a substantial cover. It provided 42% cover and 100% quadrat frequency. Cheatgrass was very thick and would prevent the establishment of any seeded species without the mechanical and chemical treatments. All other species combined provided 1% cover.

Eleven species of forbs were sampled in 2005, 6 of which were annuals. Most of the species sampled were weedy annuals. Field bindweed (morning glory), a state noxious weed, was the dominant forb with nearly 9% cover and a quadrat frequency of 78%. Burr buttercup provided 5% cover and 43% quadrat frequency. All other forbs provided less than 1% cover combined. Most of the non-weedy species had been seeded on the site in a previous treatment.

### 2005 Pretreatment Assessment

Cheatgrass is the biggest pretreatment concern for the area. It will outcompete any seeded species without a successful removal. The disk and Plateau should prevent cheatgrass growth long enough to establish the seed. However, the cheatgrass may need subsequent sprayings. The field bindweed (morning glory) is also a concern. Plateau is a pre-emergent herbicide, which should affect the bindweed little. Therefore, the bindweed might become a bigger problem with little competition from the cheatgrass. In turn, it may make seed establishment difficult. Bindweed is difficult to remove. The Desirable Components Index score is very poor due to no browse cover, little perennial grass cover, and very high annual grass cover.

2005 winter range condition (DC Index) – very poor (-9) Lower potential scale

The following species were seeded on the treatment area in the fall of 2005:

Seeded species	Pounds of seed in mix	Bulk lbs/acre
Crested Wheatgrass 'Hycrest'	100	0.6
Intermediate Wheatgrass	250	1.4
Orchardgrass 'Paiute'	100	0.6
Russian Wildrye	250	1.4
Indian Ricegrass 'Nezpar'	163	0.9
Canby Bluegrass 'Canbar'	100	0.6
Blue Flax 'Appar'	92	0.5
Yellow Sweetclover	35	0.2
Alfalfa 'Ladak+'	50	0.3
Alfalfa 'Nomad'	50	0.3
Alfalfa 'Spredor 4'	50	0.3
Sainfoin 'Eski'	350	2.0
Small Burnet 'Delar'	350	2.0
Crested Wheatgrass 'Ephraim'	200	1.1
Fourwing Saltbush--Juab/Millard UT	100	0.6
Bitterbrush	50	0.3
Bluebunch WG 'Goldar'	100	0.6
Bluebunch WG 'P7'	50	0.3
Forage Kochia 'Immigrant'	90	0.5
<b>Total</b>	<b>2530</b>	<b>14.3</b>
PLS lbs/acre		12.6

HERBACEOUS TRENDS --

Management unit 16R, Study no: 20

T y p e	Species	Nested Frequency		Average Cover %	
		'05	'05	'05	'05
G	<i>Aegilops cylindrica</i> (a)	5		.01	
G	<i>Agropyron cristatum</i>	1		.00	
G	<i>Agropyron intermedium</i>	67		.14	
G	<i>Bromus japonicus</i> (a)	86		.71	
G	<i>Bromus tectorum</i> (a)	485		41.81	
G	<i>Carex</i> spp.	20		.20	
G	<i>Poa fendleriana</i>	4		.01	
G	<i>Poa secunda</i>	19		.07	
<b>Total for Annual Grasses</b>		<b>576</b>		<b>42.54</b>	
<b>Total for Perennial Grasses</b>		<b>111</b>		<b>0.43</b>	
<b>Total for Grasses</b>		<b>687</b>		<b>42.97</b>	
F	<i>Agoseris glauca</i>	7		.02	

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
F	Alyssum alyssoides (a)	57	.17
F	Convolvulus arvensis	250	8.51
F	Collinsia parviflora (a)	4	.03
F	Draba spp. (a)	2	.00
F	Erodium cicutarium (a)	35	.22
F	Linum lewisii	3	.01
F	Medicago sativa	8	.02
F	Ranunculus testiculatus (a)	149	4.80
F	Salsola iberica (a)	5	.01
F	Sanguisorba minor	2	.00
Total for Annual Forbs		252	5.25
Total for Perennial Forbs		270	8.56
Total for Forbs		522	13.82

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

#### BROWSE TRENDS --

Management unit 16R, Study no: 20

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Juniperus osteosperma	1	.36
Total for Browse		1	0.35

#### CANOPY COVER, LINE INTERCEPT --

Management unit 16R, Study no: 20

Species	Percent Cover
	'05
Juniperus osteosperma	5.33

BASIC COVER --

Management unit 16R, Study no: 20

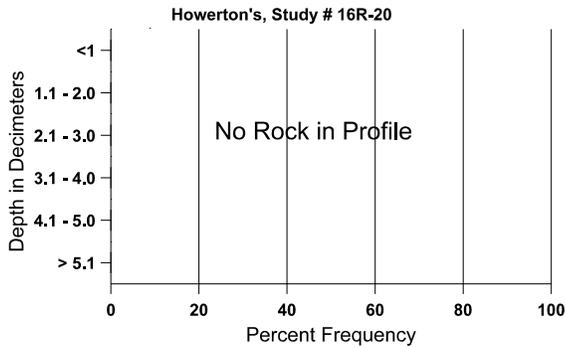
Cover Type	Average Cover %
	'05
Vegetation	57.59
Rock	.85
Pavement	.37
Litter	30.35
Bare Ground	17.92

SOIL ANALYSIS DATA --

Management unit 16R, Study no: 20, Study Name: Howerton's

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.3	- (-)	7.7	52.7	29.7	17.6	1.8	18.2	246.4	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 16R, Study no: 20

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	20	-
Deer	4	10 (25)

BROWSE CHARACTERISTICS --

Management unit 16R, Study no: 20

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Juniperus osteosperma												
05	20	-	-	20	-	-	0	0	-	-	0	-/-

Trend Study 17R-13-05

Study site name: Rabbit Gulch Chaining .

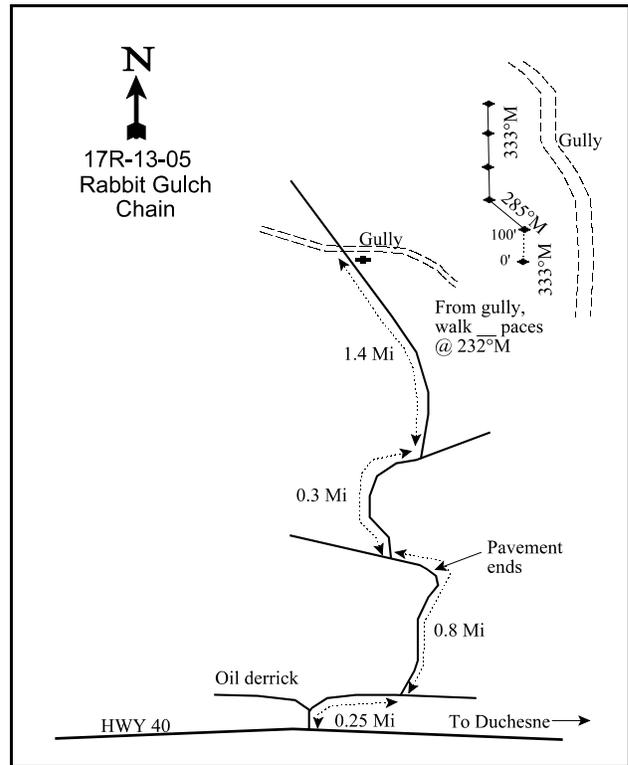
Vegetation type: Greasewood .

Compass bearing: frequency baseline 0'-100' and 200'-500' 333 degrees magnetic and 100'-200' is 285 degrees magnetic.

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

LOCATION DESCRIPTION

From Strawberry River Rd on US 40 drive east 1.3 miles to a road on the left (north) side of the road (If coming from the east drive 1.5 miles from the bridge over Starvation reservoir). Turn left on this road and make an immediate right and drive 0.25 miles to road on the left. Turn left and drive 0.8 miles to a fork, the pavement will end. From the fork, stay right and drive 0.3 miles to another fork. Stay left at the fork and drive 1.4 miles to the witness post on the right (east) side of the road. From the witness post, walk 150 feet at 232°M to the 0' stake. The 0' stake is marked with browse tag #137.



Map Name: Rabbit Gulch

Diagrammatic Sketch

Township 3S, Range 6W, Section 14

GPS: NAD 27, UTM 12T 4451589 N, 540411 E

## DISCUSSION

### Rabbit Gulch Greasewood Chaining – 17R-13

The Rabbit Gulch Greasewood Chaining is located within the boundaries of the Rabbit Gulch WMA. The Rabbit Gulch WMA consists of 8,247 acres of critical mule deer and elk winter range. The WMA and surround area are part of a 13,238-acre sage grouse wintering area. The sagebrush in, and surrounding, the WMA is part of 217,698 acres of sagebrush that have died off in since 2000 in the northeastern region of Utah. The 191-acre Rabbit Gulch Greasewood Chaining is one of many projects in the northeastern region designed to rehabilitate the dying sagebrush steppe. The treatment area is located in a valley bottom 1 mile northwest of Starvation Reservoir. The valley bottom was originally a sagebrush community, but is now dominated by black greasewood. To prevent greasewood from competing with desired seeded species, the greasewood was sprayed with a mixture of 2,4-D and Tordon during the second week in June of 2005. The area was aerielly seeded with a grass and forb mix in October of 2005. In January 2006, the area was one- way chained with a 200 foot Ely chain pulled by 2 D-8 Cats. The chain was chosen because the terrain was too difficult to maneuver with a Lawson aerator. Part of the treatment area was then seeded with the browse seed mix in February of 2006.

The monitoring study site was established toward the center of the treatment. The site was placed on a 3% slope with a southern aspect at an elevation of 5,840 feet. Pretreatment (2005) pellet group data estimates were 11 elk and 52 deer days use/acre (26 edu/ha and 129 ddu/ha). The pellets were left in winter and the remains of four deer were found in the study area.

The soil is a moderately deep loamy sand with an effective rooting depth of 24 inches. There is no rock in the soil profile and very little on the surface. The soil phosphorus concentration is marginal at 6.9 ppm, values less than 6 ppm may limit plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.6). Cryptogamic crust cover was higher in 2005 than many places around the state at 18%. The erosion index measurement in 2005 was moderate due to rills between 1.5 and 3 inches, 2 very large gullies east and west of the base line transect, mild pedestalling, mild surface litter movement, mild flow patterns, and mild soil movement.

The browse was dominated by black greasewood in 2005 with 5% cover and a density of 720 plants/acre. The greasewood had been sprayed when the site was read in 2005, so most of the shrubs were yellow. Although the yellow shrubs were not classified as dying, they were classified as having poor vigor. Ninety- four percent of greasewood shrubs sampled were classified as having poor vigor. Decadent individuals made up 53% of the population and those classified as dying made up 19%. Also sampled in the study were basin big sagebrush, stickyleaf low rabbitbrush, and cactus. The sagebrush provided only 0.5% cover and 540 plants/acre. The decadent individuals made up 33% of the population and those classified as dying made up 26%. There appeared to be only light utilization on all shrubs measured.

Five species of grasses were sampled in 2005, 2 of which were annuals. All species provided less than 1% cover and less than 2% cover combined. Cheatgrass was present, but in only 2% of the quadrats. Sixweeks fescue was the most common with a quadrat frequency of 23%.

Sixteen forb species were identified in 2005, 14 of which were annuals. The majority of forbs on this site were weedy invasives. Perennials provided less than 2% cover and annuals provided 13%. Annual stickseed was the dominant species with nearly 5% cover and 64% quadrat frequency.

#### 2005 Pretreatment Assessment

The majority of greasewood individuals were dead or dying when the sampling was read. They should not compete much with the seeded species. Although the annual grasses are not frequent and may not compete with the seeded species, the cheatgrass seedbank may be higher than suspected and could outcompete the seed.

The very abundant annual forbs are usually not competitive and shouldn't outcompete the seeded species. The area was in dire need of an improved browse condition. The Desirable Components Index score is poor due to poor browse cover, perennial grass cover, and high decadence.

2005 winter range condition (DC Index) – poor (20) Lower potential scale

The following species were aerially seeded on the treatment area in October of 2005:

Seeded Species	Bulk lbs in mix	Bulk lbs/acre
Crested Wheatgrass 'Douglas'	600	2.0
Russian Wildrye	600	2.0
Great Basin Wildrye 'Trailhead'	600	2.0
Thickspike Wheatgrass 'Critana'	575	1.9
Alfalfa 'Spredor 4'	300	1.0
Small Burnet	325	1.1
Small Burnet 'Delar'	300	1.0
Fourwing Saltbush--Carbon UT	450	1.5
<b>Total</b>	<b>3750</b>	<b>12.5</b>
PLS lbs/acre		9.9

The following browse species were aerially seed on 190 acres of the treatment area in February 2006:

Seeded Species	Bulk lbs in mix	Bulk lbs/acre
Whitestem Rubber Rabbitbrush	85	0.5
Forage Kochia--Beaver UT	200	1.0
<b>Total</b>	<b>285</b>	<b>1.5</b>
PLS lbs/acre		0.8

HERBACEOUS TRENDS --

Management unit 17R, Study no: 13

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Bromus tectorum (a)	3	.15
G	Sitanion hystrix	4	.18
G	Sporobolus cryptandrus	12	.33
G	Stipa comata	5	.53
G	Vulpia octoflora (a)	63	.60
Total for Annual Grasses		66	0.75
Total for Perennial Grasses		21	1.04
Total for Grasses		87	1.80
F	Camissonia spp. (a)	44	.77
F	Chenopodium album (a)	153	2.84
F	Chenopodium leptophyllum(a)	23	.09

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
F	Cleome lutea (a)	5	.03
F	Collinsia parviflora (a)	41	.14
F	Descurainia pinnata (a)	141	1.99
F	Eriogonum cernuum (a)	12	.05
F	Halogeton glomeratus (a)	5	.04
F	Kochia scoparia (a)	1	.00
F	Lappula occidentalis (a)	200	4.79
F	Lepidium spp. (a)	18	.16
F	Malcolmia africana	40	1.21
F	Mentzelia spp.	9	.19
F	Plantago patagonica (a)	3	.00
F	Ranunculus testiculatus (a)	1	.00
F	Salsola iberica (a)	74	2.18
Total for Annual Forbs		721	13.15
Total for Perennial Forbs		49	1.40
Total for Forbs		770	14.56

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 13

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata tridentata	10	.49
B	Chrysothamnus viscidiflorus viscidiflorus	0	-
B	Opuntia spp.	14	.84
B	Sarcobatus vermiculatus	25	5.06
Total for Browse		49	6.40

#### CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 13

Species	Percent Cover
	'05
Artemisia tridentata tridentata	.28
Opuntia spp.	1.51
Sarcobatus vermiculatus	8.28



BASIC COVER --

Management unit 17R, Study no: 13

Cover Type	Average Cover %
	'05
Vegetation	18.56
Rock	.15
Pavement	.15
Litter	44.67
Cryptogams	18.47
Bare Ground	28.46

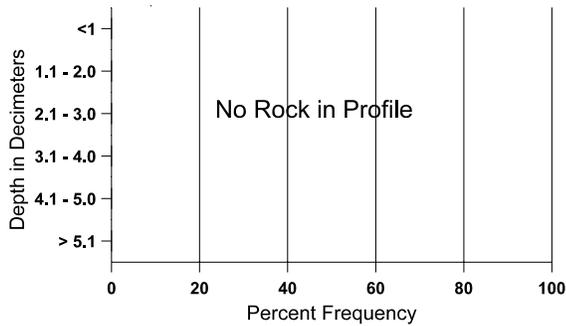
SOIL ANALYSIS DATA --

Management unit 17R, Study no: 13, Study Name: Rabbit Gulch Greasewood Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
24.5	- (-)	7.6	77.7	15.1	7.2	0.2	6.9	80.0	0.7

### Stoniness Index

Rabbit Gulch Greasewood Chaining, Study # 17R-13



PELLET GROUP DATA --

Management unit 17R, Study no: 13

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	70	-
Elk	7	11 (26)
Deer	15	52 (129)

BROWSE CHARACTERISTICS --  
 Management unit 17R, 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>												
05	<b>540</b>	740	340	20	180	1540	0	0	33	26	26	32/30
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>0</b>	-	-	-	-	20	0	0	-	-	0	24/27
<i>Opuntia spp.</i>												
05	<b>820</b>	-	-	720	100	20	0	0	12	7	7	7/27
<i>Sarcobatus vermiculatus</i>												
05	<b>720</b>	140	80	260	380	620	0	0	53	19	94	48/63

Trend Study 17R-14-05

Study site name: Skitzzy Chaining .

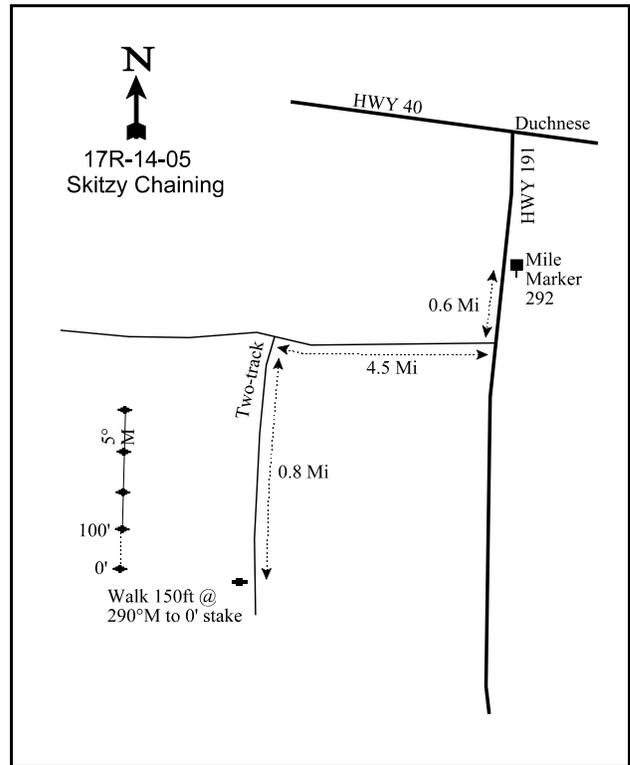
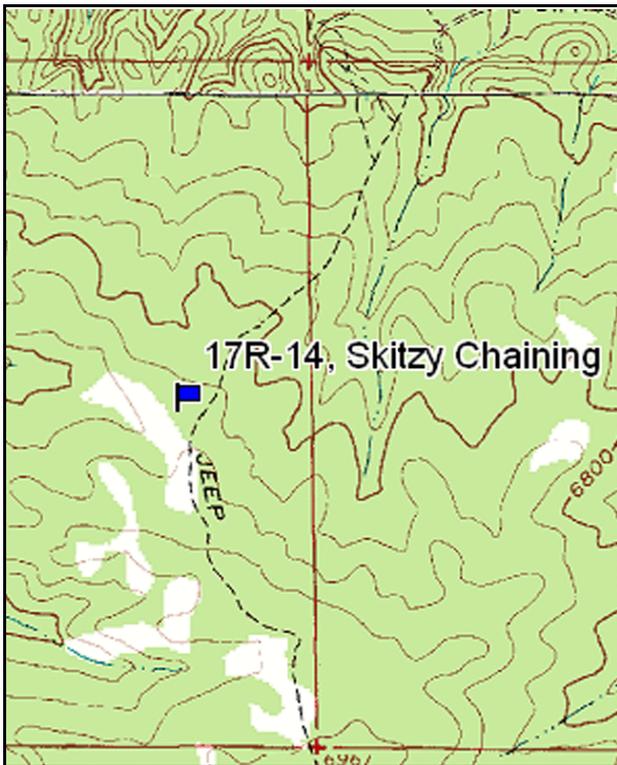
Vegetation type: P-J Chaining .

Compass bearing: frequency baseline 5 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of US 40 and US 191 in Duchesne, drive south on US 191 to mile marker 292. Drive 0.6 miles past the mile marker to a road on the right (west) side. Turn right and drive 4.5 miles to a two-track on the left (south) side of the road. Turn left and drive 0.8 miles to the witness post on the right (west) side of the road. From the witness post, walk 150 feet at 290°M to the 0' stake. The 0' stake is marked with browse tag #240.



Map Name: Buck Knoll

Diagrammatic Sketch

Township 4S, Range 6W, Section 23

GPS: NAD 27, UTM 12T 4440795 N, 540561 E

## DISCUSSION

### Skitzzy Chaining – 17R-14

The Skitzzy Chaining monitoring study is located within the Skitzzy Canyon WMA Pinyon-Juniper Chaining treatment area. The two-way chaining treated 730 acres of pinyon-juniper forest within the 5,245-acre Skitzzy Canyon WMA. The area is critical winter range for mule deer and elk in the Avintaquin sub-unit of the Wasatch Mountains Wildlife Management Unit. The herds in this unit decreased to ½ to 1/3 the historical size during the severe winters in the 1980's and early 1990's and haven't recovered. Biologists attribute the losses and lack of recovery to the loss of winter range to pinyon-juniper forests in the lower elevation areas like Skitzzy Canyon. Therefore, this project was designed to remove the pinyon-juniper overstory and rehabilitate the browse and herbaceous understory components. The area was aerially seeded with grasses and forbs in October of 2005, before the pinyon and juniper were removed. At the end of December 2005 and beginning of January 2006, the treatment area was two-way chained with a 200-foot Ely chain pulled by 2 D-8 Cats. An estimated 100 acres of scattered islands of pinyon-juniper were left unchained within the treatment area to provide game with protective cover. Then in February 2006, the browse species were aerially seeded over the treatment area.

The treatment area is located about 7 miles southwest of Duchesne City, northwest of US 191. It is on the west-facing ridge above Skitzzy Canyon. The monitoring study site is located within the northern ½ of the treatment area. It is on a northwest aspect with a slope of 3-5% at an elevation of 6,900 feet. The pellet group data in 2005 was estimated at 16 elk and 14 deer days use/acre (40 edu/ha and 35 ddu/ha).

The soil is a very shallow loam with an effective rooting depth of 8 inches. The soil surface is covered with pavement and is rocky throughout the profile. The soil pH is mildly alkaline (7.4). Phosphorus and potassium concentrations are adequate for wildland soils (Tiedemann and Lopez 2004). Litter provided 48% cover in 2005 and pavement 22%. There is some erosion present on the study site with 2 gullies which converge on the 400 foot stake of the baseline transect, but the litter and pavement cover slow the erosion. The 2005 erosion index measurement was stable.

The key browse species is black sagebrush. Black sagebrush provided 1% cover in 2005 with 460 plants/acre. The bulk of the population is mature (61%) and decadent (35%) individuals. Young plants only make up 4% of the population and plants classified as dying make up 17%. Black sagebrush leader growth averaged 1.4 inches in 2005. The black sagebrush population is dwindling due to the dense pinyon-juniper overstory (Tausch and West 1994). Serviceberry was also sampled on the study, but provided less than 1% cover with 20 plants/acre.

The pinyon and mature juniper trees provided a combined overstory canopy cover of 28% in 2005. Estimated Utah juniper tree density was 252 trees/acre in 2005 with an average trunk diameter of 12.0 inches. The estimated pinyon density was 185 trees/acre with an average diameter of 4.3 inches. Grass diversity was high in 2005 with 11 species, 10 of which were perennials. Bluebunch wheatgrass and squirreltail bottlebrush had the highest cover with slightly less than 1% cover each. Both of which had a quadrat frequency of 20-30%. Perennial grass provided a combined 4% cover. Cheatgrass was the only annual species sampled in 2005 and was only sampled in 1 quadrat.

Fifteen species of forbs were sampled in 2005, 5 of which were annuals. Forbs provided 3% cover combined. Utah sweetvetch was the dominant forb species with a cover of nearly 2% and quadrat frequency of 19%. All other species provided less than 1% cover individually. Rockcress, although it provided little cover, was sampled in 30% of the quadrats.

#### 2005 Pretreatment Assessment

The pinyon and old juniper trees have outcompeted most other species in this area, particularly the browse species. There is high grass diversity on the study site, but each species is scattered throughout the site. The

chaining and seeding will open the canopy and provide the area with the much-needed browse species. Cheatgrass is present, but not abundant and should compete little with the desired seeded species. The chaining should greatly improve the winter range in this area. The Desirable Components Index score is poor due to low browse cover, low perennial grass cover, and low perennial forb cover.

2005 winter range condition (DC Index) – poor (16) Lower potential scale

The following is the grass and forb seed mix aerially applied to the treatment in October 2005:

Species seeded	Bulk lbs in mix	Bulk lbs/acre
Canby Bluegrass 'Canbar'	175	0.3
Alfalfa 'Ladak'	350	0.5
Sainfoin 'Eski'	1400	2.0
Small Burnet	1400	2.0
Blue Flax	175	0.3
Thickspike Wheatgrass 'Bannock'	700	1.0
Crested Wheatgrass 'Hycrest'	700	1.0
Russian Wildrye	700	1.0
Orchardgrass 'Paiute'	350	0.5
Fourwing Saltbush--Juab UT	500	0.7
Fourwing Saltbush--Sevier UT	200	0.3
Snake River Wheatgrass 'Secar'	350	0.5
<b>Total</b>	<b>7000</b>	<b>10.0</b>
Total PLS		8.7

The following is the browse seed mix aerially applied to the treatment area in February 2006:

Species seeded	Bulk lbs in mix	Bulk lbs/acre
Sagebrush, Wyoming--Sanpete UT	700	1.0
Forage Kochia--Beaver UT	700	1.0
Whitestem Rubber Rabbitbrush--Sanpete UT	350	0.5
<b>Total</b>	<b>1750</b>	<b>2.5</b>
Total PLS		1.1

HERBACEOUS TRENDS --  
Management unit 17R, Study no: 14

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron dasystachyum	29	.47
G	Agropyron spicatum	55	.91
G	Bouteloua gracilis	1	.03
G	Bromus tectorum (a)	1	.00
G	Carex spp.	3	.15

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Elymus salina</i>	12	.45
G	<i>Oryzopsis hymenoides</i>	8	.04
G	<i>Poa fendleriana</i>	9	.16
G	<i>Poa secunda</i>	46	.37
G	<i>Sitanion hystrix</i>	75	.84
G	<i>Stipa comata</i>	7	.56
Total for Annual Grasses		1	0.00
Total for Perennial Grasses		245	4.01
Total for Grasses		246	4.02
F	<i>Androsace septentrionalis</i> (a)	8	.04
F	<i>Arabis</i> spp.	56	.33
F	<i>Astragalus convallarius</i>	2	.00
F	<i>Chenopodium album</i> (a)	44	.79
F	<i>Chaenactis douglasii</i>	8	.04
F	<i>Chenopodium leptophyllum</i> (a)	9	.01
F	<i>Cryptantha</i> spp.	5	.01
F	<i>Descurainia pinnata</i> (a)	18	.07
F	<i>Hedysarum boreale</i>	37	1.82
F	<i>Lappula occidentalis</i> (a)	8	.04
F	<i>Penstemon</i> spp.	10	.05
F	<i>Phlox austromontana</i>	12	.08
F	<i>Phlox longifolia</i>	11	.05
F	<i>Schoenocrambe linifolia</i>	7	.04
F	<i>Townsendia</i> spp.	3	.00
Total for Annual Forbs		87	0.96
Total for Perennial Forbs		151	2.44
Total for Forbs		238	3.40

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

BROWSE TRENDS --

Management unit 17R, Study no: 14

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Amelanchier utahensis	1	.03
B	Artemisia nova	16	1.03
B	Chrysothamnus depressus	4	.03
B	Chrysothamnus viscidiflorus viscidiflorus	1	.38
B	Ephedra viridis	0	-
B	Gutierrezia sarothrae	2	.03
B	Juniperus osteosperma	10	4.42
B	Opuntia spp.	6	.06
B	Pinus edulis	8	5.06
Total for Browse		48	11.04

CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 14

Species	Percent Cover
	'05
Amelanchier utahensis	.38
Artemisia nova	.41
Chrysothamnus depressus	.01
Chrysothamnus viscidiflorus viscidiflorus	.33
Gutierrezia sarothrae	.10
Juniperus osteosperma	12.23
Opuntia spp.	.06
Pinus edulis	16.18

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17R, Study no: 14

Species	Average leader growth (in)
	'05
Artemisia nova	1.4

POINT-QUARTER TREE DATA --  
 Management unit 17R, Study no: 14

Species	Trees per Acre
	'05
Juniperus osteosperma	252
Pinus edulis	185

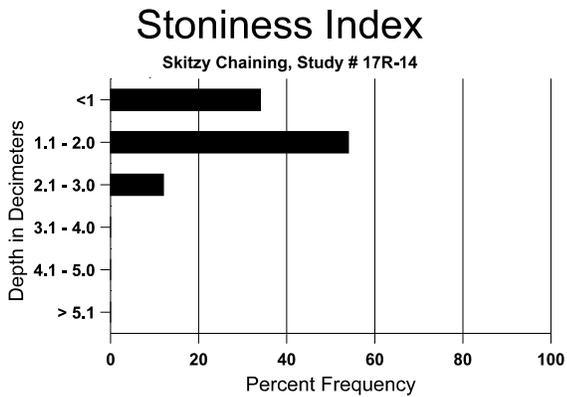
Average diameter (in)
'05
12.0
4.3

BASIC COVER --  
 Management unit 17R, Study no: 14

Cover Type	Average Cover %
	'05
Vegetation	16.67
Rock	2.87
Pavement	22.13
Litter	47.67
Cryptogams	1.89
Bare Ground	21.44

SOIL ANALYSIS DATA --  
 Management unit 17R, Study no: 14, Study Name: Skitzzy Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
7.5	- (-)	7.4	44.0	37.4	18.6	6.4	19.2	131.2	1.3



PELLET GROUP DATA --

Management unit 17R, Study no: 14

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	31	-
Elk	4	16 (40)
Deer	2	14 (35)

BROWSE CHARACTERISTICS --

Management unit 17R, Study no: 14

		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>												
05	<b>20</b>	-	-	20	-	-	100	0	-	-	0	22/10
<i>Artemisia nova</i>												
05	<b>460</b>	-	20	280	160	200	35	57	35	17	17	12/25
<i>Chrysothamnus depressus</i>												
05	<b>160</b>	-	-	160	-	-	0	0	-	-	0	7/7
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	13/22
<i>Ephedra viridis</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	56/76
<i>Gutierrezia sarothrae</i>												
05	<b>80</b>	-	-	80	-	-	0	0	-	-	0	7/5
<i>Juniperus osteosperma</i>												
05	<b>200</b>	-	20	140	40	20	0	0	20	10	10	-/-
<i>Opuntia spp.</i>												
05	<b>140</b>	-	-	140	-	-	0	0	-	-	0	5/14
<i>Pinus edulis</i>												
05	<b>160</b>	100	40	120	-	60	0	0	-	-	0	-/-

Trend Study 17R-15-05

Study site name: Golden Stairs Chaining .

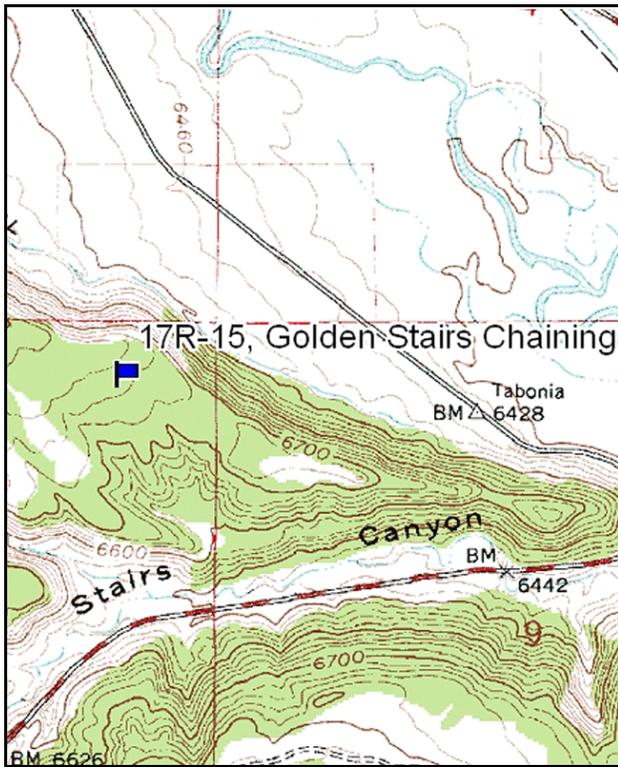
Vegetation type: Wyoming Big Sagebrush/P-J .

Compass bearing: frequency baseline 297 degrees magnetic.

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

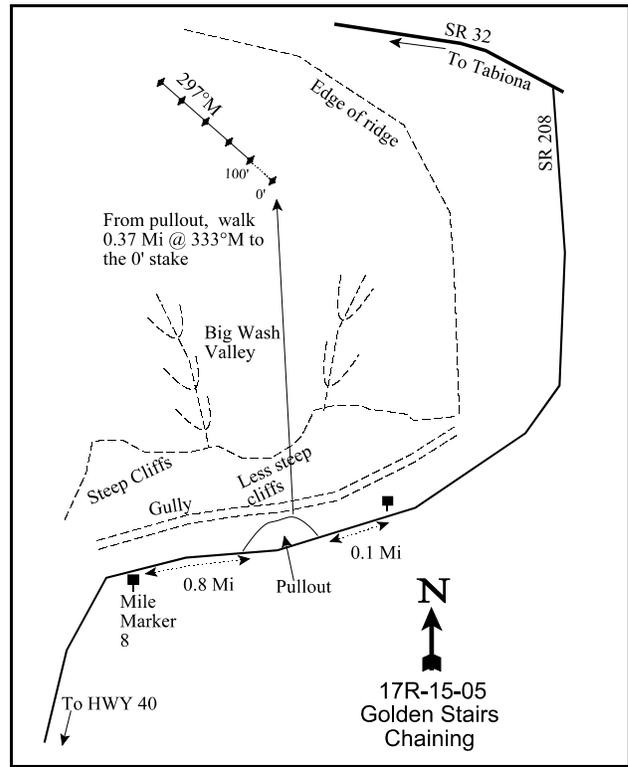
LOCATION DESCRIPTION

From the junction of US 40 and SR 208, drive north on SR 208 to mile marker 8. Drive 0.8 miles past the mile marker to a pullout on the left (north) side of the road. Park at this pullout (there is a sign just 0.1 miles north of the pullout). From the pullout, walk 0.37 miles at 333°M to the 0' stake. There are some steep cliffs to the right and some less steep cliffs on the left. Go between the cliffs to a big wash valley. The 0' stake is marked with browse tag #85.



Map Name: Tabonia

Township 6S, Range 11E, Section 3



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4463809 N, 562139 E

## DISCUSSION

### Golden Stairs Chaining – 17R-15

The Golden Stairs Chaining monitoring study is located within the Golden Stairs Range Rehabilitation project area. This chaining treated 185 acres of pinyon-juniper dominated critical mule deer, elk, and sage grouse winter habitat within the Tabby Mountain WMA. UDWR biologists have mapped an extensive sagebrush die-off in the northeastern region of Utah; this treatment is 1 of many within the region designed to improve dying sagebrush communities. This die-off could likely have deleterious effects on sagebrush-dependent wildlife species. Therefore, this project was designed to remove the pinyon-juniper overstory and rehabilitate the browse and herbaceous understory components. The area was aerially seeded with grasses and forbs in October of 2005, before the pinyon and juniper were removed. At the end of November and beginning of December 2005, the treatment area was two-way chained with a 200-foot Ely chain pulled by 2 D-8 CATs. An estimated 55 acres of scattered islands of pinyon-juniper were left unchained within the treatment area to provide game with protective cover. During the chaining, a browse mix was dribble seeded from the CAT tractors. Then in February 2006, the browse species were aerially seeded over the treatment area. The treatment area was divided into 3 parcels.

The treatment area is located about 2 miles southeast of Tabiona and just west of the intersection of SR-35 and SR-208. The monitoring study is located in the northeast treatment on an eastern aspect 4% slope and an elevation of 6,770 feet. The pellet group data in 2005 was estimated at 42 elk, 13 deer, and 4 cow days use/acre (103 edu/ha, 33 ddu/ha, and 11 cdu/ha).

The soil is a shallow sandy loam with an effective rooting depth of 19 inches. The soil profile is quite rocky, with the majority of rock measured in the upper 12 inches of the profile. At 19 inches is a calcium hardpan layer. The phosphorus concentration is 3.5 ppm, values less than 6 ppm may limit plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.6). Cryptogamic crusts make up nearly 7% of the surface cover and rock and pavement only make up about 3% combined. Bare ground cover is high at 40%. The 2005 erosion index measurement was slight due to rills up to 3 inches deep, moderate pedestalling and flow patterns, as well as moderate soil movement.

The abundance and diversity of browse species were low at the time of the pretreatment study in 2005. The key browse species were Wyoming big sagebrush and true mountain mahogany, both of which were in very low numbers. Cactus was the dominant browse species at 1,200 plant/acre. The browse component of the area has been out competed by the dense pinyon-juniper cover, particularly that of pinyon.

The combined pinyon and juniper overstory canopy cover before the chaining in 2005 was nearly 23%. 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. In 2005, juniper densities were estimated at 87 trees/acre with an average diameter of 10.3 inches. Pinyon densities were at an estimated 252 trees/acre, with an average diameter of 5.0 inches.

Perennial grasses dominate the herbaceous understory. Seven species of grasses were sampled in 2005, six of which were perennials. Slender wheatgrass was the dominant species with 6% cover and a quadrat frequency of 73%. All other grass species provided less than 1% cover. Cheatgrass also provided less than 1% cover and a quadrat frequency of only 8%.

Seventeen species of forbs were sampled in 2005, 8 of which were annuals. Forbs provided a combined cover of 3%, none of which provided more than one-half percent cover. Forbs with possible sage grouse use include: Rockcress, timber poisonvetch, littleflower collinsia, and nodding eriogonum (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

## 2005 Pretreatment Assessment

The pinyon and old juniper trees have outcompeted most other species in this area, particularly the browse species. There is moderate grass diversity on the study site, but each species is scattered throughout the site. The chaining and seeding will open the canopy and provide the area with the much-needed browse species. Cheatgrass is present, but not abundant and should compete little with the desired seeded species. The chaining should greatly improve the winter range in this area. . The Desriable Components Index score was poor due to no browse cover.

2005 winter range condition (DC Index) – poor (21) Lower potential scale

The following is the grass and forb seed mix aerially applied to the treatment in October 2005:

<u>Seeded Species</u>	<u>Bulk lbs in mix</u>	<u>Bulk lbs/acre</u>
Crested Wheatgrass 'Hycrest'	150	0.8
Thickspike Wheatgrass 'Critana'	200	1.1
Orchardgrass 'Paiute'	100	0.5
Russian Wildrye	200	1.1
Snake River Wheatgrass 'Secar'	100	0.5
Canby Bluegrass 'Canbar'	50	0.3
Blue Flax	50	0.3
Alfalfa 'Ladak+'	100	0.5
Sainfoin 'Eski'	400	2.1
Small Burnet 'Delar'	200	1.1
Fourwing Saltbush--Juab/Millard UT	200	1.1
<b>Total</b>	<b>1750</b>	<b>9.2</b>
Total PLS		8

The following is the browse seed mix dribbled onto the treatment during the chaining:

<u>Seeded Species</u>	<u>Bulk lbs in mix</u>	<u>Bulk lbs/acre</u>
Bitterbrush--Ada/Boise ID	25	0.1
Green Ephedra	25	0.1
True Mountain Mahogany	25	0.1
Fourwing Saltbush--Juab/Millard UT	25	0.1
<b>Total</b>	<b>100</b>	<b>0.5</b>
Total PLS		0.3

The following is the browse seed mix aerially applied to the treatment area in February 2006:

<u>Seeded Species</u>	<u>Bulk lbs in mix</u>	<u>Bulk lbs/acre</u>
Forage Kochia--Millard UT	200	1.05
Sagebrush, Wyoming--Sanpete UT	200	1.05
<b>Total</b>	<b>400</b>	<b>2.1</b>
Total PLS		1.0

HERBACEOUS TRENDS --  
Management unit 17R, Study no: 15

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron smithii	41	.21
G	Agropyron trachycaulum	211	6.19
G	Bromus tectorum (a)	18	.26
G	Carex spp.	8	.60
G	Oryzopsis hymenoides	26	.45
G	Poa secunda	30	.66
G	Stipa comata	68	.95
Total for Annual Grasses		18	0.26
Total for Perennial Grasses		384	9.08
Total for Grasses		402	9.34
F	Arabis spp.	7	.16
F	Astragalus convallarius	-	.03
F	Chenopodium fremontii (a)	15	.45
F	Chenopodium leptophyllum(a)	10	.16
F	Collinsia parviflora (a)	96	.37
F	Cryptantha spp.	20	.12
F	Descurainia pinnata (a)	55	.49
F	Draba spp. (a)	36	.18
F	Eriogonum cernuum (a)	13	.04
F	Ipomopsis congesta	11	.07
F	Lappula occidentalis (a)	25	.24
F	Leucelene ericoides	4	.06
F	Lepidium montanum	2	.33
F	Lesquerella spp.	3	.03
F	Polygonum douglasii (a)	19	.05
F	Schoenrambe linifolia	12	.22
F	Townsendia spp.	-	-
Total for Annual Forbs		269	2.02
Total for Perennial Forbs		59	1.05
Total for Forbs		328	3.07

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

BROWSE TRENDS --

Management unit 17R, Study no: 15

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata wyomingensis	0	-
B	Cercocarpus montanus	3	.15
B	Eriogonum corymbosum	8	.44
B	Gutierrezia sarothrae	13	.06
B	Juniperus osteosperma	5	3.24
B	Leptodactylon pungens	8	-
B	Opuntia spp.	34	.74
B	Pinus edulis	11	9.44
Total for Browse		82	14.08

CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 15

Species	Percent Cover
	'05
Cercocarpus montanus	.98
Eriogonum corymbosum	1.18
Juniperus osteosperma	12.11
Opuntia spp.	.41
Pinus edulis	10.69

POINT-QUARTER TREE DATA --

Management unit 17R, Study no: 15

Species	Trees per Acre	Average diameter (in)
	'05	
Juniperus osteosperma	87	10.3
Pinus edulis	252	5.0

**BASIC COVER --**

Management unit 17R, Study no: 15

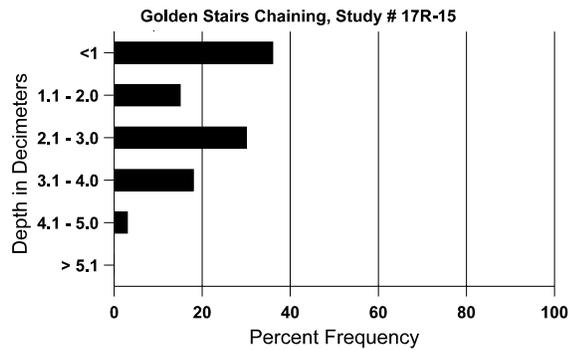
Cover Type	Average Cover %
	'05
Vegetation	22.96
Rock	1.25
Pavement	1.55
Litter	39.20
Cryptogams	6.65
Bare Ground	40.43

**SOIL ANALYSIS DATA --**

Management unit 17R, Study no: 15, Study Name: Golden Stairs Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
15.3	- (-)	7.6	57.0	27.4	15.6	2.0	3.5	89.6	0.8

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 17R, Study no: 15

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	56	-
Elk	22	42 (103)
Deer	6	13 (33)
Cattle	-	4 (11)

BROWSE CHARACTERISTICS --  
Management unit 17R, 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 wyomingensis</i>												
05	<b>0</b>	-	-	-	-	100	0	0	-	-	0	19/21
<i>Cercocarpus montanus</i>												
05	<b>60</b>	-	-	-	60	20	0	100	100	33	33	44/36
<i>Eriogonum corymbosum</i>												
05	<b>260</b>	80	-	240	20	-	31	0	8	8	8	17/27
<i>Gutierrezia sarothrae</i>												
05	<b>480</b>	20	20	460	-	20	0	0	-	-	0	6/8
<i>Juniperus osteosperma</i>												
05	<b>120</b>	20	80	-	40	60	0	0	33	33	33	-/-
<i>Leptodactylon pungens</i>												
05	<b>300</b>	-	-	280	20	-	13	0	7	-	0	3/5
<i>Opuntia spp.</i>												
05	<b>1200</b>	40	160	900	140	20	0	0	12	2	2	5/13
<i>Pinus edulis</i>												
05	<b>260</b>	60	180	80	-	-	0	0	-	-	0	-/-

Trend Study 17R-16-05

Study site name: Grey Wolf Chaining .

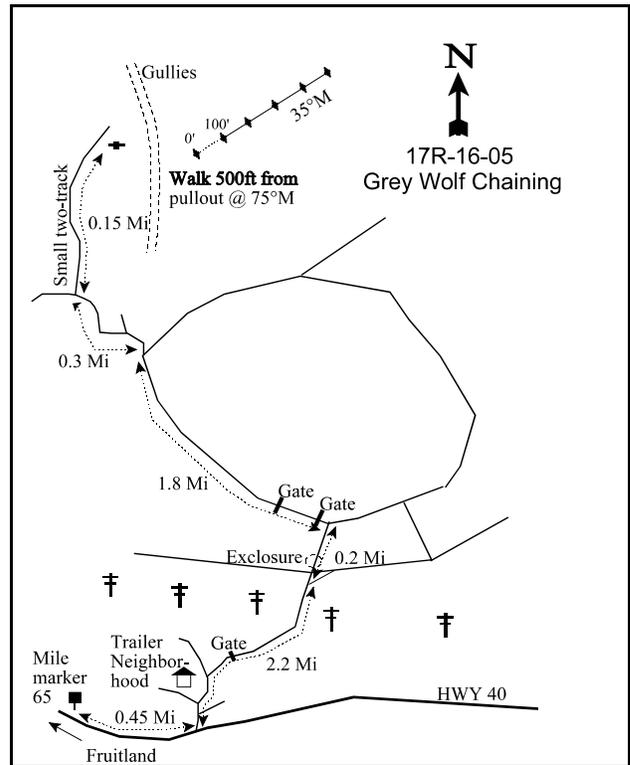
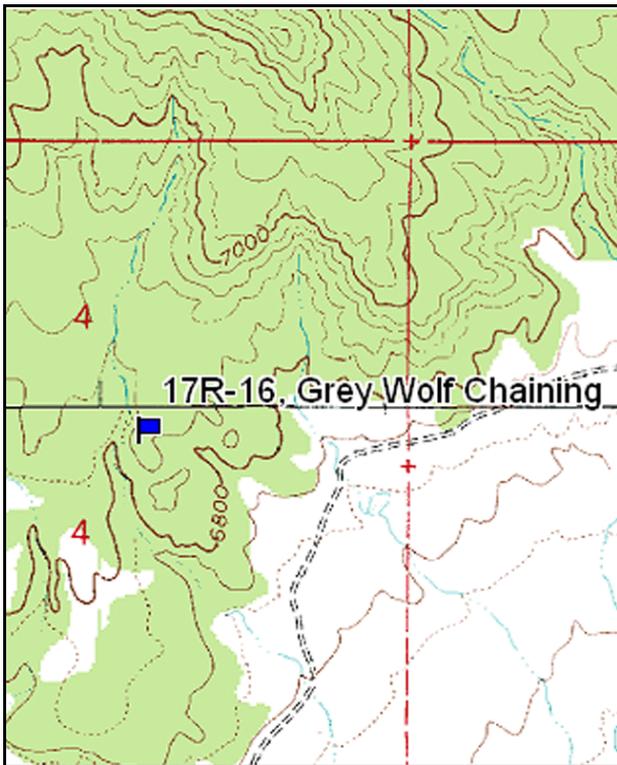
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 35 degrees magnetic.

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

LOCATION DESCRIPTION

From Fruitland, drive east on US 40 to mile marker 65. Continue 0.45 miles past the mile marker to a road on the left (north). Turn on this road and drive 2.2 miles past several trailers and through a gate to a fork. Stay left at the fork and drive 0.2 miles passing through an exclosure to a fork. Take the left fork and drive 1.8 miles through a gate to road on the left (west) side. Turn left and drive 0.3 miles to a two-track on the right, maybe hard to see. Turn right (north) on the two-track and drive 0.15 miles to the witness post on the right (east). From the witness post, walk 520 feet at 75°M to the 0' stake. The 0' stake is marked with browse tag #86.



Map Name: Fruitland

Diagrammatic Sketch

Township 6S, Range 10E, Section 34

GPS: NAD 27, UTM 12T 4455230 N, 517818 E

## DISCUSSION

### Grey Wolf Chaining – 17R-16

The Grey Wolf Chaining monitoring site was established within the Grey Wolf Mountain Rehabilitation project area. This chaining was originally planned to treat 775 acres of pinyon-juniper dominated critical mule deer, elk, and sage grouse winter habitat within the Tabby Mountain WMA. UDWR biologists have mapped an extensive sagebrush die-off in the northeastern region of Utah; this treatment is 1 of many within the region designed to improve dying sagebrush communities. This die-off could likely have deleterious effects on sagebrush-dependent wildlife species. Therefore, this project was designed to remove the pinyon-juniper overstory and rehabilitate the browse and herbaceous understory components. This treatment is located within 1,000 feet of the Lower Red Creek sage grouse lek within the Alan Smith property. The area was aerially seeded with grasses and forbs in October of 2005, before the pinyon and juniper were removed. At the end of October and beginning of November 2005, the treatment area was two-way chained with a 200-foot Ely chain pulled by 2 D-8 Cats. An estimated 160 acres of scattered islands of pinyon-juniper were originally to be left unchained within the treatment area to provide game with protective cover. The actual total treatment area was about 610 acres. During the chaining, a browse mix was dribble seeded from the CAT tractors. During the chaining, a browse mix was dribble seeded from the CAT tractors. Then in February 2006, the browse species were aerially seeded over the treatment area. The treatment area was divided into several parcels. An estimated 130 acres of the treatment were on the Alan Smith property and the rest in the Tabby Mountain WMA.

The treatment area is approximately 3 miles northeast of Fruitland. The monitoring site is located within one of the western-most treatment areas within the Alan Smith property. It is on a southwest aspect on a 4% slope at an elevation of 6,800 feet. Pellet group data estimates from 2005 pretreatment data were 35 elk and 7 deer days use/acre (86 edu/ha and 17 ddu/ha). Both deer and elk pellets were left during winter use.

The soil is a shallow loam with an effective rooting depth of 11 inches. Very little rock was found in the profile, with the exception of near stake number 4, where the soil profile was very rocky. Phosphorus and potassium concentrations are sufficient for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.6). Bare ground cover was high at 52% in 2005. Several large unvegetated gullies cross the study site. The 2005 erosion index measurement was moderate due to gullies with 10-50% of gully walls showing active erosion, moderately deep rills, moderate surface litter movement, as well as slight pedestals and flow patterns.

The key browse species were true mountain mahogany and corymbid eriogonum before the chaining. The eriogonum was the dominant browse species with nearly 2% cover and a 1,300-plants/acre density in 2005. Although generally not a preferred browse species, in this winter range there was little else to browse. Use was light to moderate. True mountain mahogany was sampled in very low densities, 200 plants/acre, and cover (less than 1%). Use on mahogany was high. Mahogany annual leader growth averaged 4.4 inches in 2005. Some dead sagebrush were sampled in the study area. The browse density was low in this very mature stand of pinyon-juniper.

Combined pinyon and juniper overstory canopy cover was 21% in 2005. 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 Utah juniper density was 72 trees/acre with an average trunk diameter of 22.9 inches in 2005. The pinyon density was estimated at 50 trees/acre with an average trunk diameter of 8.7 inches. Although the densities are not extraordinarily high, the trees were very large and mature.

Seven species of grass were sampled in 2005, all of which were perennials. None of these species exceeded 1% cover individually and they only provided 2% cover collectively. Slender wheatgrass and Indian ricegrass were the most abundant. Cheatgrass was not sampled on the site.

Nineteen species of forbs were sampled in 2005, 9 of which were annuals. Combined, forbs only provided 3% cover and none of which exceeded one-half percent cover individually. Forbs with possible sage grouse use include: Utah milkvetch, littleflower collinsia, nodding eriogonum, and sulfur eriogonum (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

2005 Pretreatment Assessment

The pinyon and old juniper trees have outcompeted most other species in this area, particularly the browse species. There is moderate grass diversity on the study site, but each species is scattered throughout the site. The chaining and seeding will open the canopy and provide the area with the much-needed browse species. The chaining should greatly improve the winter range in this area. The Desirable Components Index score was poor due to very low browse cover.

2005 winter range condition (DC Index) – poor (10) Lower potential scale

The following is the grass and forb seed mix aerially applied to the treatment in October 2005:

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Crested Wheatgrass 'Douglas'	750	1.0
Thickspike Wheatgrass 'Critana'	800	1.0
Orchardgrass 'Paiute'	117	0.2
Russian Wildrye	750	1.0
Snake River Wheatgrass 'Secar'	400	0.5
Canby Bluegrass 'Canbar'	200	0.3
Orchardgrass 'Paiute'	255	0.3
Blue Flax	200	0.3
Alfalfa 'Ladak+'	400	0.5
Sainfoin 'Eski'	1850	2.4
Small Burnet 'Delar'	1550	2.0
Fourwing Saltbush--Emery UT	400	0.5
Fourwing Saltbush--Juab/Millard UT	300	0.4
<b>Total</b>	<b>7972</b>	<b>10.3</b>
Total PLS		9

The following is the browse seed mix dribbled onto the treatment area:

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Bitterbrush--Ada/Boise ID	25	0.0
Green Ephedra	50	0.1
True Mountain Mahogany	25	0.0
Fourwing Saltbush--Juab/Millard UT	50	0.1
<b>Total</b>	<b>150</b>	<b>0.2</b>
Total PLS		0.1

The following is the browse seed mix aerially applied to the treatment area in February 2006:

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Forage Kochia--Millard UT	610	1.0
Sagebrush, Wyoming--Sanpete UT	610	1.0
<b>Total</b>	<b>1220</b>	<b>2.0</b>
Total PLS		0.9

HERBACEOUS TRENDS --

Management unit 17R, Study no: 16

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron smithii	2	.00
G	Agropyron spicatum	3	.00
G	Agropyron trachycaulum	61	.90
G	Carex spp.	6	.01
G	Oryzopsis hymenoides	88	.82
G	Poa secunda	10	.07
G	Stipa comata	21	.51
Total for Annual Grasses		0	0
Total for Perennial Grasses		191	2.33
Total for Grasses		191	2.33
F	Arenaria spp.	6	.03
F	Astragalus utahensis	4	.00
F	Chenopodium fremontii (a)	20	.53
F	Chenopodium leptophyllum(a)	40	.33
F	Collinsia parviflora (a)	71	.49
F	Cryptantha spp.	21	.14
F	Descurainia pinnata (a)	11	.10
F	Eriogonum cernuum (a)	17	.02
F	Eriogonum umbellatum	3	.15
F	Gilia spp. (a)	8	.02
F	Hedysarum boreale	13	.75
F	Lappula occidentalis (a)	10	.02
F	Lepidium spp. (a)	12	.16
F	Penstemon spp.	1	.00
F	Phlox austromontana	13	.10
F	Polygonum douglasii (a)	1	.00
F	Schoenocrambe linifolia	7	.01
F	Senecio multilobatus	12	.05

Type	Species	Nested Frequency	Average Cover %
		'05	'05
F	<i>Thelypodium integrifolium</i>	18	.15
Total for Annual Forbs		190	1.70
Total for Perennial Forbs		98	1.41
Total for Forbs		288	3.11

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 16

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata wyomingensis</i>	0	-
B	<i>Cercocarpus montanus</i>	10	.33
B	<i>Chrysothamnus viscidiflorus</i>	1	-
B	<i>Eriogonum corymbosum</i>	36	1.59
B	<i>Gutierrezia sarothrae</i>	13	.55
B	<i>Juniperus osteosperma</i>	2	.72
B	<i>Leptodactylon pungens</i>	0	-
B	<i>Opuntia</i> spp.	4	.03
B	<i>Pinus edulis</i>	6	.03
B	<i>Purshia tridentata</i>	0	-
Total for Browse		72	3.25

#### CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 16

Species	Percent Cover
	'05
<i>Cercocarpus montanus</i>	1.75
<i>Eriogonum corymbosum</i>	1.10
<i>Gutierrezia sarothrae</i>	.20
<i>Juniperus osteosperma</i>	14.56
<i>Pinus edulis</i>	6.88

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 17R, Study no: 16

Species	Average leader growth (in)
	'05
Cercocarpus montanus	4.4

POINT-QUARTER TREE DATA --  
Management unit 17R, Study no: 16

Species	Trees per Acre	Average diameter (in)
	'05	'05
Juniperus osteosperma	72	22.9
Pinus edulis	50	8.7

BASIC COVER --  
Management unit 17R, Study no: 16

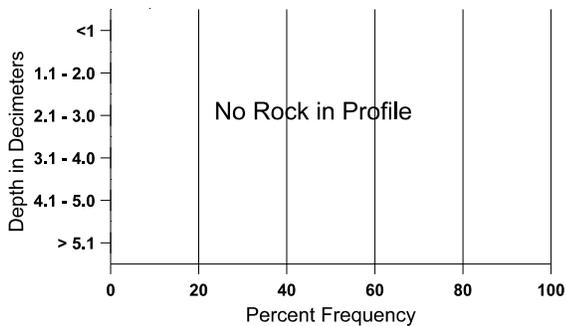
Cover Type	Average Cover %
	'05
Vegetation	8.07
Rock	1.93
Pavement	1.89
Litter	38.46
Cryptogams	2.73
Bare Ground	52.04

SOIL ANALYSIS DATA --  
Management unit 17R, Study no: 16, Study Name: Grey Wolf Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.5	- (-)	7.6	49.4	32.7	17.9	2.4	8.4	115.2	0.4

### Stoniness Index

Grey Wolf Chaining, Study # 17R-16



PELLET GROUP DATA --

Management unit 17R, Study no: 16

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	56	-
Elk	22	35 (86)
Deer	12	7 (17)

BROWSE CHARACTERISTICS --

Management unit 17R, Study no: 16

		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>												
05	<b>0</b>	-	-	-	-	20	0	0	-	-	0	11/12
<i>Cercocarpus montanus</i>												
05	<b>200</b>	-	-	200	-	40	20	80	-	-	0	41/40
<i>Chrysothamnus viscidiflorus</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	6/11
<i>Eriogonum corymbosum</i>												
05	<b>1300</b>	480	460	800	40	-	22	11	3	-	0	15/19
<i>Gutierrezia sarothrae</i>												
05	<b>880</b>	-	60	780	40	-	0	0	5	-	0	6/8
<i>Juniperus osteosperma</i>												
05	<b>40</b>	-	20	20	-	20	0	0	-	-	0	-/-
<i>Leptodactylon pungens</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	3/5
<i>Opuntia spp.</i>												
05	<b>80</b>	-	-	60	20	20	0	0	25	25	25	3/16
<i>Pinus edulis</i>												
05	<b>120</b>	40	80	40	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	9/61

Trend Study 17R-17-05

Study site name: Strawberry Grouse 1.

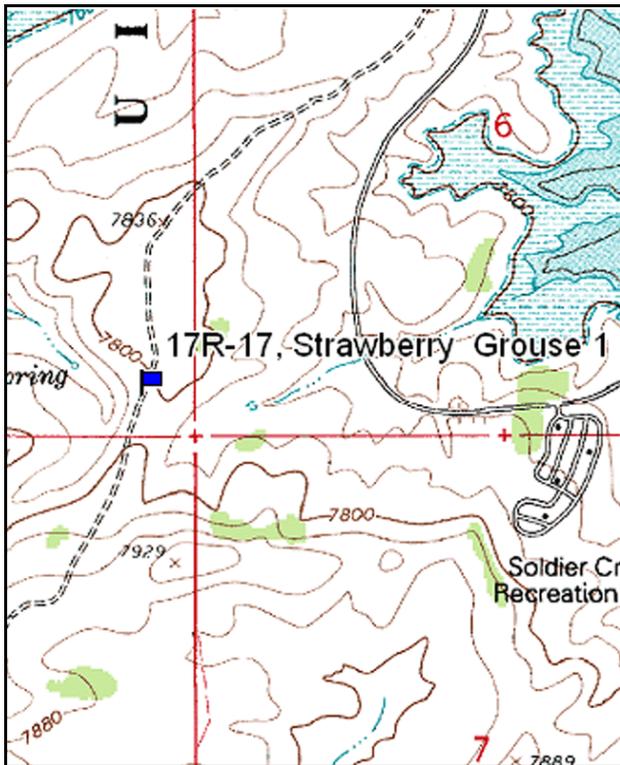
Vegetation type: Mountain Big Sagebrush.

Compass bearing: frequency baseline 310 degrees magnetic.

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

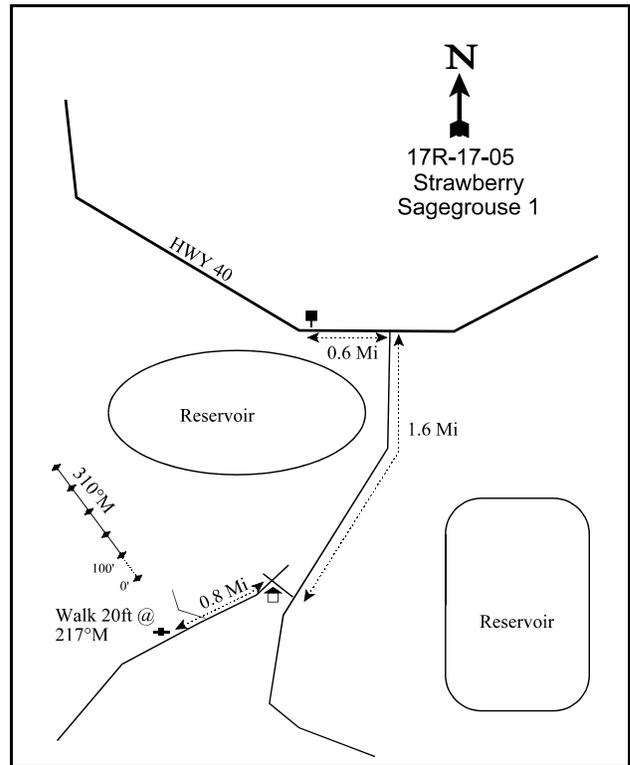
LOCATION DESCRIPTION

On US 40, drive past Strawberry Reservoir to mile marker 49 (not positive on mile marker number?). Continue 0.6 miles past the mile marker to Soldier Creek Campground Rd (FS 480) on the right (south). Turn right and drive 1.6 miles to a road on the right (west). Turn right and drive 0.1 miles to an intersection, turn left (SW). Drive 0.8 miles on a this two-track road to the witness post on the right (NW) side. From the witness post, walk 20 feet at 217°M to the 0' stake. The 0' stake is marked with browse tag #93.



Map Name: Strawberry Reservoir NE

Township 4S, Range 11W, Section 1



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4444785 N, 494285 E

## DISCUSSION

### Strawberry Sage Grouse 1 – 17R-17

The Strawberry Sage Grouse 1 study is 1 of 4 established in 2005 to monitor habitat for sage grouse in the Strawberry Valley and surrounding brood area. In conjunction with Brigham Young University, the data from the 4 studies will be used to better manage sage grouse populations in the Strawberry Valley. This study, the Road Hollow (17R-19) study, and the Road Hollow Ridge (17R-20) study are all located within sage grouse winter and brooding habitat within approximately 1 mile from one another. The fourth study, Wildcat Sage Grouse (17R-18), is located approximately 5.3 miles east of the other studies in the UDWR Wildcat WMA. Wildcat Sage Grouse is located within an area that is strictly sage grouse brooding habitat. The Strawberry Sage Grouse 1 study is located on the southwest aspect of a mountain big sagebrush ridge approximately  $\frac{3}{4}$  mile south of Road Hollow and 2.25 miles south of US 40. The slope is 8-10% at an elevation of 7,440 feet. Pellet group in 2005 data was estimated at 11 elk, 7 deer, and 2 cow days use/acre (26 edu/ha, 18 ddu/ha, and 4 cdu/ha). Estimated sage grouse pellets were 200 pellets/acre.

The soil is a shallow loam with an effective rooting depth of 10 inches. Very little rock was observed in the soil profile and it provided about 5% of the ground cover. Phosphorus and potassium concentrations are adequate for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The 2005 erosion index measurement was slight due to moderate pedestalling around shrubs and slight erosion in the banks of a gully that starts south of the baseline.

The key browse species is mountain big sagebrush. It provided 16% aerial cover and nearly 26% line intercept cover in 2005. Sagebrush density was 5,500 plants/acre in 2005, 50% of which were classified as mature. Forty-seven percent of the population was classified as decadent and 3% young. Plants classified as dying made up 25% of the population, which far outnumbers the number of young. If the dying plants are not replaced with young, the population will slowly be depleted. Sagebrush showed very light use and the average annual leader growth was 1.8 inches in 2005.

Fringed sagebrush, Parry rabbitbrush, and stickyleaf low rabbitbrush were also abundant. Fringed sagebrush provided 1% cover with a density of 2,540 plants/acre. Parry rabbitbrush also provided 1% cover, but with 1,500 plants/acre. Stickyleaf low rabbitbrush provided nearly 3% cover with 4,660 plants/acre. Other browse species sampled in 2005 include: Dwarf rabbitbrush, broom snakeweed, Oregon grape, Wood's rose, and gray horsebrush. All species showed very light use.

Grass diversity is moderately high with 13 species sampled in 2005. Crested wheatgrass and mutton bluegrass are the dominant species. Crested wheatgrass provided 7% cover in 2005. Mutton bluegrass provided nearly 5% cover in 2005. The other 11 species provided 4% cover combined.

Forb diversity is moderate with 31 species sampled in 2005. Combined forb cover was 14% in 2005. Looseflower milkvetch and desert phlox were the dominant forb species in 2005, both of which provided about 5% cover. The following species (or species the same genera) have been shown to be beneficial to sage grouse: Rose pussytoes, rockcress, pacific aster, timber milkvetch, milkvetch sp., looseflower milkvetch, sego lily, littleflower collinsia, buckwheat sp., sulfur eriogonum, silvery lupine, longleaf phlox, dandelion, and western salsify (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

2005 winter range condition (DC Index) – good (72) Mid-level potential scale

HERBACEOUS TRENDS --

Management unit 17R, Study no: 17

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Agropyron cristatum</i>	149	6.93
G	<i>Agropyron smithii</i>	94	.74
G	<i>Agropyron spicatum</i>	17	.40
G	<i>Bromus anomalus</i>	2	.00
G	<i>Carex</i> spp.	38	.71
G	<i>Festuca ovina</i>	4	.04
G	<i>Koeleria cristata</i>	56	.74
G	<i>Oryzopsis hymenoides</i>	14	.12
G	<i>Poa fendleriana</i>	162	4.75
G	<i>Poa pratensis</i>	13	.21
G	<i>Poa secunda</i>	68	.73
G	<i>Stipa columbiana</i>	8	.11
G	<i>Stipa comata</i>	15	.63
Total for Annual Grasses		0	0
Total for Perennial Grasses		640	16.13
Total for Grasses		640	16.13
F	<i>Antennaria rosea</i>	11	.05
F	<i>Androsace septentrionalis</i> (a)	2	.01
F	<i>Arabis</i> spp.	5	.01
F	<i>Aster chilensis</i>	-	.00
F	<i>Astragalus convallarius</i>	10	.05
F	<i>Astragalus kentrophyta</i>	3	.03
F	<i>Astragalus tenellus</i>	112	4.84
F	<i>Camissonia</i> spp. (a)	6	.04
F	<i>Calochortus nuttallii</i>	3	.00
F	<i>Chaenactis douglasii</i>	3	.00
F	<i>Comandra pallida</i>	85	.77
F	<i>Collinsia parviflora</i> (a)	15	.04
F	<i>Cryptantha</i> spp.	2	.15
F	<i>Eriogonum</i> spp.	13	.43
F	<i>Eriogonum umbellatum</i>	6	.09
F	<i>Gayophytum ramosissimum</i> (a)	28	.08
F	<i>Lappula occidentalis</i> (a)	10	.04
F	<i>Lesquerella</i> spp.	3	.00
F	<i>Lupinus argenteus</i>	-	.03
F	<i>Machaeranthera grindelioides</i>	47	1.62

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
F	Orthocarpus luteus (a)	7	.02
F	Orobanche spp.	1	.00
F	Orthocarpus tolmiei (a)	17	.37
F	Penstemon spp.	7	.07
F	Phlox austromontana	126	5.32
F	Phlox longifolia	3	.00
F	Polygonum douglasii (a)	34	.11
F	Potentilla gracilis	4	.03
F	Senecio multilobatus	1	.03
F	Taraxacum officinale	4	.01
F	Tragopogon dubius	-	.00
Total for Annual Forbs		119	0.72
Total for Perennial Forbs		449	13.61
Total for Forbs		568	14.33

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 17

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia frigida	39	1.08
B	Artemisia tridentata vaseyana	72	16.42
B	Chrysothamnus depressus	2	.03
B	Chrysothamnus parryi	29	1.06
B	Chrysothamnus viscidiflorus viscidiflorus	72	2.83
B	Gutierrezia sarothrae	11	.37
B	Mahonia repens	3	.18
B	Rosa woodsii	0	-
B	Tetradymia canescens	18	1.12
Total for Browse		246	23.13

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

Species	Percent Cover '05
Artemisia frigida	1.11
Artemisia tridentata vaseyana	25.66
Chrysothamnus parryi	.85
Chrysothamnus viscidiflorus viscidiflorus	4.59
Gutierrezia sarothrae	.85
Tetradymia canescens	.43

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 17R, Study no: 17

Species	Average leader growth (in) '05
Artemisia tridentata vaseyana	1.8

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

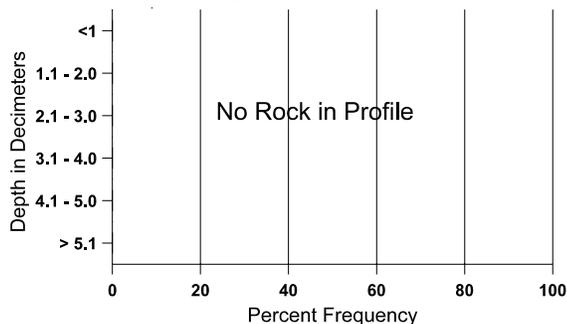
Cover Type	Average Cover % '05
Vegetation	46.00
Rock	4.96
Pavement	.57
Litter	48.10
Cryptogams	3.32
Bare Ground	22.49

SOIL ANALYSIS DATA --  
 Management unit 17R, Study no: 17, Study Name: Strawberry Sage Grouse 1

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.3	59.2 (10.9)	7.3	47.4	34.7	17.9	1.3	10.3	150.4	0.5

## Stoniness Index

Strawberry Sage Grouse 1, Study # 17R-17



### PELLET GROUP DATA --

Management unit 17R, Study no: 17

Type	Quadrat Frequency '05	Days use per acre (ha) '05
Rabbit	30	-
Grouse	17	200/acre
Elk	4	11 (26)
Deer	10	7 (18)
Cattle	1	2 (4)

### BROWSE CHARACTERISTICS --

Management unit 17R, Study no: 17

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia frigida</i>												
05	<b>2540</b>	40	480	1880	180	20	5	0	7	4	4	7/10
<i>Artemisia tridentata vaseyana</i>												
05	<b>5500</b>	-	180	2740	2580	900	2	0	47	25	25	17/24
<i>Chrysothamnus depressus</i>												
05	<b>80</b>	-	-	80	-	-	0	0	-	-	0	7/5
<i>Chrysothamnus parryi</i>												
05	<b>1500</b>	-	100	1320	80	20	7	1	5	1	1	7/11
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>4660</b>	-	40	4040	580	20	0	.42	12	5	5	9/13
<i>Gutierrezia sarothrae</i>												
05	<b>900</b>	-	220	680	-	-	0	0	-	-	0	5/7
<i>Mahonia repens</i>												
05	<b>220</b>	-	-	220	-	-	0	0	-	-	0	3/3

		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)
Rosa woodsii												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	7/8
Tetradymia canescens												
05	<b>520</b>	-	40	400	80	-	0	0	15	8	8	9/14

Trend Study 17R-18-05

Study site name: Wildcat Sagegrouse .

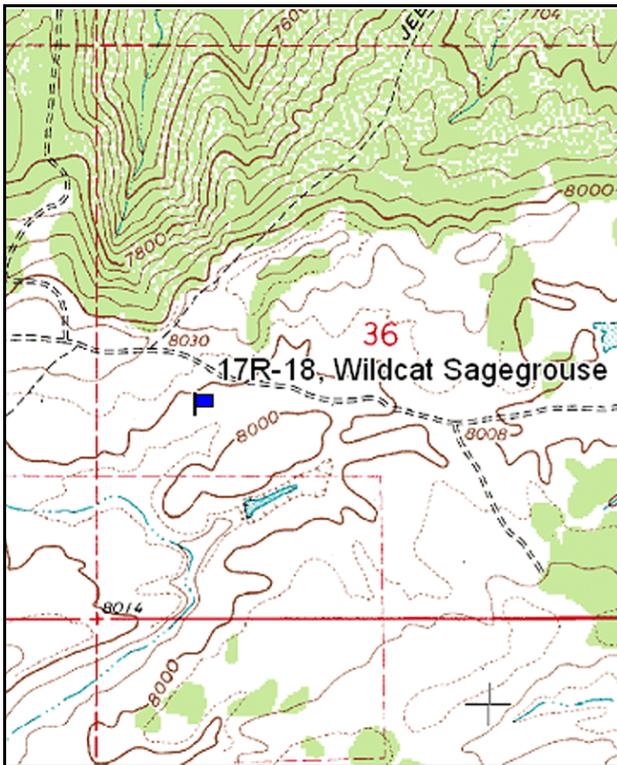
Vegetation type: Mountain Big Sagebrush .

Compass bearing: frequency baseline 230 degrees magnetic.

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

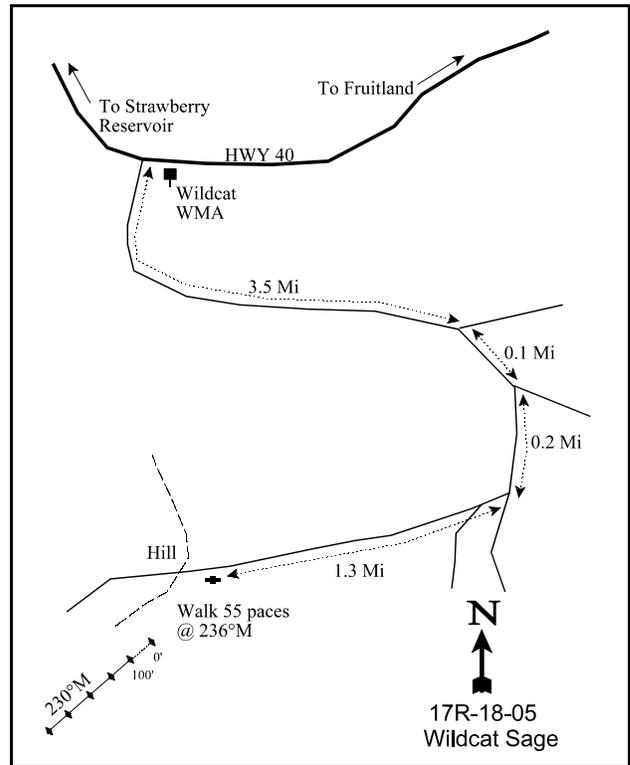
LOCATION DESCRIPTION

On US 40, drive east past Strawberry Reservoir to the road that goes to the Wildcat WMA. Turn right (south) and drive 3.5 miles to a fork. Turn right and drive 0.1 miles to a fork and stay right. Drive 0.2 miles to another fork and stay right again. Drive 1.3 miles to the witness post on the left (south) side of the road just before a hill. From the witness post, walk 55 paces at 236°M to the 0' stake. The 0' stake is marked with browse tag #95.



Map Name: Deep Creek Canyon

Township 3S, Range 10W, Section 36



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4446858 N, 502722 E

## DISCUSSION

### Wildcat Sage Grouse – 17R-18

The Wildcat Sage Grouse study is 1 of 4 established in 2005 to monitor habitat for sage grouse in the Strawberry Valley and surrounding brood area. In conjunction with Brigham Young University, the data from the 4 studies will be used to better manage sage grouse populations in the Strawberry Valley. This study is located within the UDWR Wildcat WMA approximately 5.3 miles east of the other studies. It is within an area that is strictly sage grouse brooding habitat. It is located approximately 1.5 miles south of US 40 on a plateau with a southwestern aspect with a slope of 1% at an elevation of 7,980 feet. Pellet group data in 2005 were estimated at 30 elk, 3 deer, and 1 cow days use/acre (74 edu/ha, 8 ddu/ha, and 2 cdu/ha). In 2005, an estimated 96 sage grouse pellets/acre were sampled.

The soil is a shallow clay loam with an effective rooting depth of 11 inches. No stone was measured in the upper 4 inches of the soil profile, but was very stony deeper. The upper 2 inches of the profile consisted of grass roots. Phosphorus and potassium concentrations are adequate for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is slightly acidic (6.5). The 2005 erosion index measurement was slight due to pedestals around shrubs up to 1 inch tall, moderate surface litter movement, as well as slight flow patterns and soil movement.

The key browse species are silver sagebrush and mountain big sagebrush, but mountain big sagebrush is the preferred browse species. The silver sagebrush provided 12% aerial cover and 17% line intercept cover in 2005. Its density was 5,400 plants/acre, 80% of which were classified as mature and 11% as decadent. Young individuals made up 10% of the population and those classified as dying made up 3%. Only light use was observed on the silver sagebrush. Mountain big sagebrush provided 3% aerial cover and 5% line intercept cover in 2005. Its density was 1,560 plants/acre with 71% of the population mature individuals and 17% decadent. Young plants made up 13% of the population and plants classified as dying made up 4%. Use was moderate to light. Mountain big sagebrush leader growth averaged 2.0 inches in 2005.

Stickyleaf low rabbitbrush, Parry rabbitbrush, and bitterbrush were also sampled in 2005. All of which provided less than 1% aerial and line intercept cover in 2005.

Thirteen species of grasses were sampled in 2005, all of which were perennials. The dominant species was sheep fescue with nearly 19% cover and 80% quadrat frequency. A sedge species was also abundant with 4% cover and 52% quadrat frequency. Mutton bluegrass, subalpine needlegrass, and Letterman needlegrass provided between 1-2% each. The other species provided less than 0.5% cover each.

Eighteen species of forbs were sampled in 2005, 3 of which were annuals. Western yarrow, an aster, and Rainier pleated gentian were the dominant forb species provided around 4% cover each in 2005. Owlclover, Watson penstemon, and beauty cinquefoil all provided between 1-2% cover each. All other species provided less than 1% cover individually. Western yarrow, pale agoseris, rose pussytoes, looseflower milkvetch, aster, silvery lupine, little polecat, dandelion, and longleaf phlox (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

2005 winter range condition (DC Index) – good (79) Mid-level potential scale

HERBACEOUS TRENDS --

Management unit 17R, Study no: 18

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron smithii	5	.01
G	Bromus carinatus	3	.00
G	Carex spp.	164	4.39
G	Deschampsia caespitosa	15	.45
G	Festuca ovina	319	18.76
G	Juncus spp.	62	.50
G	Koeleria cristata	41	.48
G	Poa fendleriana	58	1.79
G	Poa pratensis	49	.37
G	Sitanion hystrix	24	.34
G	Stipa columbiana	45	1.11
G	Stipa comata	13	.39
G	Stipa lettermani	39	1.18
Total for Annual Grasses		0	0
Total for Perennial Grasses		837	29.81
Total for Grasses		837	29.81
F	Achillea millefolium	164	4.57
F	Agoseris glauca	1	.15
F	Antennaria rosea	31	.40
F	Astragalus tenellus	9	.07
F	Aster spp.	151	4.29
F	Cirsium spp.	11	.91
F	Gentiana calycosa	112	3.95
F	Geranium spp.	4	.15
F	Lupinus spp.	40	.68
F	Microsteris gracilis (a)	2	.00
F	Orthocarpus spp. (a)	135	1.17
F	Pedicularis groenlandica	-	.00
F	Penstemon watsonii	80	1.98
F	Phlox longifolia	20	.21
F	Polygonum douglasii (a)	29	.09
F	Potentilla gracilis	48	1.51
F	Potentilla spp.	29	.81
F	Taraxacum officinale	18	.11
Total for Annual Forbs		166	1.27
Total for Perennial Forbs		718	19.85

Type	Species	Nested Frequency	Average Cover %
		'05	'05
Total for Forbs		884	21.13

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 18

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia cana	71	11.95
B	Artemisia tridentata vaseyana	28	2.95
B	Chrysothamnus parryi	0	.03
B	Chrysothamnus viscidiflorus viscidiflorus	15	.18
B	Purshia tridentata	1	.76
Total for Browse		115	15.87

#### CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 18

Species	Percent Cover
	'05
Artemisia cana	16.81
Artemisia tridentata vaseyana	4.96
Chrysothamnus viscidiflorus viscidiflorus	.53
Purshia tridentata	.75

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17R, Study no: 18

Species	Average leader growth (in)
	'05
Artemisia tridentata vaseyana	2.0
Purshia tridentata	2.5

**BASIC COVER --**

Management unit 17R, Study no: 18

Cover Type	Average Cover % '05
Vegetation	62.34
Rock	.00
Pavement	.01
Litter	27.44
Cryptogams	.55
Bare Ground	22.07

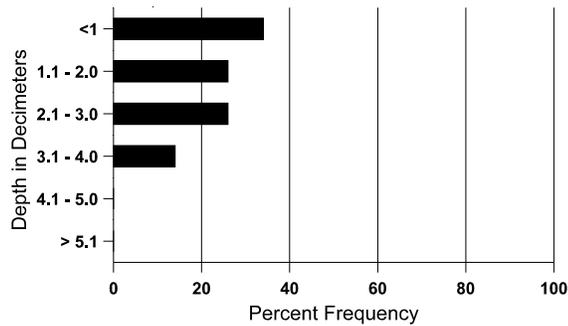
**SOIL ANALYSIS DATA --**

Management unit 17R, Study no: 18, Study Name: Wildcat Sage Grouse

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.1	- (-)	6.5	32.4	39.7	27.8	4.5	18.1	275.2	0.5

**Stoniness Index**

Wildcat Sage Grouse, Study # 17R-18



**PELLET GROUP DATA --**

Management unit 17R, Study no: 18

Type	Quadrat Frequency '05	Days use per acre (ha) '05
Rabbit	14	-
Moose	1	1 (2)
Grouse	6	96/acre
Elk	13	30 (74)
Deer	4	3 (8)

BROWSE CHARACTERISTICS --  
 Management unit 17R, Study no: 18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia cana</i>												
05	<b>5400</b>	20	520	4300	580	20	0	0	11	3	3	15/23
<i>Artemisia tridentata vaseyana</i>												
05	<b>1560</b>	-	200	1100	260	120	45	1	17	4	4	19/25
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>660</b>	-	60	580	20	-	0	0	3	-	0	10/14
<i>Purshia tridentata</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	24/78

Trend Study 17R-19-05

Study site name: Road Hollow .

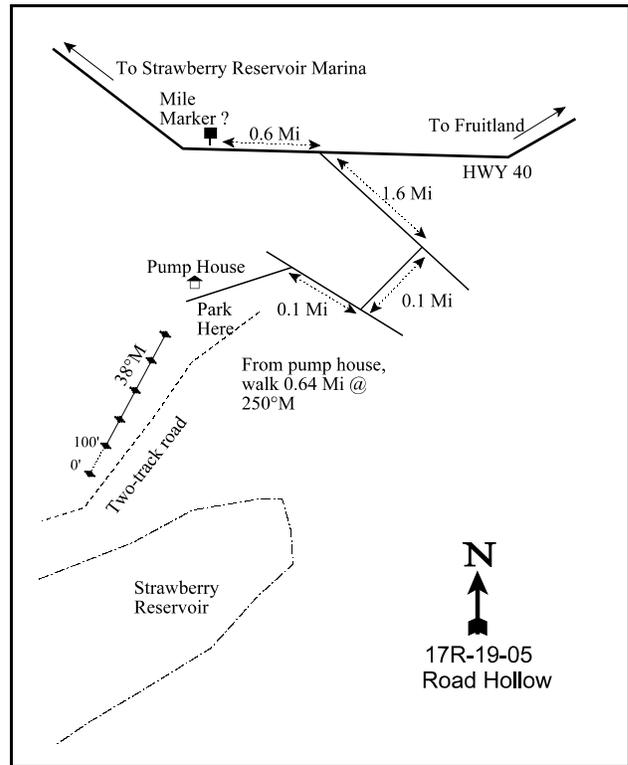
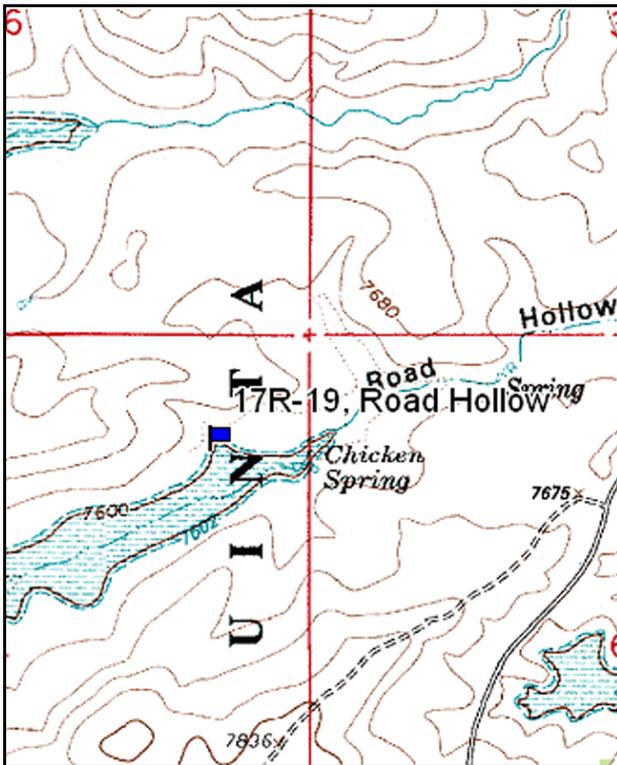
Vegetation type: Mountain Big Sagebrush .

Compass bearing: frequency baseline 38 degrees magnetic.

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

LOCATION DESCRIPTION

On US 40, drive east past Strawberry Reservoir to mile marker 49 (not positive on mile marker number?). Continue 0.6 miles past the mile marker to Soldier Creek Campground Rd (FS 480) on the right (south). Turn right and drive 1.6 miles to a road on the right (west). Turn right and drive 0.1 miles to an intersection, turn right and drive 0.1 miles to a two-track road on the left (NW). Turn left and drive up to the pump house. From the pump house, walk along the two-track road for 0.54 miles at 250°M to the 0' stake. The 0' stake is marked with browse tag #138.



Map Name: Strawberry Reservoir NE

Diagrammatic Sketch

Township 4S , Range 11W , Section 1

GPS: NAD 27, UTM 12T 4445989 N, 494170 E

## DISCUSSION

### Road Hollow – 17R-19

The Road Hollow study is 1 of 4 established in 2005 to monitor habitat for sage grouse in the Strawberry Valley and surrounding brood area. In conjunction with Brigham Young University, the data from the 4 studies will be used to better manage sage grouse populations in the Strawberry Valley. This study, the Strawberry Sage Grouse 1 (17R-17) study, and the Road Hollow Ridge (17R-20) study are all located within sage grouse winter and brooding habitat within approximately 1 mile from one another. The fourth study, Wildcat Sage Grouse (17R-18), is located approximately 5.3 miles east of the other studies in the UDWR Wildcat WMA. Wildcat Sage Grouse is located within an area that is strictly sage grouse brooding habitat. The Road Hollow study is located halfway up Road Hollow, which is an arm of Strawberry Reservoir. The baseline transect begins at the bottom of Road Hollow and runs up slope. It is located approximately 1.5 miles south of US 40 on an overall southeast aspect with a slope of 5-10% at an elevation of 7,600 feet. There is a cabin development about 2,000 feet to the east of the site. Pellet group data in 2005 was estimated at 2 deer and 1 cow days use/acre (5 ddu/ha and 2 cdu/ha). In 2005, an estimated 52 sage grouse pellets/acre were sampled and a sage grouse was seen on the site.

The soil is a shallow sandy loam with an effective rooting depth of 11 inches. No rock was sampled in the profile and very little was measured on the soil surface. Phosphorus and potassium concentrations are adequate for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The pH is neutral (6.9). The 2005 erosion index measurement was stable.

The key browse species is mountain big sagebrush. It provided nearly 23% aerial cover and nearly 29% line intercept cover in 2005. It had a density of 6,820 plants/acre, 65% of which were mature individuals, 32% were decadent, and 3% were young. Plants classified as dying were low at only 10% of the population. The number of dying is higher than young, which can slowly deplete the population. Mountain big sagebrush leader growth was 1.8 inches in 2005 and use was mostly light. Bolander silver sagebrush was also sampled on the site. It provided 6% aerial cover and nearly 8% line intercept cover in 2005. Silver sagebrush density was 2,220 plants/acre, 73% of which were mature individuals, 23% were decadent, and 4% were young. Plants classified as dying only made up 4% of the population.

Other browse species sampled in 2005 include: Rubber rabbitbrush, Parry rabbitbrush, stickyleaf low rabbitbrush, and gray horsebrush. Stickyleaf low rabbitbrush density was 3,460 plants/acre and Parry rabbitbrush was 1,560 plants/acre, all other species had far lower densities.

Grass density was moderately high with 13 species in 2005, all of which were perennials. Rose pussytoes, sandwort, aster, yellow owlclover, and desert phlox were the dominant forb species. All of which provided more than 1% cover. All forbs combined provided 9% cover in 2005. The following species (or species the same genera) have been shown to be beneficial to sage grouse: Rose pussytoes, aster, sulfur eriogonum, and longleaf phlox (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

2005 winter range condition (DC Index) – good (75) Mid-level potential scale

HERBACEOUS TRENDS --  
Management unit 17R, Study no: 19

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron smithii	17	.10
G	Carex spp.	70	1.35
G	Deschampsia caespitosa	14	.22
G	Festuca ovina	97	3.25
G	Juncus spp.	24	.27
G	Koeleria cristata	118	2.16
G	Poa fendleriana	45	.70
G	Poa pratensis	80	1.11
G	Poa secunda	1	.03
G	Sitanion hystrix	10	.27
G	Stipa columbiana	30	.89
G	Stipa comata	10	.24
G	Stipa lettermani	100	3.04
Total for Annual Grasses		0	0
Total for Perennial Grasses		616	13.68
Total for Grasses		616	13.68
F	Antennaria rosea	44	1.64
F	Arenaria spp.	67	1.04
F	Aster spp.	76	1.43
F	Cirsium spp.	2	.00
F	Comandra pallida	1	.00
F	Eriogonum umbellatum	25	.82
F	Gayophytum ramosissimum(a)	25	.09
F	Gentiana calycosa	6	.21
F	Gilia spp. (a)	7	.04
F	Linum lewisii	2	.03
F	Machaeranthera canescens	2	.01
F	Orthocarpus luteus (a)	153	2.80
F	Penstemon caespitosus	5	.03
F	Pedicularis groenlandica	15	.15
F	Penstemon watsonii	12	.10
F	Phlox austromontana	65	3.50
F	Phlox longifolia	3	.00
F	Polygonum douglasii (a)	17	.04
F	Potentilla gracilis	5	.01
F	Viola spp.	6	.06

Type	Species	Nested Frequency	Average Cover %
		'05	'05
	Total for Annual Forbs	202	2.97
	Total for Perennial Forbs	336	9.08
	Total for Forbs	538	12.06

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 19

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia cana</i>	23	5.94
B	<i>Artemisia tridentata vaseyana</i>	78	22.52
B	<i>Chrysothamnus nauseosus</i>	2	.00
B	<i>Chrysothamnus parryi</i>	18	1.81
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	36	1.44
B	<i>Tetradymia canescens</i>	3	.03
	Total for Browse	160	31.76

#### CANOPY COVER, LINE INTERCEPT --

Management unit 17R, Study no: 19

Species	Percent Cover
	'05
<i>Artemisia cana</i>	7.55
<i>Artemisia tridentata vaseyana</i>	28.75
<i>Chrysothamnus parryi</i>	1.61
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	1.54

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17R, Study no: 19

Species	Average leader growth (in)
	'05
<i>Artemisia tridentata vaseyana</i>	1.8

BASIC COVER --

Management unit 17R, Study no: 19

Cover Type	Average Cover %
	'05
Vegetation	51.50
Rock	.66
Pavement	.54
Litter	33.17
Cryptogams	4.17
Bare Ground	24.63

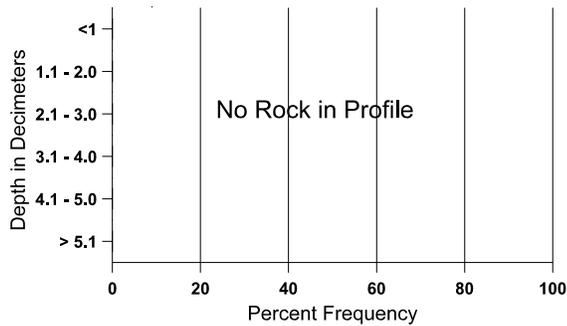
SOIL ANALYSIS DATA --

Management unit 17R, Study no: 19, Study Name: Road Hollow

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.3	53.4 (13.3)	6.9	54.4	26.7	18.8	2.3	21.8	185.6	0.5

### Stoniness Index

Road Hollow, Study # 17R-19



PELLET GROUP DATA --

Management unit 17R, Study no: 19

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	8	-
Grouse	4	52/acre
Deer	4	2 (5)
Cattle	1	1 (2)

BROWSE CHARACTERISTICS --  
 Management unit 17R, Study no: 19

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia cana</i>												
05	<b>2220</b>	80	100	1620	500	20	4	0	23	4	4	13/22
<i>Artemisia tridentata vaseyana</i>												
05	<b>6820</b>	160	160	4460	2200	400	2	17	32	10	10	18/28
<i>Chrysothamnus nauseosus</i>												
05	<b>60</b>	-	40	20	-	-	0	0	-	-	0	5/19
<i>Chrysothamnus parryi</i>												
05	<b>1560</b>	-	20	1220	320	-	0	0	21	18	18	7/13
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>3460</b>	-	40	2800	620	20	0	0	18	8	9	7/10
<i>Tetradymia canescens</i>												
05	<b>60</b>	-	-	40	20	-	0	0	33	33	33	10/10

Trend Study 17R-20-05

Study site name: Road Hollow Ridge .

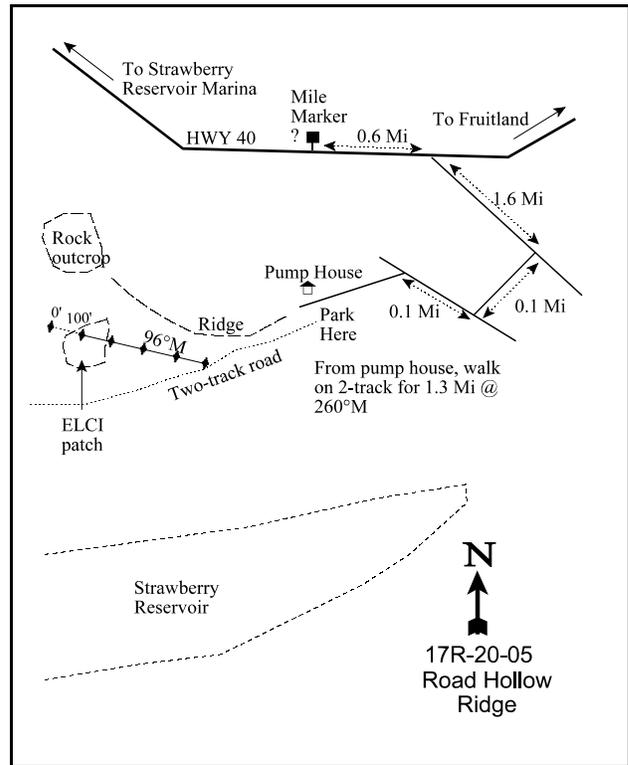
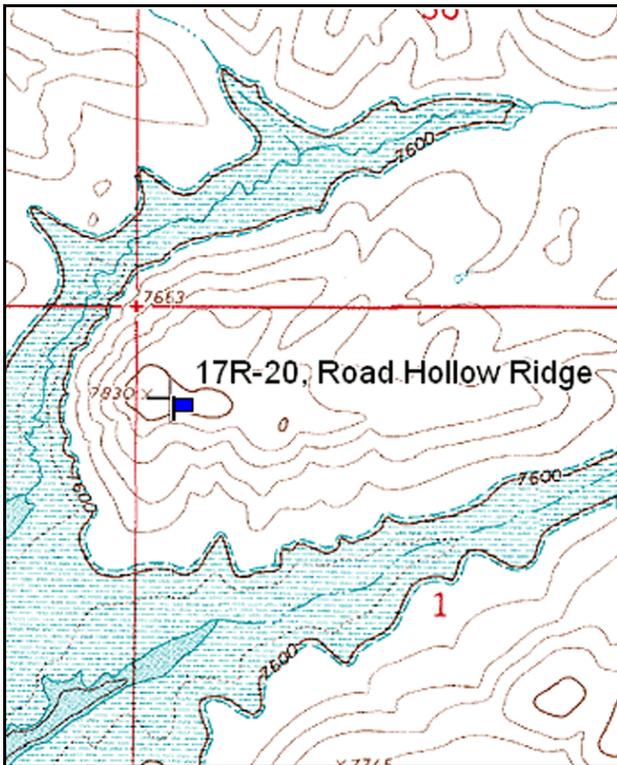
Vegetation type: Mountain Big Sagebrush .

Compass bearing: frequency baseline 96 degrees magnetic.

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

LOCATION DESCRIPTION

On US 40, drive east past Strawberry Reservoir to mile marker 49 (not positive on mile marker number?). Continue 0.6 miles past the mile marker to Soldier Creek Campground Rd (FS 480) on the right (south). Turn right and drive 1.6 miles to a road on the right (west). Turn right and drive 0.1 miles to an intersection, turn right and drive 0.1 miles to a two-track road on the left (NW). Turn left and drive up to the pump house. From the pump house, walk along the two-track road for 1.3 miles at 260°M to the 0' stake. The site is north of the two-track near a rock outcrop. There is also a great basin wildrye patch that the site runs through. The 0' stake is marked with browse tag #94.



Map Name: Strawberry Reservoir NE

Diagrammatic Sketch

Township 4S, Range 11W, Section 1

GPS: NAD 27, UTM 12T 4445991 N, 492913 E

## DISCUSSION

### Road Hollow Ridge – 17R-20

The Road Hollow Ridge study is 1 of 4 established in 2005 to monitor habitat for sage grouse in the Strawberry Valley and surrounding brood area. In conjunction with Brigham Young University, the data from the 4 studies will be used to better manage sage grouse populations in the Strawberry Valley. This study, the Strawberry Sage Grouse 1 (17R-17) study, and the Road Hollow (17R-19) study are all located within sage grouse winter and brooding habitat within approximately 1 mile from one another. The fourth study, Wildcat Sage Grouse (17R-18), is located approximately 5.3 miles east of the other studies in the UDWR Wildcat WMA. Wildcat Sage Grouse is located within an area that is strictly sage grouse brooding habitat. The Road Hollow Ridge study is located on the western edge of the ridge north of Road Hollow about  $\frac{3}{4}$  mile west of the Road Hollow study. The baseline transect traverses the ridge. It is located approximately 1.5 miles south of US 40 on a southern aspect with a slope of 25% at an elevation of 7,760 feet. There is a cabin development about 1 mile to the east of the site. Pellet group data in 2005 was estimated at 1 elk and 7 deer days use/acre (2 edu/ha and 18 ddu/ha). In 2005, an estimated 426 sage grouse pellets/acre were sampled.

The soil is shallow loam with an effective rooting depth of 13 inches. There was little rock in the profile in the first half of the baseline, but rock was in 20-50% of the profile in the last half. Phosphorus and potassium concentrations are adequate for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.4). The 2005 erosion index measurement was slight due to moderate erosion in gullies, some flow patterns, as well as other slight signs of erosion like pedestalling.

The key browse species is mountain big sagebrush, which provided 20% aerial cover and nearly 25% line intercept cover in 2005. Sagebrush density was 3,320 plants/acre in 2005, with 75% of the population classified as mature. Twenty-five percent of the population was classified as decadent and 9% classified as dying. Less than 1% was young. The lack of young individuals to replace the dying plants could lead to losses of sagebrush in the community. Sagebrush leader growth averaged 1.6 inches in 2005. Other browse species sample on the study site include: Fringed sagebrush, Parry rabbitbrush, stickyleaf low rabbitbrush, Wyeth eriogonum, broom snakeweed, Oregon grape, Wood's rose, snowberry, and gray horsebrush.

Twelve species of grass were sampled in 2005, 1 of which was an annual. The only annual was cheatgrass, which provided less than 1% cover and a quadrat frequency of 10%. The dominant grass species were mutton bluegrass, needle-and-thread grass, and Letterman needlegrass. Letterman needlegrass provided 4% cover and the other 2 species provided 1% cover each. Combined, perennial grasses provided 10% cover.

Twenty-seven species of forbs were sampled in 2005, 6 of which were annuals. The dominant forb species were pale alyssum, a stoneseed species, Tolmie owllover, and desert phlox. Each of these species provided between 1-2% cover. Annual forbs provided nearly 4% cover and perennials provided nearly 8%. The following species (or species the same genera) have been shown to be beneficial to sage grouse: Rose pussytoes, timber poisonvetch, looseflower milkvetch, aster, littleflower collinsia, wing eriogonum, sulfureriogonum, silvery lupine, western salsify, and longleaf phlox (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

2005 winter range condition (DC Index) – good (69) Mid-level potential scale

HERBACEOUS TRENDS --  
Management unit 17R, Study no: 20

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron smithii	55	.98
G	Agropyron spicatum	5	.21
G	Bromus tectorum (a)	40	.41
G	Carex spp.	42	.90
G	Festuca ovina	15	.54
G	Koeleria cristata	23	.22
G	Oryzopsis hymenoides	12	.68
G	Poa fendleriana	52	1.19
G	Poa pratensis	10	.06
G	Sitanion hystrix	1	.03
G	Stipa comata	30	1.29
G	Stipa lettermani	161	4.18
Total for Annual Grasses		40	0.41
Total for Perennial Grasses		406	10.31
Total for Grasses		446	10.72
F	Alyssum alyssoides (a)	128	2.25
F	Allium spp.	61	.29
F	Antennaria rosea	11	.19
F	Astragalus convallarius	3	.00
F	Astragalus tenellus	16	.73
F	Aster spp.	6	.03
F	Castilleja linariaefolia	9	.13
F	Chaenactis douglasii	3	.18
F	Cirsium spp.	8	.51
F	Comandra pallida	12	.10
F	Collinsia parviflora (a)	3	.00
F	Cryptantha spp.	11	.36
F	Eriogonum alatum	2	.06
F	Eriogonum umbellatum	1	.03
F	Gayophytum ramosissimum(a)	1	.00
F	Lappula occidentalis (a)	2	.03
F	Linum lewisii	4	.15
F	Lithospermum spp.	35	1.69
F	Lupinus argenteus	10	.81
F	Machaeranthera grindelioides	8	.43
F	Orthocarpus tolmiei (a)	52	1.36

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
F	Phlox austromontana	42	1.88
F	Phlox longifolia	1	.03
F	Polygonum douglasii (a)	5	.00
F	Potentilla gracilis	3	.03
F	Schoenrambe linifolia	1	.00
F	Tragopogon dubius	1	.03
Total for Annual Forbs		191	3.66
Total for Perennial Forbs		248	7.71
Total for Forbs		439	11.37

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

#### BROWSE TRENDS --

Management unit 17R, Study no: 20

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia frigida	1	.03
B	Artemisia tridentata vaseyana	72	20.07
B	Chrysothamnus parryi	15	.93
B	Chrysothamnus viscidiflorus viscidiflorus	84	9.13
B	Eriogonum heracleoides	15	.91
B	Gutierrezia sarothrae	8	.68
B	Mahonia repens	43	2.04
B	Rosa woodsii	5	.03
B	Symphoricarpos oreophilus	5	.56
B	Tetradymia canescens	7	.18
Total for Browse		255	34.58

CANOPY COVER, LINE INTERCEPT --  
 Management unit 17R, Study no: 20

Species	Percent Cover
	'05
Artemisia tridentata vaseyana	24.75
Chrysothamnus parryi	2.09
Chrysothamnus viscidiflorus viscidiflorus	8.69
Eriogonum heracleoides	1.28
Gutierrezia sarothrae	1.03
Mahonia repens	1.06
Symphoricarpos oreophilus	.21
Tetradymia canescens	.15

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 17R, Study no: 20

Species	Average leader growth (in)
	'05
Artemisia tridentata vaseyana	1.6

BASIC COVER --  
 Management unit 17R, Study no: 20

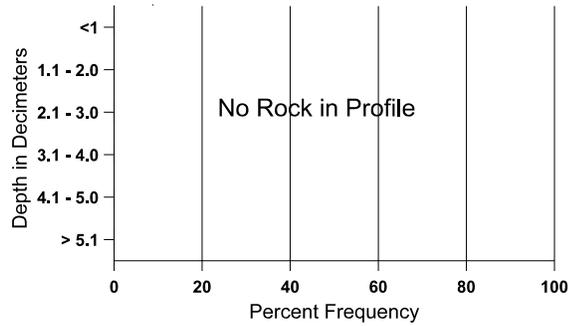
Cover Type	Average Cover %
	'05
Vegetation	51.82
Rock	3.44
Pavement	1.28
Litter	35.62
Cryptogams	1.26
Bare Ground	23.52

SOIL ANALYSIS DATA --  
 Management unit 17R, Study no: 20, Study Name: Road Hollow Ridge

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.8	57.6 (10.9)	7.4	44.7	33.1	22.2	2.2	9.3	140.8	0.7

# Stoniness Index

Road Hollow Ridge, Study # 17R-20



## PELLET GROUP DATA --

Management unit 17R, Study no: 20

Type	Quadrat Frequency '05	Days use per acre (ha) '05
Rabbit	6	-
Grouse	6	426/acre
Elk	1	1 (2)
Deer	7	7 (18)

## BROWSE CHARACTERISTICS --

Management unit 17R, Study no: 20

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia frigida</i>												
05	<b>40</b>	-	-	-	40	-	0	0	100	-	0	5/11
<i>Artemisia tridentata vaseyana</i>												
05	<b>3320</b>	-	20	2480	820	260	23	19	25	9	9	23/37
<i>Chrysothamnus parryi</i>												
05	<b>760</b>	-	20	740	-	-	0	0	-	-	0	6/11
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>4520</b>	20	320	3860	340	-	0	0	8	2	2	11/19
<i>Eriogonum heracleoides</i>												
05	<b>780</b>	-	-	780	-	-	10	0	-	-	0	6/14
<i>Gutierrezia sarothrae</i>												
05	<b>380</b>	-	-	340	40	-	0	0	11	-	0	5/8
<i>Mahonia repens</i>												
05	<b>2720</b>	-	160	2500	60	20	0	0	2	-	0	3/4
<i>Rosa woodsii</i>												
05	<b>180</b>	-	140	40	-	-	0	22	-	-	0	8/5

		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>Symphoricarpos oreophilus</i>												
05	<b>180</b>	-	-	80	100	-	0	0	56	11	11	16/33
<i>Tetradymia canescens</i>												
05	<b>220</b>	-	-	160	60	20	0	0	27	9	9	10/21

Trend Study 18R-2-05

Study site name: Clover Bullhog Drill.

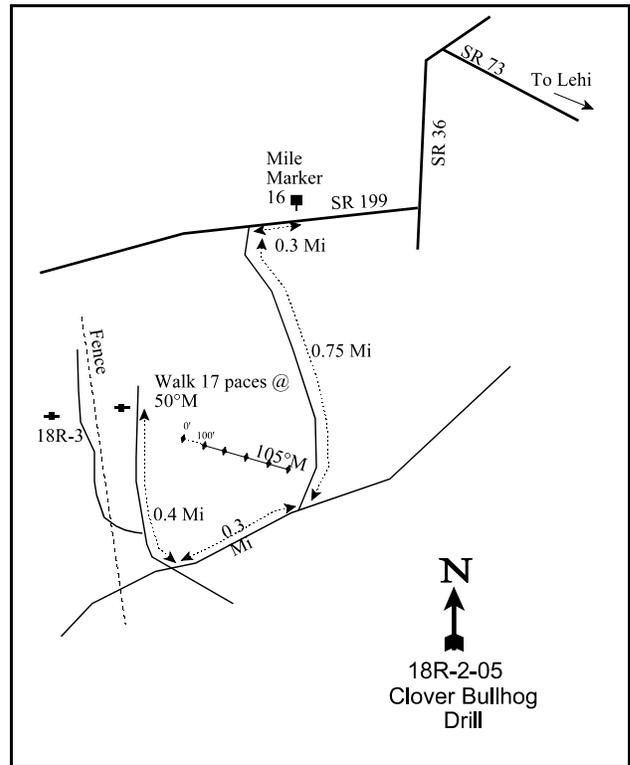
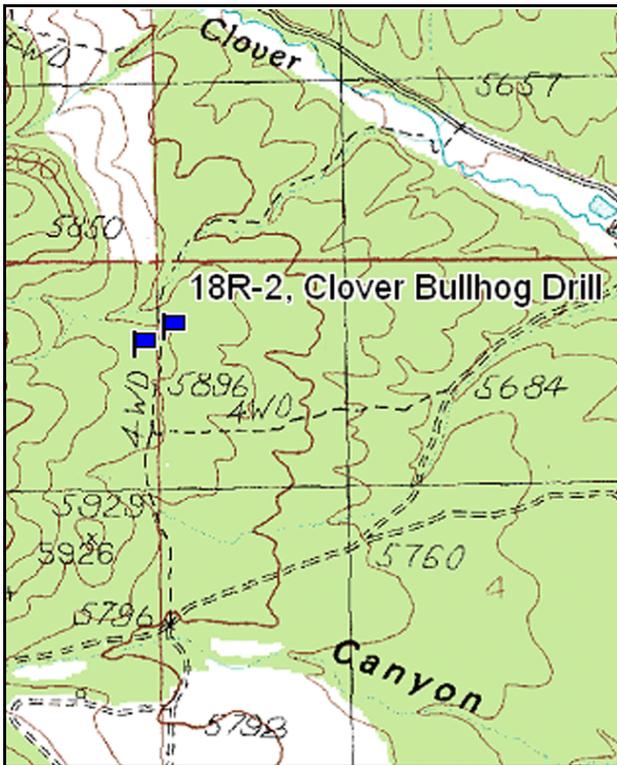
Vegetation type: Wyoming Big Sagebrush / P-J.

Compass bearing: frequency baseline 105 degrees magnetic.

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

LOCATION DESCRIPTION

From Lehi, drive west on SR 73 (Main st) to the junction of SR 36. Turn left (south) and drive 3.7 miles to the SR 199. Turn right on SR 199 and drive to mile marker 16. Continue 0.3 miles to a road on the left (south) near a power pole. Turn left and drive 0.75 miles to a fork. Stay right (west) and drive 0.3 miles to an intersection. Turn right (north) and drive 0.4 miles to the witness post on the left (west) side of the road. From the witness post, walk 17 paces at 50°M to the 0' stake. The 0' stake is marked with browse tag #79.



Map Name: Johnson Pass

Diagrammatic Sketch

Township 6S, Range 6W, Section 4

GPS: NAD 27, UTM 12T 4465370 N, 369551 E

## DISCUSSION

### Clover Bullhog Drill – 18R-02

The Clover Bullhog Drill study was established to monitor 1 of 2 different treatments within the third phase of the Clover Bullhog project. It is part of a 5-phase project that began in 2004 and the last treatment should be finished in the fall of 2007. An approximate total of 3,700 acres of BLM land will be treated by the end of phase 5. The treatment areas are historic sagebrush steppe habitats that were invaded by juniper and cheatgrass. The purpose of the project is to restore the native sagebrush habitat, improve wildlife habitat, increase biodiversity, decrease the risk of wildfire, and slow the continual spread of cheatgrass. In the fall of 2005, this area was treated with a bullhog mounted to a track hoe; grasses and forbs were then drill seeded with a rangeland drill. Browse species were then aerially seeded over the treatment area in February 2006. Pinyon and juniper trees in 40-foot wide strips were removed with the bullhog, which left scattered clumps of pinyon and juniper for protective cover for wildlife. The other treatment in phase 2 included aerially applied seed by a fixed-wing aircraft, then the pinyon–juniper forest was bullhogged similar to this treatment. A total of 442 acres of BLM land was treated as part of phase 2 in 2005, 212 acres were aerially seeded and 230 acres were drill seeded. This study site monitors the bullhog and drill treatment.

Both treatment areas are located on the east slope of the Onaqui Mountains 11 miles northwest of Faust and 3.5 miles west of Clover, Utah. It is on an eastern aspect with a 6% slope at an elevation 5,850 feet. Pellet group data in 2005 was estimated at 1 elk and 7 deer days use/acre (2 edu/ha and 18 ddu/ha). Pellets were from winter and spring. Fresh tracks and a deer were seen on the site in 2005.

The soil is a shallow clay loam with an effective rooting depth of 12 inches. The soil profile is stony with about 25% rock in the profile. Rock and pavement covered 18% of the soil surface in 2005. Phosphorus and potassium concentrations are adequate for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is neutral (7.1). In 2005, the soil erosion condition measurement was stable.

The key browse species measured in the study area are Wyoming big sagebrush and bitterbrush. Both species were scattered around the treatment area in very low numbers. Sagebrush was not sampled in cover measurements, but only 40 plants/acre were sampled in the density strips. Half of that population was mature and the other half was classified as decadent and dying. The average leader growth in 2005 was 4.6 inches. Bitterbrush provided less than one-half percent cover in 2005 and a density of 100 plants/acre. Eighty percent of the individuals were mature and the other 20% were young. Use was moderate to heavy. Wyeth eriogonum, broom snakeweed, and snowberry were also present in small numbers in 2005. The browse density and cover were low due to the high juniper cover.

In 2005, Utah Juniper provided 29% canopy cover. Juniper density was high in 2005 with 402 trees/acre and an average trunk diameter of 7.4 inches. 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.

Six species of grasses were sampled in 2005, 2 of which were annuals. Bluebunch wheatgrass and Sandberg bluegrass were the dominant species. Bluebunch provided 4% cover with a quadrat frequency of 41%. Sandberg bluegrass provided 3% cover with 53% cover. Cheatgrass was also present, but provided very little cover with a quadrat frequency of 12%. Perennial species provided 8% cover in 2005.

Fifteen species of forbs were sampled in 2005, 7 of which were annuals. A species of pepperweed was the dominant forb in 2005. It provided 1% cover and 90% quadrat frequency. All other species species provided 1% cover combined.

## 2005 Pretreatment Assessment

The juniper forest is preventing the growth of the understory species. Juniper removal and seeding will allow desired species to establish and thrive. Cheatgrass is sparse and should compete little with the seeded species. The Desirable Components Index score is poor due to very low browse cover, low recruitment, very low perennial forb cover, and moderate perennial grass cover.

2005 winter range condition (DC Index) – poor (17) Lower potential scale

The following species were drill seeded on the treatment area in the fall of 2005:

<u>Seed Species</u>	<u>Bulk lbs in mix</u>	<u>Bulk lbs/acre</u>
Crested Wheatgrass 'Hycrest'	200	0.9
Siberian Wheatgrass 'Vavilov'	250	1.1
Western Wheatgrass	200	0.9
Bluebunch WG 'P7'	250	1.1
Orchardgrass 'Paiute'	250	1.1
Snake River Wheatgrass 'Secar'	250	1.1
Canby Bluegrass 'Canbar'	150	0.7
Sandberg Bluegrass 'Toole MT'	100	0.4
Western Yarrow	40	0.2
Blue Flax	150	0.7
Alfalfa 'Ladak+'	250	1.1
Alfalfa 'Ranger'	250	1.1
Sainfoin 'Eski'	600	2.6
Small Burnet 'Delar'	600	2.6
<b>Total</b>	<b>3540</b>	<b>15.4</b>
Total PLS/acre		14

The following is the aerial browse mix applied to this treatment and 18R-03 (Clover Bullhog Aerial) in February 2006:

<u>Seed Species</u>	<u>Bulk lbs in mix</u>	<u>Bulk lbs/acre</u>
Sagebrush, Wyoming--Sanpete UT	450	1.0
Forage Kochia--Beaver UT	200	0.4
Forage Kochia--Millard UT	250	0.6
<b>Total</b>		<b>2.0</b>
Total PLS/acre		0.9

HERBACEOUS TRENDS --  
Management unit 18R, Study no: 2

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron spicatum	127	4.13
G	Bromus tectorum (a)	27	.06
G	Oryzopsis hymenoides	3	.21
G	Poa secunda	170	2.57
G	Sitanion hystrix	44	.92
G	Vulpia octoflora (a)	2	.00
Total for Annual Grasses		29	0.07
Total for Perennial Grasses		344	7.84
Total for Grasses		373	7.91
F	Antennaria rosea	2	.00
F	Astragalus convallarius	1	.00
F	Chaenactis douglasii	-	.00
F	Descurainia pinnata (a)	23	.09
F	Galium aparine (a)	6	.19
F	Gilia spp. (a)	5	.01
F	Ipomopsis aggregata	5	.01
F	Lactuca serriola	16	.05
F	Lepidium spp. (a)	302	1.14
F	Microsteris gracilis (a)	12	.03
F	Phlox austromontana	4	.03
F	Phlox longifolia	31	.28
F	Physaria spp.	3	.01
F	Ranunculus testiculatus (a)	86	.20
F	Veronica biloba (a)	37	.09
Total for Annual Forbs		471	1.77
Total for Perennial Forbs		62	0.40
Total for Forbs		533	2.17

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

BROWSE TRENDS --

Management unit 18R, Study no: 2

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata wyomingensis	2	-
B	Eriogonum heracleoides	1	-
B	Gutierrezia sarothrae	0	-
B	Juniperus osteosperma	19	12.13
B	Purshia tridentata	4	.15
B	Symphoricarpos oreophilus	7	.18
Total for Browse		33	12.46

CANOPY COVER, LINE INTERCEPT --

Management unit 18R, Study no: 2

Species	Percent Cover
	'05
Juniperus osteosperma	29.45
Purshia tridentata	.31
Symphoricarpos oreophilus	.36

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 18R, Study no: 2

Species	Average leader growth (in)
	'05
Purshia tridentata	4.6

POINT-QUARTER TREE DATA --

Management unit 18R, Study no: 2

Species	Trees per Acre	Average diameter (in)
	'05	
Juniperus osteosperma	402	7.4

**BASIC COVER --**

Management unit 18R, Study no: 2

Cover Type	Average Cover %
	'05
Vegetation	20.77
Rock	2.89
Pavement	15.31
Litter	40.06
Cryptogams	5.05
Bare Ground	29.92

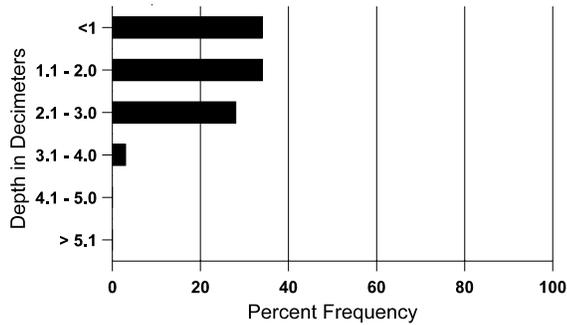
**SOIL ANALYSIS DATA --**

Management unit 18R, Study no: 2, Study Name: Clover Bullhog Drill

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.0	51.6 (14.0)	7.1	33.7	38.1	28.2	4.4	13.0	185.6	0.7

**Stoniness Index**

Clover Bullhog Drill, Study # 18R-2



**PELLET GROUP DATA --**

Management unit 18R, Study no: 2

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	47	-
Elk	1	1 (2)
Deer	6	7 (18)
Cattle	1	-

BROWSE CHARACTERISTICS --  
 Management unit 18R, 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>												
05	<b>40</b>	-	-	20	20	300	0	0	50	50	50	21/21
<i>Eriogonum heracleoides</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	6/7
<i>Gutierrezia sarothrae</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	8/7
<i>Juniperus osteosperma</i>												
05	<b>460</b>	20	60	360	40	20	0	0	9	9	13	-/-
<i>Purshia tridentata</i>												
05	<b>100</b>	-	20	80	-	-	80	20	-	-	0	33/55
<i>Symphoricarpos oreophilus</i>												
05	<b>160</b>	-	40	120	-	-	0	0	-	-	0	17/30

Trend Study 18R-3-05

Study site name: Clover Bullhog Aerial.

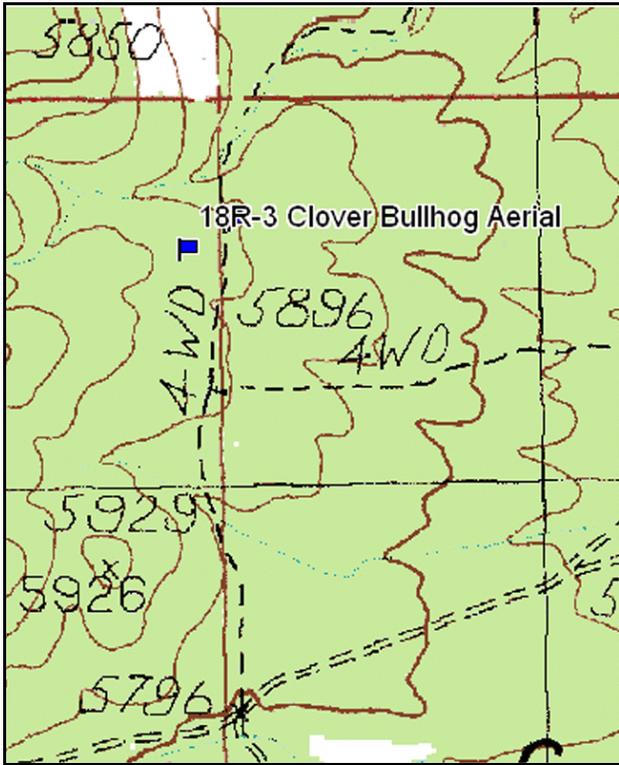
Vegetation type: Wyoming Big Sagebrush / P-J.

Compass bearing: frequency baseline 270 degrees magnetic.

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

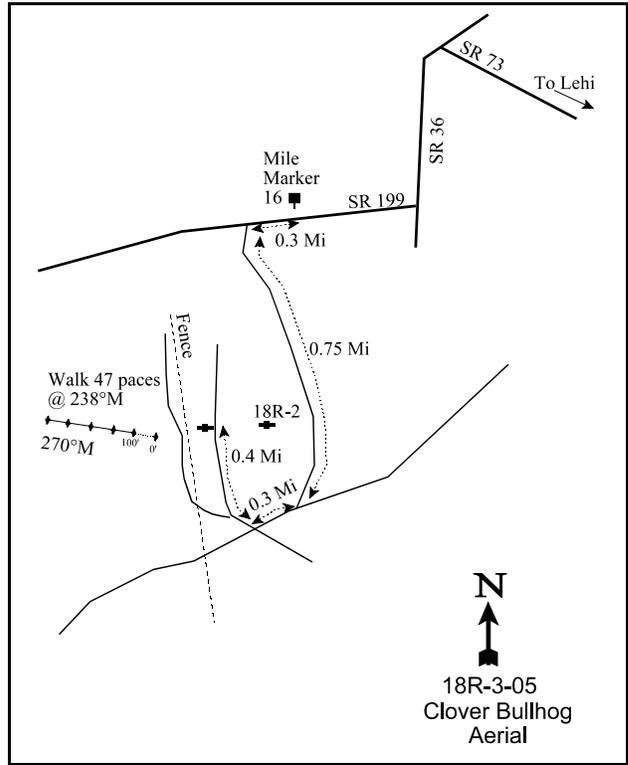
LOCATION DESCRIPTION

From Lehi, drive west on SR 73 (Main st) to the junction of SR 36. Turn left (south) and drive 3.7 miles to the SR 199. Turn right on SR 199 and drive to mile marker 16. Continue 0.3 miles to a road on the left (south) near a power pole. Turn left and drive 0.75 miles to a fork. Stay right (west) and drive 0.3 miles to an intersection. Turn right (north) and drive 0.4 miles to the witness post on the left (west) side of the road. From the witness post, walk 47 paces at 238°M to the 0' stake. Pass over a fence line.



Map Name: Johnson Pass

Township 6S, Range 6W, Section 5



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4465328 N, 369478 E

## DISCUSSION

### Clover Bullhog Aerial – 18R-03

The Clover Bullhog Aerial study was established to monitor 1 of 2 different treatments within the third phase of the Clover Bullhog project. It is part of a 5-phase project that began in 2004 and the last treatment should be finished in the fall of 2007. An approximate total of 3,700 acres of BLM land will be treated by the end of phase 5. The treatment areas are historic sagebrush steppe habitats that were invaded by juniper and cheatgrass. The purpose of the project is to restore the native sagebrush habitat, improve wildlife habitat, increase biodiversity, decrease the risk of wildfire, and slow the continual spread of cheatgrass. In the fall of 2005, this area was seeded aurally by a fixed-wing airplane with a grass and forb seed mix then treated with a bullhog mounted to a track hoe. Browse species were then aurally seeded over the treatment area in February 2006. Pinyon and juniper trees in 40-foot wide strips were removed with the bullhog, which left scattered clumps of pinyon and juniper for protective cover for wildlife. The other treatment in phase 2 was treated with a bullhog, grass and forb were seeded with a rangeland drill, then browse species were seeded aurally. A total of 442 acres of BLM land was treated as part of phase 2 in 2005, 212 acres were aurally seeded and 230 acres were drill seeded. This study site monitors the bullhog and aerial seed treatment.

Both treatment areas are located on the east slope of the Onaqui Mountains 11 miles northwest of Faust and 3.5 miles west of Clover, Utah. It is on a northeastern aspect with a 2-5% slope at an elevation 5,880 feet. Pellet group data in 2005 was estimated at 2 elk and 4 deer days use/acre (5 edu/ha and 10 ddu/ha). Pellets were from winter and spring.

The soil is a shallow loam with an effective rooting depth of 11 inches. The soil profile contained about 15% rock. Nearly 18% of the soil surface was covered by rock and pavement in 2005. Phosphorus and potassium concentrations are adequate for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is mildly alkaline (7.6). In 2005, the soil erosion condition measurement was stable.

Wyoming big sagebrush and bitterbrush are the key browse species, although sparsely scattered through the study area. Sagebrush provided very little cover in 2005 with a density of 80 plants/acre. Half of the population mature and half was dying and decadent. Use was light to moderate in 2005 and average leader growth was 1.2 inches. Bitterbrush also provided very little cover and density was 120 plants/acre. Mature individuals made up 50% of the population, young 33%, and decadent 17%. Use was moderate to heavy in 2005 and average leader growth was 3.7 inches. Wyeth eriogonum, low rabbitbrush, broom snakeweed, and snowberry were also present in small numbers in 2005. The browse density and cover were low due to the high juniper cover.

In 2005, Utah Juniper provided 30% canopy cover. Juniper density was high in 2005 with 219 trees/acre and an average trunk diameter of 7.5 inches. 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.

Nine species of grasses were sampled in 2005, 2 of which were annuals. Bluebunch wheatgrass was the dominant species with 11% cover and a quadrat frequency of 84%. The only other species that provided a notable amount of cover was Sandberg bluegrass, which provided 1% cover and 41% quadrat frequency. These two species provided 95% of the grass cover. Cheatgrass and Japanese chess were the only annual grasses sampled. Cover for both species was very low and the combined quadrat frequency of the two species was less than 10%.

Eighteen species of forbs were sampled in 2005, 8 of which were annuals. Forbs provided less than 2% cover. All species provided less than 1% cover individually.

2005 Pretreatment Assessment

The juniper forest is preventing the growth of the understory species. Juniper removal and seeding will allow desired species to establish and thrive. Cheatgrass is sparse and should compete little with the seeded species. The Desirable Components Index score is fair due to very low browse cover, low recruitment, very low perennial forb cover, and moderate perennial grass cover.

2005 winter range condition (DC Index) – fair (26) Lower potential scale

The following grass/forb species were aerially seeded on the treatment area in the fall of 2005:

Seed Species	Bulk lbs in mix	Bulk lbs/acre
Crested Wheatgrass 'Hycrest'	250	1.2
Siberian Wheatgrass 'Vavilov'	200	1.0
Western Wheatgrass 'Arriba'	250	1.2
Bluebunch WG 'Anatone'	250	1.2
Orchardgrass 'Paiute'	250	1.2
Snake River Wheatgrass 'Secar'	250	1.2
Canby Bluegrass 'Canbar'	150	0.7
Sandberg Bluegrass 'Toole MT'	100	0.5
Western Yarrow	50	0.2
Blue Flax	150	0.7
Alfalfa 'Ranger'	500	2.5
Sainfoin 'Eski'	550	2.7
Small Burnet 'Delar'	550	2.7
<b>Total</b>	<b>3500</b>	<b>17.4</b>
Total PLS/acre		15.8

The following is the aerial browse mix applied to this treatment and 18R-02 (Clover Bullhog Drill) in February 2006:

Seed Species	Bulk lbs in mix	Bulk lbs/acre
Sagebrush, Wyoming--Sanpete UT	450	1.0
Forage Kochia--Beaver UT	200	0.4
Forage Kochia--Millard UT	250	0.6
<b>Total</b>		<b>2.0</b>
Total PLS/acre		0.9

HERBACEOUS TRENDS --  
Management unit 18R, Study no: 3

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron smithii	7	.06
G	Agropyron spicatum	252	10.81

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Bromus japonicus</i> (a)	1	.00
G	<i>Bromus tectorum</i> (a)	18	.07
G	<i>Oryzopsis hymenoides</i>	8	.18
G	<i>Poa bulbosa</i>	8	.18
G	<i>Poa pratensis</i>	1	.03
G	<i>Poa secunda</i>	110	1.03
G	<i>Sitanion hystrix</i>	3	.04
Total for Annual Grasses		19	0.07
Total for Perennial Grasses		389	12.34
Total for Grasses		408	12.41
F	<i>Allium</i> spp.	8	.03
F	<i>Astragalus convallarius</i>	3	.03
F	<i>Calochortus nuttallii</i>	8	.01
F	<i>Comandra pallida</i>	-	.00
F	<i>Collinsia parviflora</i> (a)	3	.00
F	<i>Crepis acuminata</i>	-	.00
F	<i>Descurainia pinnata</i> (a)	12	.04
F	<i>Galium aparine</i> (a)	9	.01
F	<i>Gilia</i> spp. (a)	3	.00
F	<i>Ipomopsis aggregata</i>	4	.03
F	<i>Lactuca serriola</i>	10	.02
F	<i>Lepidium</i> spp. (a)	258	.95
F	<i>Microsteris gracilis</i> (a)	4	.01
F	<i>Phlox austromontana</i>	2	.03
F	<i>Phlox longifolia</i>	12	.03
F	<i>Ranunculus testiculatus</i> (a)	40	.09
F	<i>Veronica biloba</i> (a)	18	.07
F	<i>Vicia americana</i>	55	.40
Total for Annual Forbs		347	1.19
Total for Perennial Forbs		102	0.60
Total for Forbs		449	1.80

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

BROWSE TRENDS --

Management unit 18R, Study no: 3

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata wyomingensis	4	.03
B	Chrysothamnus viscidiflorus	0	-
B	Eriogonum microthecum	1	.03
B	Gutierrezia sarothrae	4	.16
B	Juniperus osteosperma	10	15.86
B	Purshia tridentata	6	.18
B	Symphoricarpos oreophilus	2	.03
Total for Browse		27	16.29

CANOPY COVER, LINE INTERCEPT --

Management unit 18R, Study no: 3

Species	Percent Cover
	'05
Juniperus osteosperma	29.63
Purshia tridentata	1.79

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 18R, Study no: 3

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	1.2
Purshia tridentata	3.7

POINT-QUARTER TREE DATA --

Management unit 18R, Study no: 3

Species	Trees per Acre	Average diameter (in)
	'05	
Juniperus osteosperma	219	7.5

**BASIC COVER --**

Management unit 18R, Study no: 3

Cover Type	Average Cover %
	'05
Vegetation	28.57
Rock	1.73
Pavement	15.86
Litter	38.63
Cryptogams	3.85
Bare Ground	32.59

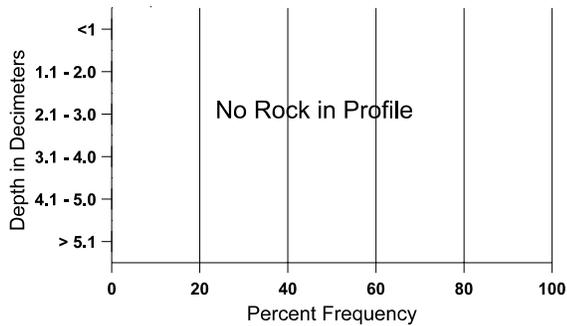
**SOIL ANALYSIS DATA --**

Management unit 18R, Study no: 3, Study Name: Clover Bullhog Aerial

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.8	60.8 (12.3)	7.6	34.1	39.7	26.2	1.9	7.2	185.6	0.6

**Stoniness Index**

Clover Bullhog Aerial, Study # 18R-3



**PELLET GROUP DATA --**

Management unit 18R, Study no: 3

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	43	-
Elk	-	2 (5)
Deer	4	4 (10)

BROWSE CHARACTERISTICS --  
 Management unit 18R, 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>												
05	<b>80</b>	-	-	40	40	560	25	25	50	50	50	21/27
<i>Chrysothamnus viscidiflorus</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	10/12
<i>Eriogonum microthecum</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	7/7
<i>Gutierrezia sarothrae</i>												
05	<b>100</b>	-	-	100	-	-	0	0	-	-	0	10/10
<i>Juniperus osteosperma</i>												
05	<b>200</b>	-	40	160	-	20	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
05	<b>120</b>	-	40	60	20	20	17	50	17	-	0	29/59
<i>Symphoricarpos oreophilus</i>												
05	<b>40</b>	-	-	40	-	-	0	0	-	-	0	18/31

Trend Study 19R-2-05

Study site name: Deep Creek Aerator .

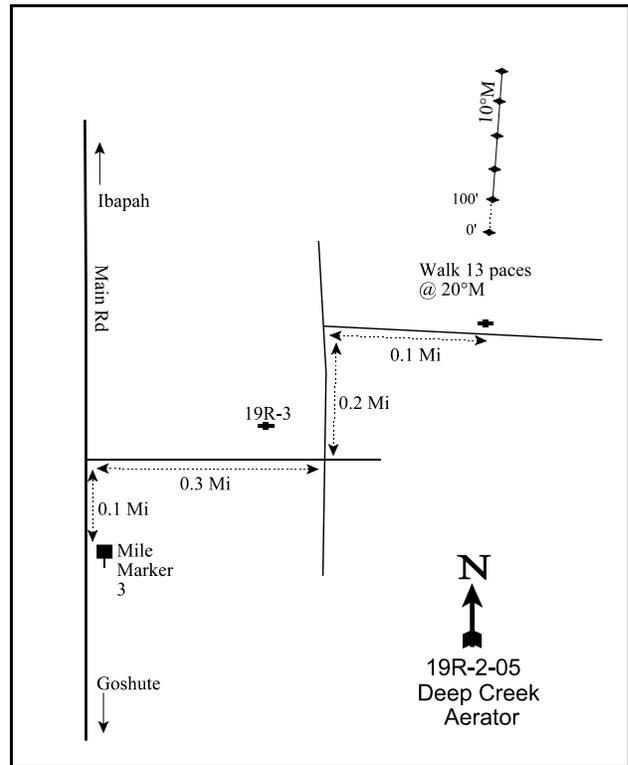
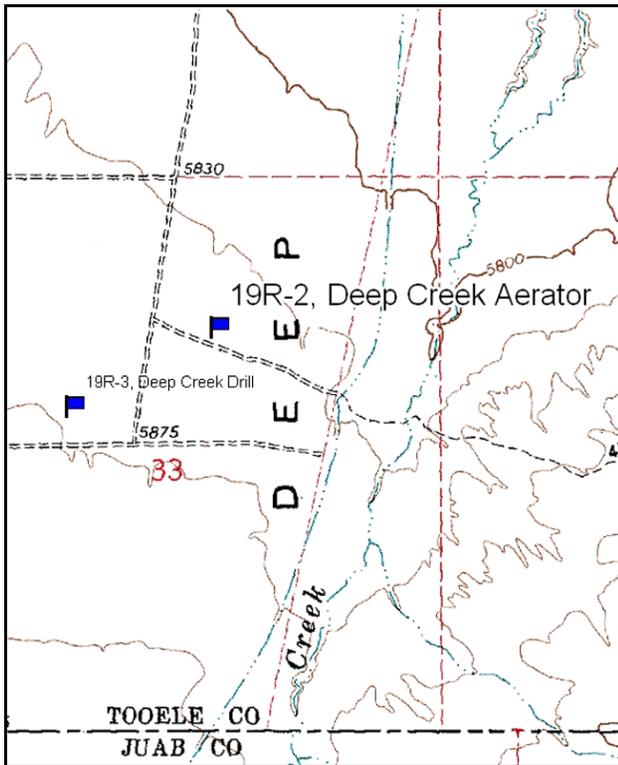
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 10 degrees magnetic.

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

LOCATION DESCRIPTION

Drive north of Goshute toward Ibapah to mile marker 3. Drive north of the mile marker 0.1 miles to a two-track road on the right (east) side of the road. Turn right and drive 0.3 miles to a four-way intersection. Turn left at the intersection and drive 0.2 miles to a road on the right. Turn right and drive 0.1 miles to the witness post on the left (north) side of the road. From the witness post, walk 13 paces at 2°M to the 0' stake. The 0' stake is marked with browse tag #77.



Map Name: Goshute

Diagrammatic Sketch

Township 10S, Range 19W, Section 33

GPS: NAD 27, UTM 12S 4422554 N, 244383 E

## DISCUSSION

### Deep Creek Aerator – 19R-02

The Deep Creek Aerator study was established to monitor the effectiveness of the Deep Creek Valley Sagebrush Improvement and Fuels Reduction treatment. The 3-phase treatment project is located within a historic sagebrush steppe on the west side of the Deep Creek Mountains. The remaining sagebrush has become decadent and replaced by cheatgrass. The treatment will decrease fire fuels, as well as improve habitat for sage grouse and big game. To remove decadent sagebrush and weedy species, 3 methods have been and will continue to be used to treat the areas. These 3 methods include: Seeding grass, forb, and browse species with a rangeland drill; disturbing the ground and decadent shrubs with a Lawson double drum aerator; as well as a combination of drill seeding and aerating with the Lawson double drum aerator. Phase 1 aerated the western pasture of the Deep Creek Allotment in November of 2003. This study was established in one of the phase 2 treatments. Approximately 258 acres were treated with the aerator and 591 acres of aerated and un-aerated land were drill seeded in the fall of 2005. In December 2005, browse species were aerially seeded on all of treatments with fixed wing airplane. This study monitors a 390-acre Wyoming big sagebrush flat that was drill seeded over the entire treatment area. Previous to the seeding in the same treatment area, a Lawson double drum aerator disturbed 50-foot strips (running east and west) in the treatment area, and left 100-foot strips untreated between them. A monitoring study (Deep Creek Drill) was also established directly to the west, within a sagebrush flat with a dense crested wheatgrass understory, that was drill seeded. Phase 3 will be completed in 2007 using similar methods stated above.

The phase 2 treatments are located 7 miles south of Ibapah on BLM-managed land. The slope is 1-2% on a northeast aspect at an elevation of 5,850 feet. Pellet group transect data was estimated at 2 deer and 1 antelope days use/acre (5 ddu/ha and 2 adu/ha) in 2005. Eighty-seven estimated sage grouse pellets/acre were sampled.

The soil is a shallow loam with an effective rooting depth of 11 inches. Phosphorus and potassium concentrations are adequate for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is neutral (7.1). In 2005, the soil erosion condition measurement was stable.

Wyoming big sagebrush is key browse species. It provided 16% aerial cover and 17% line intercept cover in 2005. Sagebrush density was 3,780 plants/acre with 47% of the population classified as mature and 53% decadent. Only 1% of the population was young and 23% were classified as dying. The percentage of young individuals was much lower than dying. Average browse leader growth was 1.2 inches in 2005. Use was mostly light. Narrowleaf low rabbitbrush and cactus were also sampled in 2005, but in low densities.

Six species of grasses were sampled in 2005, 2 of which were annuals. Cheatgrass was the dominant species with 24% cover and 98% quadrat frequency. Sandberg bluegrass provided nearly 4% cover and 41% quadrat frequency. The other 4 species provided less than 2% cover combined in 2005. These species include: Bulbous bluegrass, squirreltail bottlebrush, needle-and-thread grass, and sixweeks fescue.

Thirteen species of forbs were sampled in 2005, 3 of which were annuals. Forbs are a minor component of the herbaceous understory and provided less than 1% cover combined. The following 7 forb species (or species the same genera) have been shown to be beneficial to sage grouse: Milkvetch sp., tapertip hawksbeard, Nuttall larkspur, prickly lettuce, desert parsley, little polecat, and longleaf phlox (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

### 2005 Pretreatment Assessment

Removing the decadent sagebrush with the aerator should allow seeded species to establish well. The cheatgrass cover high on the monitoring study, which could outcompete the seeded species. Timing of

precipitation and extent of disturbance caused by the aerator and rangeland drill will determine Cheatgrass success. The Desirable Components Index score was poor due to high annual grass cover, low browse recruitment, and low perennial forb cover.

2005 winter range condition (DC Index) – poor (17) Lower potential scale

The following grass/forb species were drill seeded on the drill treatment area in the fall of 2005:

Seed Species	Bulk lbs in mix	Bulk lbs/acre
Western Wheatgrass	600	1.0
Bluebunch WG 'Anatone'	450	0.8
Orchardgrass 'Paiute'	300	0.5
Great Basin Wildrye 'Trailhead'	300	0.5
Russian Wildrye 'Bozoisky'	600	1.0
Snake River Wheatgrass 'Secar'	450	0.8
Western Yarrow	50	0.1
Alfalfa 'Ladak+'	300	0.5
Alfalfa 'Nomad'	300	0.5
Sainfoin 'Eski'	1200	2.0
Small Burnet 'Delar'	1200	2.0
Rocky Mountain Beeplant	293	0.5
<b>Total</b>	<b>6043</b>	<b>10.2</b>
Total PLS/acre		9.4

The following browse species were aerially seeded on this treatment area and 19R-03 (Deep Creek Drill) in December 2005:

Seed Species	Bulk lbs in mix	Bulk lbs/acre
Forage Kochia--Millard UT	1000	1.0
Sagebrush, Wyoming--Utah UT	800	0.8
Sagebrush, Wyoming--Utah UT	200	0.2
<b>Total</b>	<b>2000</b>	<b>2.0</b>
Total PLS/acre		0.9

HERBACEOUS TRENDS --  
Management unit 19R, Study no: 2

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Bromus tectorum (a)	469	23.53
G	Poa bulbosa	5	.39
G	Poa secunda	96	3.69
G	Sitanion hystrix	20	.48
G	Stipa comata	8	.53

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Vulpia octoflora</i> (a)	21	.04
Total for Annual Grasses		490	23.57
Total for Perennial Grasses		129	5.10
Total for Grasses		619	28.68
F	<i>Astragalus</i> spp.	6	.05
F	<i>Chaenactis douglasii</i>	1	.03
F	<i>Crepis acuminata</i>	3	.03
F	<i>Delphinium nuttallianum</i>	1	.00
F	<i>Gayophytum ramosissimum</i> (a)	2	.00
F	<i>Lactuca serriola</i>	1	.00
F	<i>Lomatium</i> spp.	17	.10
F	<i>Lygodesmia</i> spp.	-	.03
F	<i>Microsteris gracilis</i> (a)	55	.23
F	<i>Phlox hoodii</i>	2	.03
F	<i>Phlox longifolia</i>	64	.30
F	<i>Ranunculus testiculatus</i> (a)	11	.03
F	<i>Zigadenus paniculatus</i>	-	.03
Total for Annual Forbs		68	0.27
Total for Perennial Forbs		95	0.62
Total for Forbs		163	0.89

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

#### BROWSE TRENDS --

Management unit 19R, Study no: 2

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	83	15.62
B	<i>Chrysothamnus viscidiflorus</i> <i>stenophyllus</i>	9	.01
B	<i>Opuntia</i> spp.	1	-
Total for Browse		98	15.63

CANOPY COVER, LINE INTERCEPT --  
Management unit 19R, Study no: 2

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	16.70
Chrysothamnus viscidiflorus stenophyllus	.36

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 19R, Study no: 2

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

BASIC COVER --  
Management unit 19R, Study no: 2

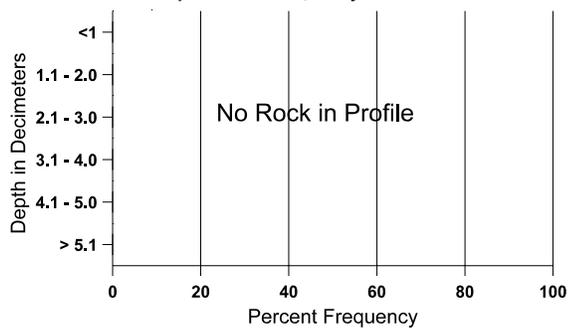
Cover Type	Average Cover %
	'05
Vegetation	45.26
Rock	.22
Pavement	3.96
Litter	45.94
Cryptogams	2.87
Bare Ground	17.12

SOIL ANALYSIS DATA --  
Management unit 19R, Study no: 2, Study Name: Deep Creek Aerator

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.3	59.2 (11.7)	7.1	37.7	39.1	23.2	1.2	9.16	198.4	0.4

### Stoniness Index

Deep Creek Aerator, Study # 19R-2



PELLET GROUP DATA --  
 Management unit 19R, Study no: 2

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	8	-
Grouse	2	87/acre
Deer	1	2 (5)
Cattle	2	-
Antelope	-	1 (2)

BROWSE CHARACTERISTICS --  
 Management unit 19R, 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)
05	<b>3780</b>	-	20	1760	2000	1460	10	.52	53	23	24	26/34
<i>Chrysothamnus viscidiflorus stenophyllus</i>												
05	<b>180</b>	-	-	160	20	20	0	0	11	-	0	12/19
<i>Opuntia</i> spp.												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	6/14

Trend Study 19R-3-05

Study site name: Deep Creek Drill.

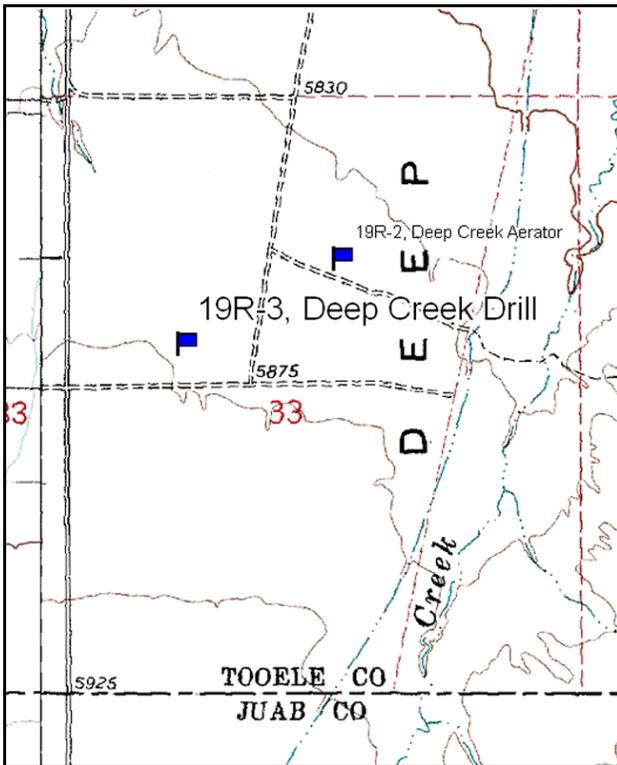
Vegetation type: Wyoming Big Sagebrush.

Compass bearing: frequency baseline 356 degrees magnetic.

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

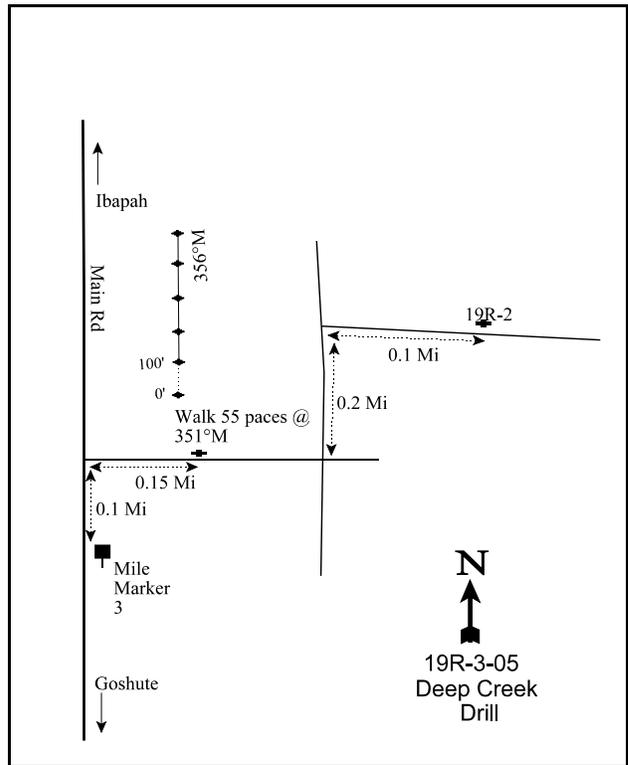
LOCATION DESCRIPTION

Drive north of Goshute toward Ibapah to mile marker 3. Drive north of the mile marker 0.1 miles to a two-track road on the right (east) side of the road. Turn right and drive 0.3 miles to a four-way intersection. Turn left at the intersection and drive 0.15 miles to the witness post on the left (north) side of the road. From the witness post, walk 55 paces at 351°M to the 0' stake. The 0' stake is marked with browse tag #78.



Map Name: Goshute

Township 10S, Range 19W, Section 33



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4422337 N, 243952 E

## DISCUSSION

### Deep Creek Drill – 19R-03

The Deep Creek Drill study was established to monitor the effectiveness of the Deep Creek Valley Sagebrush Improvement and Fuels Reduction treatment. The 3-phase treatment project is located within a historic sagebrush steppe on the west side of the Deep Creek Mountains. The remaining sagebrush has become decadent and replaced by cheatgrass. The treatment will decrease fire fuels, as well as improve habitat for sage grouse and big game. To remove decadent sagebrush and weedy species, 3 methods have been and will continue to be used to treat the areas. These 3 methods include: Seeding grass, forb, and browse species with a rangeland drill; disturbing the ground and decadent shrubs with a Lawson double drum aerator; as well as a combination of drill seeding and aerating with the Lawson double drum aerator. Phase 1 aerated the western pasture of the Deep Creek Allotment in November of 2003. This study was established in one of the phase 2 treatments. Approximately 258 acres were treated with the aerator and 591 acres of aerated and un-aerated land were drill seeded in the fall of 2005. In December 2005, browse species were aerially seeded on all of treatments with fixed wing airplane. This study monitors a Wyoming big sagebrush flat with a dense crested wheatgrass understory that was drill seeded. The study established in 2005, however, was missed by the implement operator and will need to be repositioned to be within the treatment area. A monitoring study (Deep Creek Aerator) was also established directly to the east within an area that was aerated then drill seeded. Phase 3 will be completed in 2007 using similar methods stated above.

The phase 2 treatments are located 7 miles south of Ibapah on BLM-managed land. The slope is 1% on a slightly southeast aspect at an elevation of 5,850 feet. Pellet group transect data was estimated at 1 deer and 21 cow days use/acre (2 ddu/ha and 52 cdu/ha) in 2005. Although not measured in the pellet group transect, sage grouse pellets were identified on the study site.

The soil is a very shallow loam with an effective rooting depth of 9 inches. The soil profile is gravely throughout. Phosphorus and potassium concentrations are adequate for normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). The soil pH is neutral (6.9). Bare ground cover was quite high at 50% in 2005. In 2005, the soil erosion condition measurement was stable.

Wyoming big sagebrush is the key, and only, browse species sampled on the study site. It provided 12% cover and density was 3,220 plants/acre. Fifty percent of the population was decadent, 48% mature, and 2% young. Individuals classified as dying made up 22% of the population. The deficit between young and dying is quite high and could lead to declining sagebrush numbers. Use was mostly light and the average browse leader growth was 1.4 inches.

Six species of grasses were sampled in 2005, 2 of which were annuals. Crested wheatgrass is the dominant species with 12% cover and a quadrat frequency of 92%. Sandberg bluegrass is the second-most abundant species with 4% cover and 74% quadrat frequency. Cheatgrass, as with the Deep Creek Aerator study, was present with nearly 2% cover and a quadrat frequency of 59%. The cheatgrass has been out-competed by the crested wheatgrass. Bulbous bluegrass, squirreltail bottlebrush, and sixweeks fescue are also present in low numbers.

Ten species of forbs were sampled in 2005, 3 of which were annuals. Burr buttercup is the dominant species with 4% cover and 85% quadrat frequency. The other 9 species provided less than one-half percent cover. The following 5 forb species (or species the same genera) have been shown to be beneficial to sage grouse: Milkvetch sp., Utah milkvetch, desert parsley, little polecat, and longleaf phlox (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

2005 Pretreatment Assessment

Cheatgrass is far less abundant than on the aerator study and will have less of an affect on the establishment of seeded species. The crested wheatgrass has kept the cheatgrass from growing too rapidly. Seeding more species into the community may improve diversity and sagebrush health. The Desirable Components Index score was good due to moderate browse cover, excellent perennial grass cover, and low annual grass cover.

2005 winter range condition (DC Index) – good (47) Lower potential scale

The following grass/forb species were drill seeded on the drill treatment area in the fall of 2005:

Seed Species	Bulk lbs in mix	Bulk lbs/acre
Western Wheatgrass	600	1.0
Bluebunch WG 'Anatone'	450	0.8
Orchardgrass 'Paiute'	300	0.5
Great Basin Wildrye 'Trailhead'	300	0.5
Russian Wildrye 'Bozoisky'	600	1.0
Snake River Wheatgrass 'Secar'	450	0.8
Western Yarrow	50	0.1
Alfalfa 'Ladak+'	300	0.5
Alfalfa 'Nomad'	300	0.5
Sainfoin 'Eski'	1200	2.0
Small Burnet 'Delar'	1200	2.0
Rocky Mountain Beeplant	293	0.5
<b>Total</b>	<b>6043</b>	<b>10.2</b>
Total PLS/acre		9.4

The following browse species were aerially seeded on this treatment area and 19R-02 (Deep Creek Aerator) in December 2005:

Seed Species	Bulk lbs in mix	Bulk lbs/acre
Forage Kochia--Millard UT	1000	1.0
Sagebrush, Wyoming--Utah UT	800	0.8
Sagebrush, Wyoming--Utah UT	200	0.2
<b>Total</b>	<b>2000</b>	<b>2.0</b>
Total PLS/acre		0.9

HERBACEOUS TRENDS --

Management unit 19R, Study no: 3

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	276	11.76
G	Bromus tectorum (a)	190	1.68
G	Poa bulbosa	19	.28

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Poa secunda	180	3.86
G	Sitanion hystrix	3	.00
G	Vulpia octoflora (a)	58	.21
Total for Annual Grasses		248	1.89
Total for Perennial Grasses		478	15.91
Total for Grasses		726	17.81
F	Astragalus spp.	2	.01
F	Astragalus utahensis	-	.00
F	Castilleja spp.	3	.00
F	Gayophytum ramosissimum(a)	4	.01
F	Lomatium spp.	4	.01
F	Microsteris gracilis (a)	57	.18
F	Phlox hoodii	6	.01
F	Phlox longifolia	8	.07
F	Ranunculus testiculatus (a)	302	3.90
F	Zigadenus paniculatus	-	.00
Total for Annual Forbs		363	4.09
Total for Perennial Forbs		23	0.12
Total for Forbs		386	4.22

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

#### BROWSE TRENDS --

Management unit 19R, Study no: 3

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata wyomingensis	80	11.66
Total for Browse		80	11.66

#### CANOPY COVER, LINE INTERCEPT --

Management unit 19R, Study no: 3

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	12.46

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 19R, Study no: 3

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	1.4

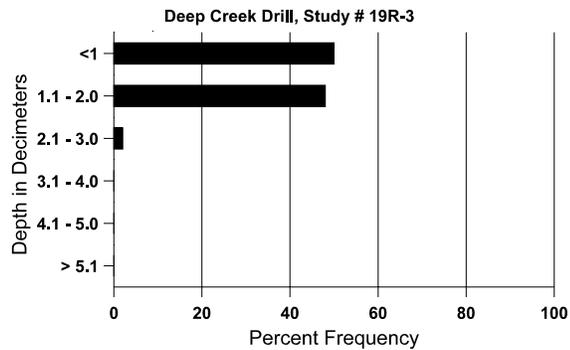
BASIC COVER --  
Management unit 19R, Study no: 3

Cover Type	Average Cover %
	'05
Vegetation	31.25
Rock	.43
Pavement	5.48
Litter	23.17
Cryptogams	2.13
Bare Ground	50.00

SOIL ANALYSIS DATA --  
Management unit 19R, Study no: 3, Study Name: Deep Creek Drill

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.0	61.2 (9.6)	6.9	44.1	37.7	18.2	0.5	10.0	249.6	0.5

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 19R, Study no: 3

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	6	-
Grouse	1	-
Deer	1	1 (2)
Cattle	4	21 (52)

BROWSE CHARACTERISTICS --  
 Management unit 19R, 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)
Artemisia tridentata wyomingensis												
05	<b>3220</b>	320	60	1560	1600	440	16	4	50	22	23	23/32

Trend Study 19R-4-05

Study site name: Bennion Chaining .

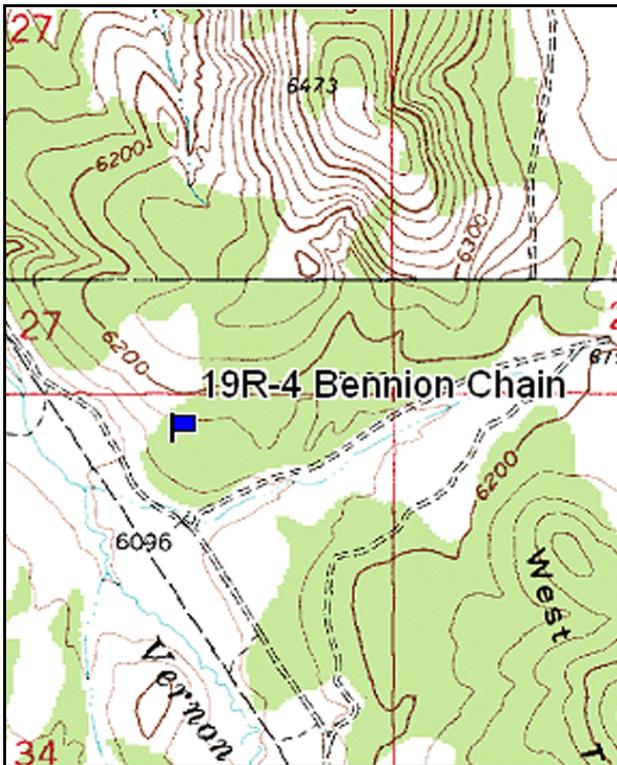
Vegetation type: Pinyon-Juniper .

Compass bearing: frequency baseline 345 degrees magnetic.

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

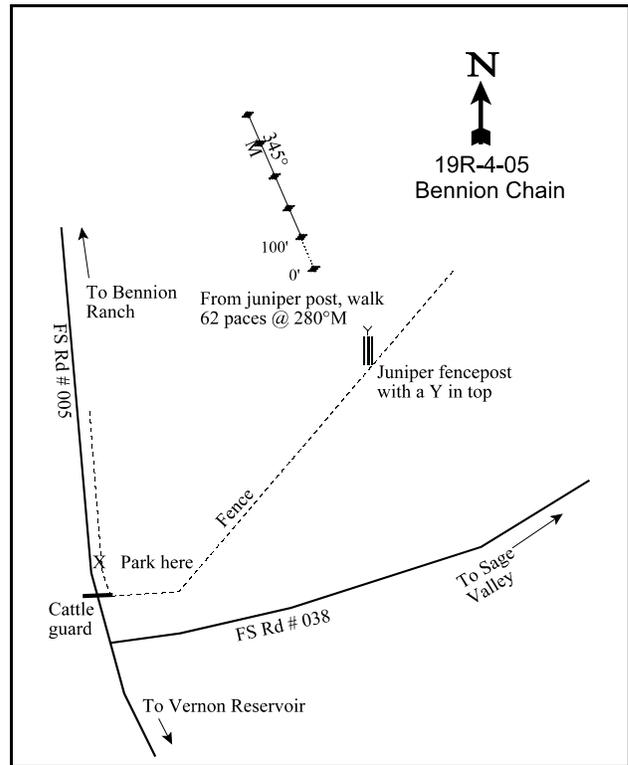
LOCATION DESCRIPTION

From Eureka, drive southwest on US 6 to Tintic Junction (SR36 and 67). Turn right (NW) on SR 36 and drive 19.5 miles to two road that go west, take the first road that goes south towards Vernon Reservoir. Drive south for 7.3 miles to a cattle guard just before the junction of FS road #038 and park here. Walk along the fenceline ~800 feet to a juniper fence post. From the fence post, walk 62 paces at 280°M to the 0' stake. The 0' stake is marked with browse tag #99.



Map Name: Dutch Peak

Township 9S, Range 5W, Section 34



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4428117 N 381454 E

HERBACEOUS TRENDS --  
Management unit 19R, Study no: 4

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron spicatum	15	.16
G	Bromus tectorum (a)	19	.07
G	Oryzopsis hymenoides	-	.00
G	Poa secunda	125	1.77
G	Sitanion hystrix	4	.04
Total for Annual Grasses		19	0.07
Total for Perennial Grasses		144	1.99
Total for Grasses		163	2.06
F	Agoseris glauca	2	.00
F	Alyssum alyssoides (a)	126	.31
F	Antennaria rosea	1	.03
F	Astragalus convallarius	3	.00
F	Astragalus utahensis	4	.01
F	Cryptantha spp.	4	.00
F	Descurainia pinnata (a)	16	.09
F	Gilia spp. (a)	58	.31
F	Lactuca serriola	-	.00
F	Lygodesmia spinosa	4	.00
F	Ranunculus testiculatus (a)	16	.03
F	Trifolium spp.	3	.00
Total for Annual Forbs		216	0.74
Total for Perennial Forbs		21	0.06
Total for Forbs		237	0.80

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

BROWSE TRENDS --

Management unit 19R, Study no: 4

Type	Species	Strip Frequency	Average Cover %
		'05	'05
	Artemisia tridentata wyomingensis	2	-
B	Juniperus osteosperma	23	12.33
B	Opuntia spp.	7	.15
B	Pinus edulis	0	1.00
B	Pinus monophylla	1	4.61
Total for Browse		33	18.11

CANOPY COVER, LINE INTERCEPT --

Management unit 19R, Study no: 4

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	.06
Juniperus osteosperma	33.90
Pinus edulis	1.70
Pinus monophylla	9.19

POINT-QUARTER TREE DATA --

Management unit 19R, Study no: 4

Species	Trees per Acre	Average diameter (in)
	'05	
Juniperus osteosperma	392	5.1
Pinus monophylla	32	8.6

BASIC COVER --

Management unit 19R, Study no: 4

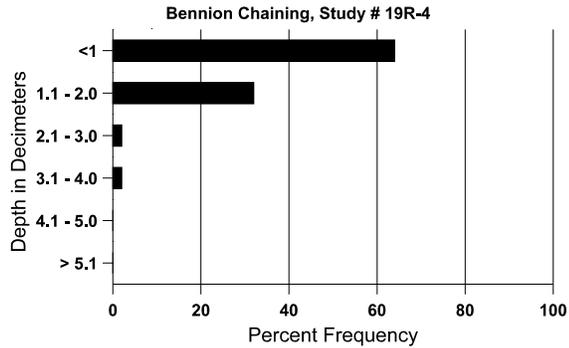
Cover Type	Average Cover %
	'05
Vegetation	20.04
Rock	8.97
Pavement	31.68
Litter	39.37
Cryptogams	.62
Bare Ground	16.62

SOIL ANALYSIS DATA --

Management unit 19R, Study no: 4, Study Name: Bennion Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.5	49.8 (9.8)	7.5	37.4	36.0	26.6	2.4	9.7	169.6	0.6

Stoniness Index



PELLET GROUP DATA --

Management unit 19R, Study no: 4

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	62	-
Deer	1	1 (2)

BROWSE CHARACTERISTICS --

Management unit 19R, 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>												
05	<b>60</b>	-	-	20	40	180	0	0	67	33	33	12/17
<i>Juniperus osteosperma</i>												
05	<b>560</b>	-	100	460	-	-	0	0	-	-	0	-/-
<i>Opuntia spp.</i>												
05	<b>180</b>	-	60	120	-	-	0	0	-	-	0	4/11
<i>Pinus monophylla</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-

Trend Study 20-3-03

Study site name: Mountain Home Seeding.

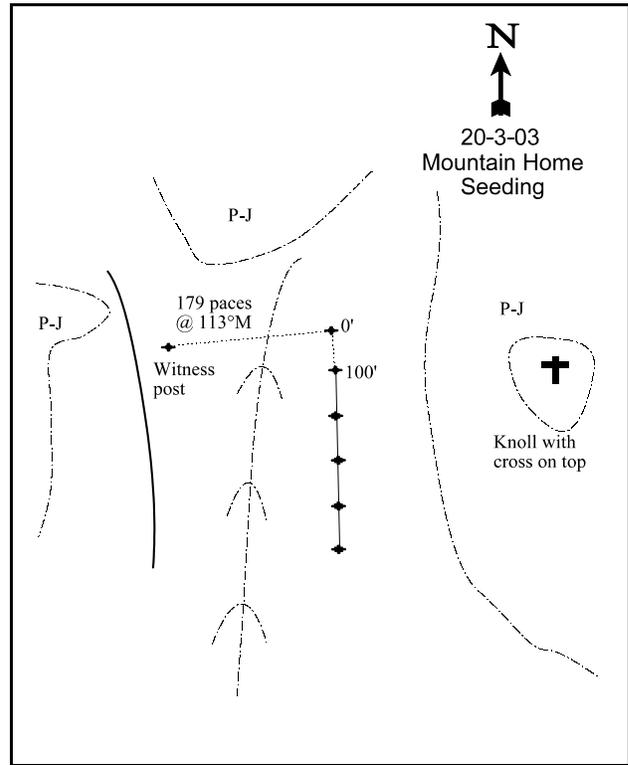
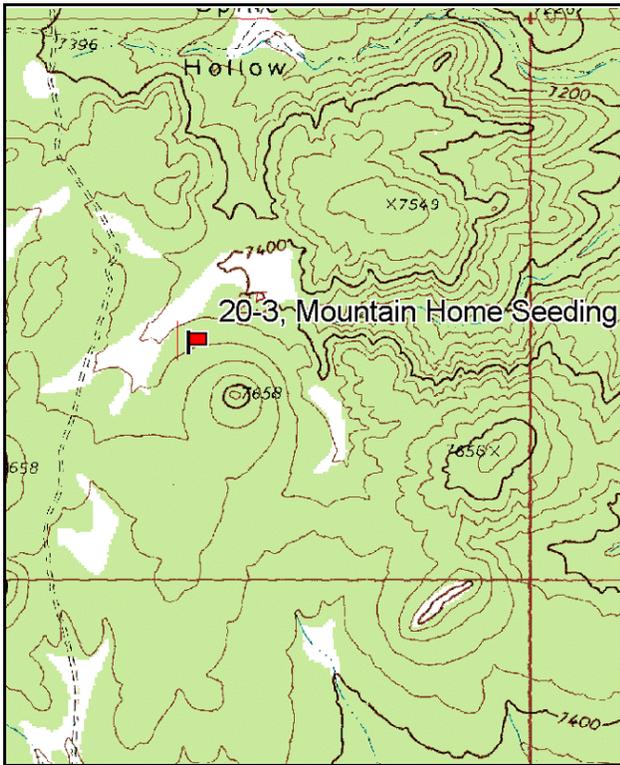
Vegetation type: Burn.

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 the Indian Peaks cabin drive to the main Pine Valley Road. Turn left (north) and drive about 2.0 miles to a fork which is labeled with a sign saying “Hamblin Valley Road 15 miles.” Drive west on this road avoiding side roads about 12.0 miles to a four-way intersection. The sign reads “Lopers Spring 6.0 miles” to the north. Turn right (north) and drive 6.2 miles to a witness post on the right side of the road. (You will pass another 4 way intersection at about 3.7 miles.) The 0-foot stake is 170 paces from the witness post at 113 degrees magnetic. The 0-foot stake is marked with browse tag #143.



Map Name: Lopers Spring

Diagrammatic Sketch

Township 27S, Range 19W, Section 25

GPS: NAD 27, UTM 12S 4257365 N, 244883 E

## DISCUSSION

### Mountain Home Seeding - Trend Study No. 20-3

The Mountain Home Seeding was established in 1998 on a 1,200-acre burned, hand cut, chained, and aerially seeded pinyon-juniper area. After several years of drought, the key browse and forage species had been overused by wild horses, deer, and elk. Undesirable species like rubber rabbitbrush and Utah juniper had also encroached the area. In December 2005, the 1,200-acre area was retreated to improve the habitat and reduce pinyon-juniper density. The original proposed treatment included hand thinning of the pinyon-juniper with chainsaws, chaining, harrowing with a Dixie pipe harrow, and seeding. The monitoring study site was treated with a 24-foot Dixie pipe harrow in 1 direction. The seed was applied with a broadcast seeder mounted on the tractor pulling the harrow.

It has a west, northwest aspect with a gentle slope, which varies from 3% to 7%. The elevation is about 7,500 feet. This treatment area is used heavily by wild horses and moderately by elk. The site is available most of the year. Escape and thermal cover are available at the edge of the treatment about 200 feet east of the study site. Pellet group data collected on site in 1998 was estimated at 44 horse, 27 elk, and 7 deer days use/acre (109 hdu/ha, 67 edu/ha, and 17 ddu/ha). Some of the elk sign was recent when sampled on June 9th, 1998. In 2003, most use was for horses estimated at 38 days use/acre (95 days use/ha). Elk use was also moderately high at 40 days use/acre (98 days use/ha). Cattle and deer use was insignificant at less than 3 days use/acre (7 days use/ha). In 2005, the estimated pellet group data was 28 elk, 1 deer, and 33 horse days use/acre (69 edu/ha, 2 ddu/ha, and 82 hdu/ha). Horse and elk pellets were from late spring and early summer. Wild horses were seen west of the study site in 2005.

Soil at the site is moderately shallow with an effective rooting depth of just over 12 inches. Parent material is granite. Soil texture is a sandy loam, which is slightly acidic in reaction (pH 6.3). Rock and gravel sized pavement are common on the surface and throughout the profile. There is some localized soil movement occurring on the site, although it does not appear to be a problem at this time. In 2005, the soil erosion condition measurement was stable.

A few mountain big sagebrush and resprouting rabbitbrush were encountered in 1998 and 2003. However, almost all of the shrubs were eliminated by the fire. In 2005, 560 plants/acre were sampled, 93% of which were young individuals and the other 7% were mature. Many seedlings were also sampled in 2005. In 2003, the few palatable shrubs that occur on the site (mostly mountain big sagebrush), were classified as heavily utilized. The mature sagebrush in 2005 had been received heavy use, but the young only showed light use. Despite the heavy use, 2005 sagebrush leader growth was 2.7 inches. Greystem rubber rabbitbrush was sampled from the first time in 2003 with a density of 40 plants/acre. By 2005, it had increased to 2,220 plants/acre, 95% of which were young individuals. Dead pinyon and juniper stumps numbered approximately 80/acre in 1998, but were not sampled in 2003 and 2005.

In 1998, the site was dominated by seeded grasses, primarily crested wheatgrass, which provided 84% of the grass cover. Smooth brome and intermediate wheatgrass were also fairly common. All grasses combined produced 30% cover. In 2003, with continuing dry conditions, grass cover has decreased by almost 70%. In 2005, grass cover had recovered to 20%, 86% of which was provided by crested wheatgrass. Crested wheatgrass produced 25% cover in 1998, less than 9% in 2003, then nearly 18% in 2005. Smooth brome is also abundant. It provided 3% cover in 1998, >1% in 2003, then nearly 3% again in 2005. The nested frequency of smooth brome decrease in 2003, but increased to a higher frequency than 2003.

Forbs are fairly diverse, but not abundant producing less than 1% cover. The most common forb in 1998 was alfalfa which provided 35% of the forb cover. It declined significantly in 2003 and was only sampled in 1 quadrat, but was not sampled in 2005. Forb diversity decreased from 12 species in 1998, 6 in 2003, then 9 in 2005.

The following is the seed mix broadcast on the treatment area in 2005:

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Crested Wheatgrass 'Douglas'	600	0.5
Crested Wheatgrass 'Hycrest'	600	0.5
Pubescent Wheatgrass	621	0.5
Pubescent Wheatgrass	600	0.5
Snake River Wheatgrass 'Secar'	1200	1.0
Indian Ricegrass	1200	1.0
Sandberg Bluegrass 'SID OR'	600	0.5
Hard Fescue 'Durar'	600	0.5
Canby Bluegrass 'Canbar'	600	0.5
Blue Flax 'Appar'	60	0.1
Yellow Sweetclover	400	0.3
Alfalfa 'Ladak+'	400	0.3
Alfalfa 'Nomad'	400	0.3
Alfalfa 'Spredor 4'	400	0.3
Small Burnet 'Delar'	1200	1.0
Cicer Milkvetch 'Lutana'	138	0.1
Cicer Milkvetch 'Lutana'	1050	0.9
Sainfoin 'Eski'	1800	1.5
<b>Total</b>	<b>12469</b>	<b>10.4</b>
PLS lbs/acre		9.4

#### 1998 APPARENT TREND ASSESSMENT

The soil appears to have been stabilized by the treatment. Herbaceous cover is abundant and well dispersed. There are few shrubs on the site. Establishment of a significant shrub population will take many years within the thick herbaceous cover unless they are inter-seeded. Seeded perennial grasses are well established and should remain so as long as the site is not overgrazed. However, the compositional diversity is poor with crested wheatgrass dominating the site. Forbs are very limited. The Desirable Components Index score was very poor due to no browse cover and very little perennial forb cover, despite excellent perennial grass cover.

winter range condition (DC Index) – very poor (30) Mid-level potential scale

#### 2003 TREND ASSESSMENT

The trend for soil now appears to be going downward with the loss of both vegetative and litter cover to the extended drought. They have decreased by 70% and 55% respectively since 1998. There are still very few useful shrubs growing on the site. Trend is stable but poor. All together they barely provide 1% cover. With the current weather conditions, it will be a long time before a significant shrub population becomes established on this site. The herbaceous understory trend is slightly down. The nested frequency of perennial grasses decreased 18%. The perennial grasses have been severely depressed by the length of the drought and utilization by wild horses and elk. The compositional diversity continues to be very poor with crested wheatgrass still dominating the site. Forbs continue to be very limited. The Desirable Components Index score was very poor due to no browse cover, only moderate perennial grass cover, and very little perennial forb cover.

TREND ASSESSMENT

soil - down (-2)

browse - stable (0)

herbaceous understory – slightly down (-1)

winter range condition (DC Index) – very poor (19) Mid-level potential scale

2005 TREND ASSESSMENT

The soil trend is up. Relative bare ground cover decreased from 39% in 2003 to 19% in 2005 and relative vegetation cover increased from 10% to 20%. The browse trend is stable. There are a larger number of young individuals and seedlings now that precipitation has increased, but the density is relatively low. A large number of graystem rubber rabbitbrush were also sampled, which could compete with the desirable browse species like sagebrush. The seeding treatment should increase the density and diversity of palatable browse species and help remove the competing rabbitbrush. The herbaceous understory trend is slightly up. The nested frequency of perennial grasses returned to the 1998 level. The return to normal precipitation levels has improved this range. Perennial forbs provide little cover and forage. The Desirable Components Index score was poor due to a lack of browse and perennial forb cover, but perennial grass cover was excellent.

TREND ASSESSMENT

soil - up (+2)

browse - stable (0)

herbaceous understory – slightly up (+1)

winter range condition (DC Index) – poor (31) Mid-level potential scale

HERBACEOUS TRENDS --

Management unit 20 , Study no: 3

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'05	'98	'03	'05
G	Agropyron cristatum	352	318	334	25.30	8.56	17.56
G	Agropyron intermedium	34	18	43	.90	.08	.18
G	Aristida purpurea	5	-	-	.15	-	-
G	Bromus inermis	115	82	130	3.25	.67	2.63
G	Bromus tectorum (a)	84	29	10	.65	.12	.04
G	Sitanion hystrix	3	-	-	.03	-	-
Total for Annual Grasses		84	29	10	0.64	0.12	0.04
Total for Perennial Grasses		509	418	507	29.64	9.32	20.38
Total for Grasses		593	447	517	30.29	9.44	20.42
F	Astragalus spp.	1	-	-	.00	-	-
F	Chaenactis douglasii	-	-	1	-	-	.03
F	Collinsia parviflora (a)	11	-	3	.03	-	.00
F	Cymopterus spp.	34	2	-	.11	.00	-
F	Descurainia pinnata (a)	2	-	-	.03	-	-
F	Gayophytum ramosissimum(a)	-	-	7	-	-	.01
F	Gilia spp. (a)	25	-	-	.08	-	-

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'05	'98	'03	'05
F	Halogeton glomeratus (a)	-	2	-	-	.00	-
F	Lappula occidentalis (a)	5	-	1	.01	-	.00
F	Lupinus argenteus	3	-	-	.00	-	.00
F	Lygodesmia spinosa	1	5	3	.03	.15	.15
F	Medicago sativa	7	1	-	.22	.03	-
F	Microsteris gracilis (a)	24	-	5	.05	-	.06
F	Phlox longifolia	1	7	7	.00	.02	.01
F	Sphaeralcea coccinea	2	-	1	.03	.00	.09
Total for Annual Forbs		67	2	16	0.21	0.00	0.08
Total for Perennial Forbs		49	15	12	0.41	0.21	0.28
Total for Forbs		116	17	28	0.62	0.21	0.37

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

#### BROWSE TRENDS --

Management unit 20 , Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'05	'98	'03	'05
B	Amelanchier utahensis	0	0	0	-	-	-
B	Artemisia tridentata vaseyana	0	1	15	-	.00	.43
B	Chrysothamnus nauseosus	0	0	26	-	.03	.16
B	Chrysothamnus nauseosus hololeucus	0	2	40	.38	1.00	1.52
B	Chrysothamnus parryi	0	1	0	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	0	0	1	-	-	-
B	Gutierrezia sarothrae	0	1	0	-	.00	-
B	Juniperus osteosperma	0	0	0	-	-	-
B	Pinus monophylla	0	0	0	-	-	-
B	Ribes spp.	0	0	0	-	-	-
Total for Browse		0	5	82	0.37	1.03	2.12

CANOPY COVER, LINE INTERCEPT --

Management unit 20 , Study no: 3

Species	Percent Cover		
	'98	'03	'05
Artemisia tridentata vaseyana	-	.28	.53
Chrysothamnus nauseosus	-	.53	.23
Chrysothamnus nauseosus hololeucus	-	-	1.63

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 20 , Study no: 3

Species	Average leader growth (in)	
	'03	'05
Artemisia tridentata vaseyana	-	2.7

BASIC COVER --

Management unit 20 , Study no: 3

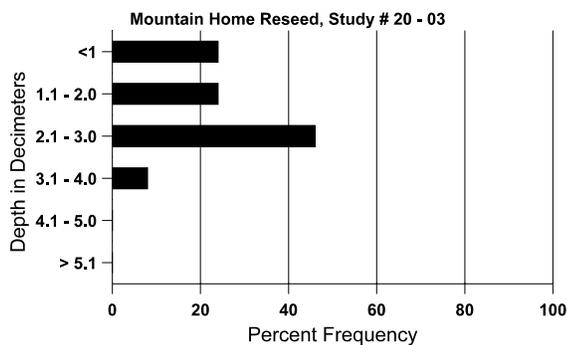
Cover Type	Average Cover %		
	'98	'03	'05
Vegetation	35.65	10.62	22.96
Rock	13.67	11.80	13.43
Pavement	23.51	24.60	39.08
Litter	42.54	18.95	15.55
Cryptogams	.04	0	0
Bare Ground	15.58	41.51	21.08

SOIL ANALYSIS DATA --

Management unit 20, Study no: 3, Study Name: Mountain Home Reseed

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
12.2	65.0 (13.8)	6.3	70.0	15.1	14.9	2.1	21.5	163.2	0.6

### Stoniness Index



PELLET GROUP DATA --

Management unit 20 , Study no: 3

Type	Quadrat Frequency		
	'98	'03	'05
Rabbit	5	-	23
Horse	30	27	21
Elk	27	16	29
Deer	14	7	9
Cattle	-	1	-

Days use per acre (ha)		
'98	'03	'05
-	-	-
44 (109)	38 (95)	33 (82)
16 (40)	39 (98)	28 (69)
7 (17)	3 (7)	1 (2)
-	1 (2)	-

BROWSE CHARACTERISTICS --

Management unit 20 , 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)
<b>Amelanchier utahensis</b>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	9/21
05	0	-	-	-	-	-	0	0	-	-	0	-/-
<b>Artemisia tridentata vaseyana</b>												
98	0	-	-	-	-	-	0	0	-	-	0	30/40
03	20	-	-	20	-	-	0	100	-	-	0	30/48
05	560	580	520	40	-	-	0	4	-	-	0	28/42
<b>Chrysothamnus nauseosus</b>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	40	-	-	-	-	0	0	-	-	0	42/61
05	1020	820	960	60	-	-	0	0	-	-	0	36/41
<b>Chrysothamnus nauseosus hololeucus</b>												
98	0	-	-	-	-	-	0	0	-	-	0	35/48
03	40	-	-	40	-	-	50	0	-	-	0	33/49
05	2220	980	2100	120	-	-	0	0	-	-	0	28/48
<b>Chrysothamnus parryi</b>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	11/10
05	0	-	-	-	-	-	0	0	-	-	0	-/-
<b>Chrysothamnus viscidiflorus viscidiflorus</b>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	12/21
05	20	-	-	20	-	-	0	0	-	-	0	9/18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Gutierrezia sarothrae</i>												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	20	-	20	-	-	-	0	0	-	-	0	6/5
05	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Juniperus osteosperma</i>												
98	0	-	-	-	-	40	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
05	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Pinus monophylla</i>												
98	0	-	-	-	-	40	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
05	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Ribes</i> spp.												
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	28/22
05	0	-	-	-	-	-	0	0	-	-	0	-/-

Trend Study 22R-7-05

Study site name: Sulphurdale .

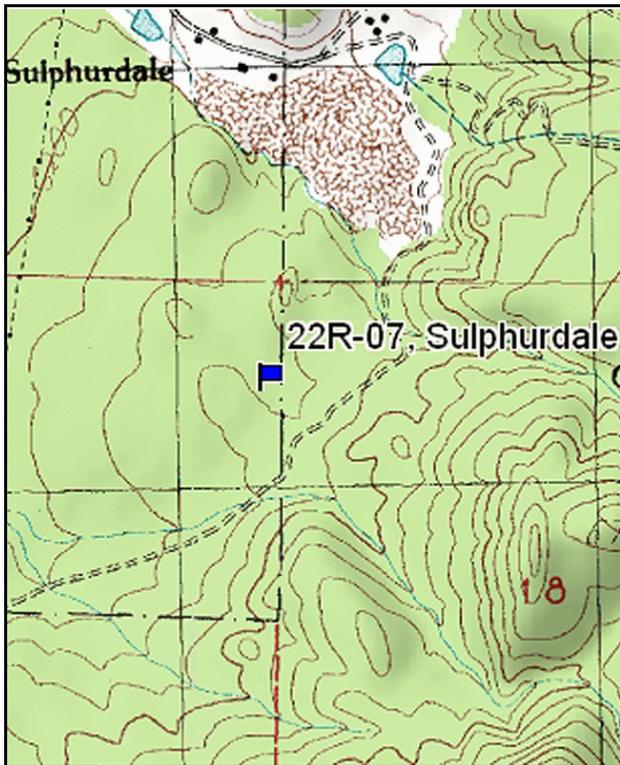
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 274 degrees magnetic.

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

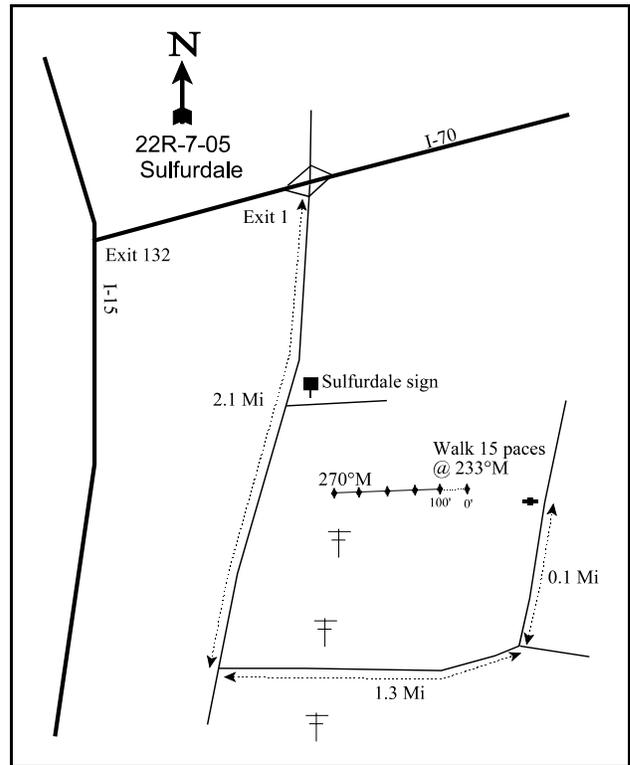
LOCATION DESCRIPTION

From Exit 1 off of I-70, proceed south on HWY 161 2.1 miles to a road on the left (east). Turn left and drive 1.3 miles to a fork. Take the left fork and drive 0.1 miles to the witness post on the left (west) side of the road. From the witness post, walk 15 paces at 270°M to the 0' stake. The 0' stake is marked with browse tag #71.



Map Name: Cove Fort

Township 26S, Range 7W, Section 13



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4268234 N 362194 E

HERBACEOUS TRENDS --  
Management unit 22R, Study no: 7

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	93	1.68
G	Agropyron dasystachyum	9	.07
G	Agropyron intermedium	24	.44
G	Agropyron spicatum	3	.00
G	Bromus inermis	147	3.94
G	Bromus japonicus (a)	3	.01
G	Bromus tectorum (a)	282	7.98
G	Oryzopsis hymenoides	5	.00
G	Poa secunda	49	.73
G	Sitanion hystrix	53	.63
Total for Annual Grasses		285	7.99
Total for Perennial Grasses		383	7.52
Total for Grasses		668	15.51
F	Alyssum alyssoides (a)	359	4.38
F	Antennaria rosea	1	.03
F	Astragalus convallarius	10	.36
F	Collinsia parviflora (a)	8	.04
F	Cryptantha spp.	33	.27
F	Descurainia pinnata (a)	18	.37
F	Eriogonum spp.	31	.32
F	Eriogonum umbellatum	4	.00
F	Gayophytum ramosissimum(a)	4	.01
F	Gilia spp. (a)	37	.12
F	Hedysarum boreale	8	.05
F	Lactuca serriola	2	.00
F	Machaeranthera canescens	3	.03
F	Microsteris gracilis (a)	41	.13
F	Petradoria pumila	11	.60
F	Phlox austromontana	45	.38
F	Phlox hoodii	38	1.21
F	Phlox longifolia	1	.00
F	Polygonum douglasii (a)	3	.01
F	Ranunculus testiculatus (a)	69	.64
F	Senecio multilobatus	2	.01
F	Sphaeralcea coccinea	4	.01
Total for Annual Forbs		539	5.72

Type	Species	Nested Frequency	Average Cover %
		'05	'05
	Total for Perennial Forbs	193	3.30
	Total for Forbs	732	9.02

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

#### BROWSE TRENDS --

Management unit 22R, Study no: 7

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata wyomingensis</i>	15	2.09
B	<i>Chrysothamnus nauseosus</i>	6	.78
B	<i>Chrysothamnus nauseosus hololeucus</i>	2	.00
B	<i>Gutierrezia sarothrae</i>	16	.48
B	<i>Juniperus osteosperma</i>	19	9.80
B	<i>Leptodactylon pungens</i>	0	-
B	<i>Opuntia</i> spp.	3	-
B	<i>Pinus edulis</i>	2	.00
B	<i>Purshia tridentata</i>	15	3.10
	Total for Browse	78	16.28

#### CANOPY COVER, LINE INTERCEPT --

Management unit 22R, Study no: 7

Species	Percent Cover
	'05
<i>Artemisia tridentata wyomingensis</i>	2.51
<i>Chrysothamnus nauseosus</i>	.45
<i>Chrysothamnus nauseosus hololeucus</i>	.26
<i>Gutierrezia sarothrae</i>	.08
<i>Juniperus osteosperma</i>	15.14
<i>Pinus edulis</i>	.05
<i>Purshia tridentata</i>	5.58

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 22R, Study no: 7

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	2.9
Purshia tridentata	5.4

POINT-QUARTER TREE DATA --  
Management unit 22R, Study no: 7

Species	Trees per Acre	Average diameter (in)
	'05	'05
Juniperus osteosperma	252	6.1
Pinus edulis	30	4.5

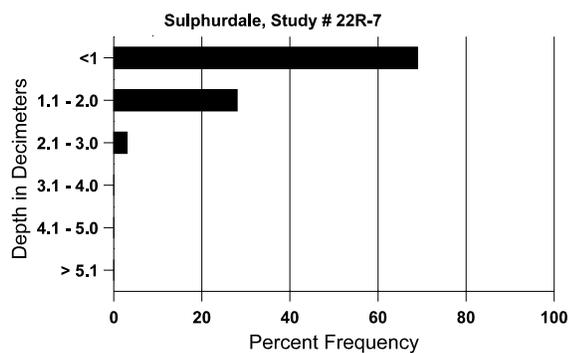
BASIC COVER --  
Management unit 22R, Study no: 7

Cover Type	Average Cover %
	'05
Vegetation	35.00
Rock	4.94
Pavement	17.04
Litter	34.26
Cryptogams	.15
Bare Ground	19.90

SOIL ANALYSIS DATA --  
Management unit 22R, Study no: 7, Study Name: Sulphurdale

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	PPM P	PPM K	ds/m
9.7	59.6 (10.6)	7.0	49.4	28.4	22.2	3.6	15.2	374.4	0.7

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 22R, Study no: 7

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	59	-
Elk	12	6 (15)
Deer	19	21 (53)
Cattle	2	8 (20)

BROWSE CHARACTERISTICS --  
 Management unit 22R, 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>												
05	<b>860</b>	100	260	560	40	20	40	0	5	2	2	29/40
<i>Chrysothamnus nauseosus</i>												
05	<b>140</b>	-	-	140	-	-	0	0	-	-	0	29/36
<i>Chrysothamnus nauseosus hololeucus</i>												
05	<b>40</b>	20	-	40	-	-	0	0	-	-	0	22/31
<i>Gutierrezia sarothrae</i>												
05	<b>620</b>	-	40	580	-	-	0	0	-	-	0	10/10
<i>Juniperus osteosperma</i>												
05	<b>400</b>	-	120	280	-	40	0	0	-	-	0	-/-
<i>Leptodactylon pungens</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	7/7
<i>Opuntia spp.</i>												
05	<b>80</b>	-	-	80	-	-	0	0	-	-	0	6/11
<i>Pinus edulis</i>												
05	<b>40</b>	20	40	-	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
05	<b>400</b>	-	60	320	20	-	20	65	5	-	0	30/59

Trend Study 22R-8-05

Study site name: P-Hill Dixie .

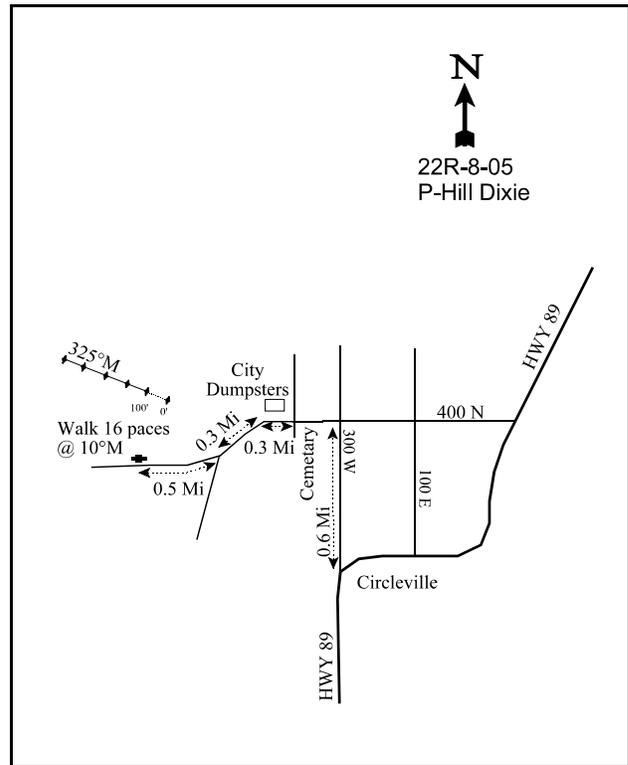
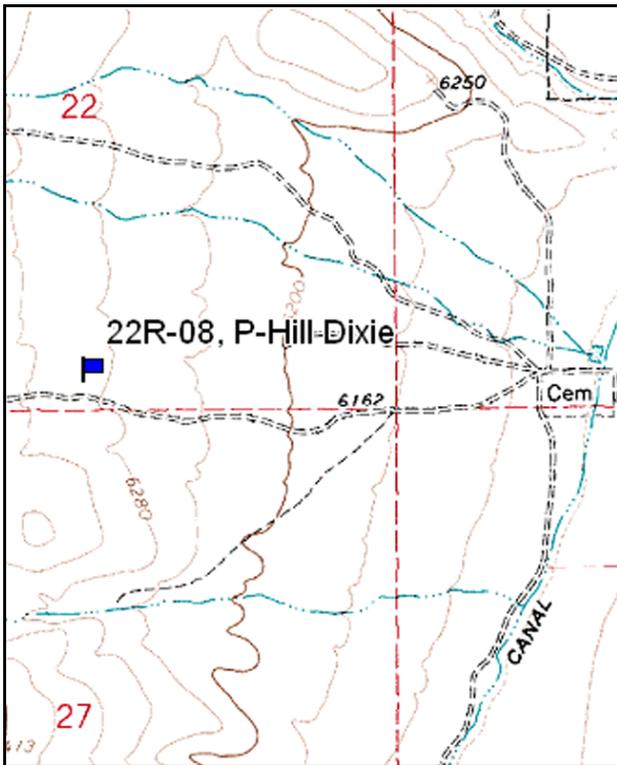
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 325 degrees magnetic.

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

LOCATION DESCRIPTION

Heading north into Circleville, UT on US 89, continue north on 300 west when US 89 bends east (just past 300 south). Drive north on 300 west for 0.6 miles to an intersection. Turn left (west) and drive past the cemetery. On the NW corner of the cemetery is an intersection, continue straight for 0.3 miles to a two-track road on the right (west). Turn right on the two-track and drive 0.5 miles to the half-high witness post on the right (north). From the half-high witness post, walk 16 paces at 10°M to the 0' stake. The 0' stake is marked with browse tag #73.



Map Name: Circleville

Diagrammatic Sketch

Township 30S , Range 4W , Section 22

GPS: NAD 27, UTM 12S 4226329 N 386372 E

HERBACEOUS TRENDS --  
 Management unit 22R, Study no: 8

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Aristida purpurea</i>	9	.09
G	<i>Stipa comata</i>	-	.00
G	<i>Vulpia octoflora</i> (a)	3	.00
Total for Annual Grasses		3	0.00
Total for Perennial Grasses		9	0.10
Total for Grasses		12	0.10
F	<i>Astragalus lentiginosus</i>	20	.11
F	<i>Descurainia pinnata</i> (a)	80	.89
F	<i>Eriogonum cernuum</i> (a)	5	.02
F	<i>Gayophytum ramosissimum</i> (a)	17	.07
F	<i>Gilia</i> spp. (a)	6	.01
F	<i>Lappula occidentalis</i> (a)	4	.00
F	<i>Lygodesmia</i> spp.	-	.00
Total for Annual Forbs		112	0.99
Total for Perennial Forbs		20	0.11
Total for Forbs		132	1.11

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

BROWSE TRENDS --  
 Management unit 22R, Study no: 8

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	89	25.43
B	<i>Opuntia</i> spp.	4	.15
Total for Browse		93	25.58

CANOPY COVER, LINE INTERCEPT --

Management unit 22R, Study no: 8

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	29.20
Opuntia spp.	.01

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 22R, Study no: 8

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	2.1

BASIC COVER --

Management unit 22R, Study no: 8

Cover Type	Average Cover %
	'05
Vegetation	25.67
Rock	9.88
Pavement	23.56
Litter	26.93
Cryptogams	.46
Bare Ground	33.50

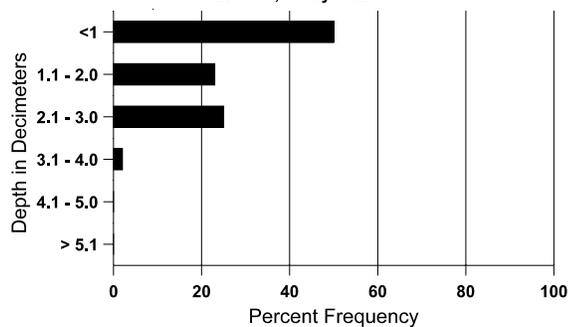
SOIL ANALYSIS DATA --

Management unit 22R, Study no: 8, Study Name: P-Hill Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.7	63.2 (10.9)	6.7	64.4	23.7	11.8	0.3	17.2	240.0	0.4

### Stoniness Index

P-Hill Dixie, Study # 22R-8



PELLET GROUP DATA --  
 Management unit 22R, Study no: 8

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	36	-
Elk	2	1 (2)
Deer	14	28 (69)

BROWSE CHARACTERISTICS --  
 Management unit 22R, Study no: 8

		Age class distribution (plants per acre)					Utilization					
Y e a r	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
05	<b>5340</b>	200	-	3080	2260	1160	14	25	42	12	14	25/35
Opuntia spp.												
05	<b>80</b>	-	-	80	-	-	0	0	-	-	25	5/16

Trend Study 23R-9-05

Study site name: Poverty Dixie .

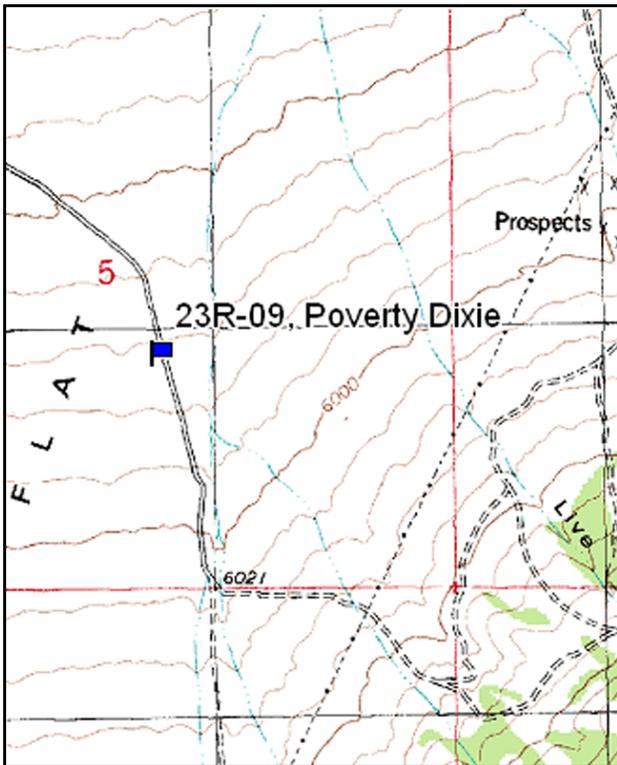
Vegetation type: Perennial Grasses .

Compass bearing: frequency baseline 245 degrees magnetic.

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

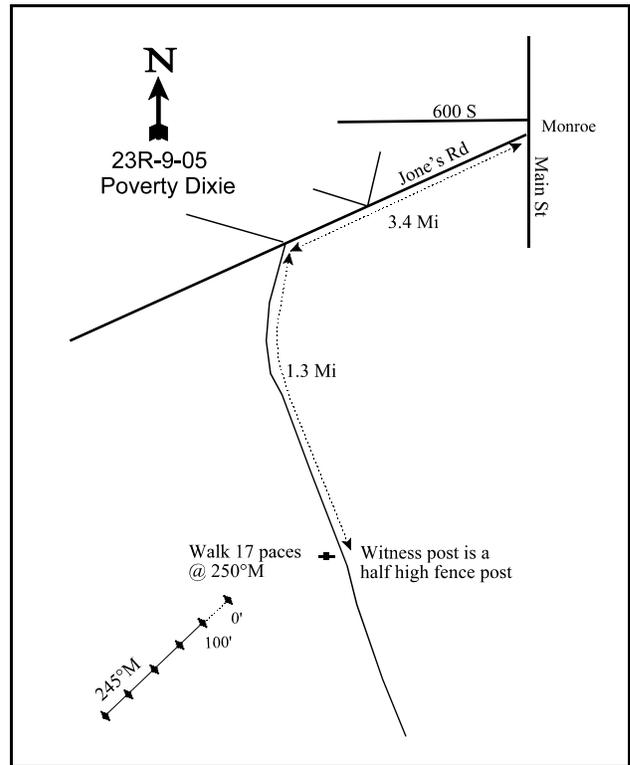
LOCATION DESCRIPTION

From 600 South and Main in Monroe, turn southwest on Jones Road, a gravel road coming in at a 45 degree angle. Proceed 3.4 miles to a junction, stay left. Proceed on this road 1.3 miles to the half-high witness post on the right (west). From the half-high witness post, walk 17 paces at 250°M to the 0' stake. The 0' stake is marked with browse tag #76.



Map Name: Antelope Range

Township 26S, Range 3W, Section 5



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4268905 N 399845 E

HERBACEOUS TRENDS --  
 Management unit 23R, Study no: 9

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	135	4.82
G	Agropyron intermedium	16	.71
G	Bouteloua gracilis	3	.03
G	Bromus tectorum (a)	413	15.41
G	Oryzopsis hymenoides	-	.00
G	Sitanion hystrix	82	1.24
Total for Annual Grasses		413	15.41
Total for Perennial Grasses		236	6.82
Total for Grasses		649	22.24
F	Amaranthus blitoides	34	.22
F	Collinsia parviflora (a)	21	.05
F	Cryptantha spp.	3	.00
F	Descurainia pinnata (a)	39	.08
F	Draba spp. (a)	9	.02
F	Euphorbia spp.	16	.03
F	Medicago sativa	3	.38
F	Ranunculus testiculatus (a)	22	.09
F	Salsola iberica (a)	279	1.53
F	Sisymbrium altissimum (a)	205	6.58
Total for Annual Forbs		575	8.36
Total for Perennial Forbs		56	0.64
Total for Forbs		631	9.01

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

BROWSE TRENDS --  
 Management unit 23R, Study no: 9

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata wyomingensis	0	-
B	Atriplex canescens	1	.56
B	Kochia prostrata	24	.61
B	Opuntia spp.	1	-
Total for Browse		26	1.17

CANOPY COVER, LINE INTERCEPT --

Management unit 23R, Study no: 9

Species	Percent Cover
	'05
Atriplex canescens	.91
Kochia prostrata	1.14

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 23R, Study no: 9

Species	Average leader growth (in)
	'05
Atriplex canescens	4.1

BASIC COVER --

Management unit 23R, Study no: 9

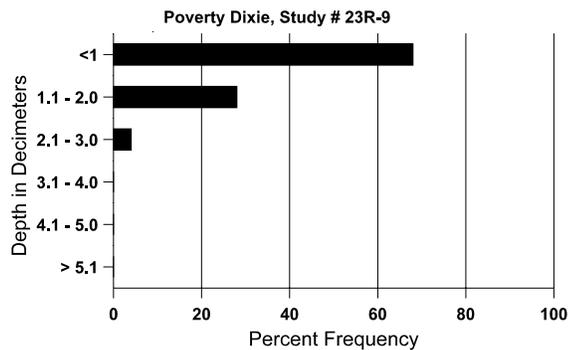
Cover Type	Average Cover %
	'05
Vegetation	30.21
Rock	9.46
Pavement	13.16
Litter	33.25
Bare Ground	22.98

SOIL ANALYSIS DATA --

Management unit 23R, Study no: 9, Study Name: Poverty Dixie

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
6.6	74.4 (6.1)	6.8	60.4	24.7	14.9	2.4	16.1	204.8	0.5

### Stoniness Index



PELLET GROUP DATA --  
 Management unit 23R, Study no: 9

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	14	-
Elk	2	3 (7)
Deer	-	2 (5)
Cattle	4	16 (40)

BROWSE CHARACTERISTICS --  
 Management unit 23R, Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	11/15
<i>Atriplex canescens</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	35/48
<i>Kochia prostrata</i>												
05	<b>1820</b>	820	1040	660	120	-	0	0	7	-	0	18/20
<i>Opuntia spp.</i>												
05	<b>20</b>	20	-	20	-	-	0	0	-	-	100	7/24

Trend Study 24R-7-05

Study site name: Horse Valley Burn .

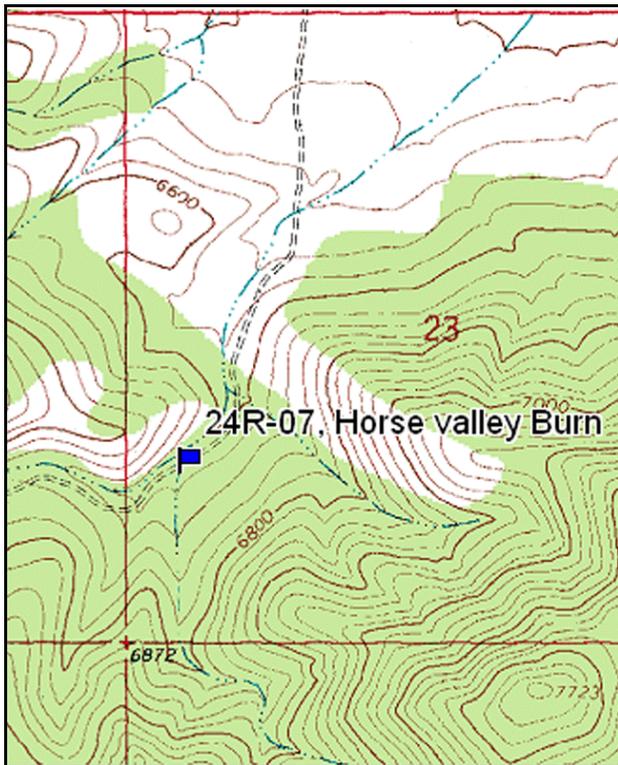
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 168 degrees magnetic.

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

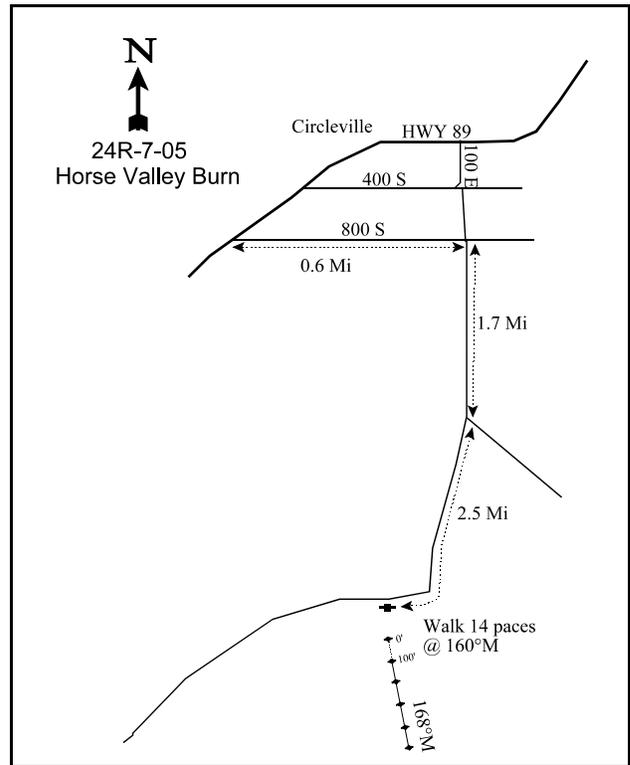
LOCATION DESCRIPTION

From the junction of US 89 and 800 south in Circleville, drive east on 800 south for 0.6 miles to a four-way intersection. Turn right (south) and drive 1.7 miles, crossing two cattle guards, to a fork. Stay right and drive 2.5 miles to the witness post on the left (south) side of the road. From the witness post, walk 14 paces at 160°M to the 0' stake. The 0' stake is marked with browse tag #72.



Map Name: Bull Rush Peak

Township 31S, Range 4W, Section 23



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4217357 N 387605 E

HERBACEOUS TRENDS --  
Management unit 24R, Study no: 7

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron spicatum	-	.00
G	Bouteloua gracilis	88	2.98
G	Bromus tectorum (a)	27	.05
G	Oryzopsis hymenoides	26	.44
G	Poa fendleriana	7	.09
G	Sitanion hystrix	144	1.32
G	Stipa comata	9	.06
Total for Annual Grasses		27	0.05
Total for Perennial Grasses		274	4.92
Total for Grasses		301	4.98
F	Arabis spp.	6	.02
F	Astragalus lentiginosus	7	.56
F	Astragalus utahensis	6	.02
F	Cryptantha spp.	24	.08
F	Descurainia pinnata (a)	2	.00
F	Eriogonum alatum	-	.00
F	Erigeron pumilus	13	.04
F	Gayophytum ramosissimum(a)	28	.06
F	Gilia spp. (a)	3	.03
F	Lupinus kingii (a)	18	.10
F	Petradoria pumila	1	.00
F	Phlox austromontana	44	.77
F	Phlox longifolia	6	.01
F	Senecio multilobatus	39	.68
F	Taraxacum officinale	1	.00
Total for Annual Forbs		51	0.19
Total for Perennial Forbs		147	2.20
Total for Forbs		198	2.40

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

BROWSE TRENDS --

Management unit 24R, Study no: 7

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata wyomingensis	76	9.48
B	Gutierrezia sarothrae	62	.90
B	Juniperus osteosperma	0	.93
B	Opuntia spp.	3	-
B	Pinus edulis	14	9.25
Total for Browse		155	20.56

CANOPY COVER, LINE INTERCEPT --

Management unit 24R, Study no: 7

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	11.26
Gutierrezia sarothrae	1.04
Juniperus osteosperma	6.00
Pinus edulis	28.66

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 24R, Study no: 7

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	2.4

POINT-QUARTER TREE DATA --

Management unit 24R, Study no: 7

Species	Trees per Acre	Average diameter (in)
	'05	
Juniperus osteosperma	29	10.0
Pinus edulis	454	2.4

BASIC COVER --

Management unit 24R, Study no: 7

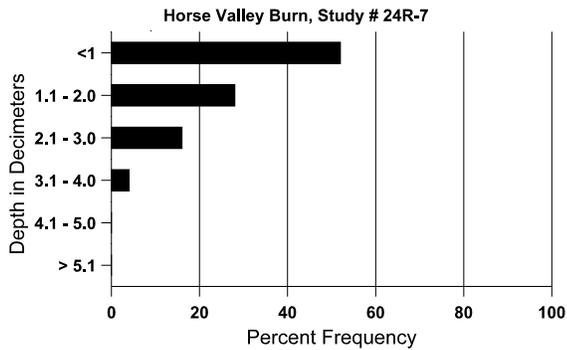
Cover Type	Average Cover %
	'05
Vegetation	25.89
Rock	20.50
Pavement	14.84
Litter	47.67
Cryptogams	.50
Bare Ground	6.30

SOIL ANALYSIS DATA --

Management unit 24R, Study no: 7, Study Name: Horse Valley Burn

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.8	51.6 (11.7)	7.0	77.4	3.7	18.8	1.5	15.4	204.8	0.7

### Stoniness Index



PELLET GROUP DATA --

Management unit 24R, Study no: 7

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	49	-
Deer	5	1 (2)

BROWSE CHARACTERISTICS --  
 Management unit 24R, 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>												
05	<b>2560</b>	60	120	960	1480	1140	14	17	58	30	30	27/34
<i>Gutierrezia sarothrae</i>												
05	<b>4300</b>	140	860	3440	-	-	0	2	-	-	0	10/7
<i>Juniperus osteosperma</i>												
05	<b>0</b>	20	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia spp.</i>												
05	<b>60</b>	-	-	40	20	-	0	0	33	-	0	4/8
<i>Pinus edulis</i>												
05	<b>440</b>	20	240	200	-	20	0	0	-	-	0	-/-

Trend Study 27R-16-05

Study site name: Alton/Mill Creek LS.

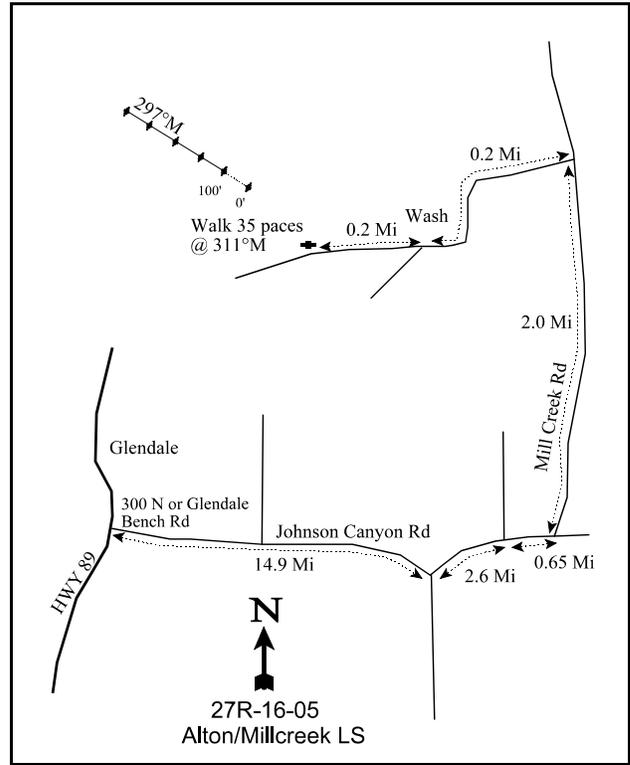
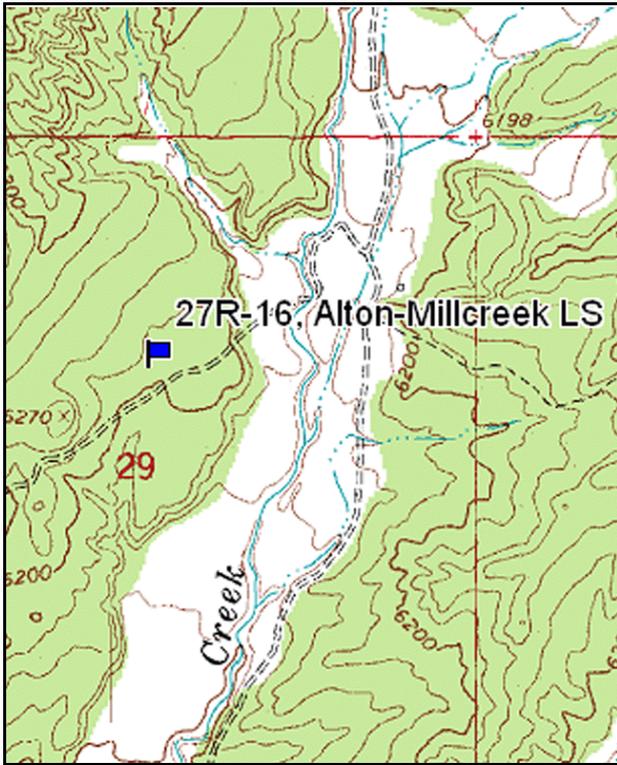
Vegetation type: P-J / Wyoming Big Sagebrush.

Compass bearing: frequency baseline 297 degrees magnetic.

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

LOCATION DESCRIPTION

From the junction of US 89 and 300 north (Glendale Bench Rd) in Glendale, drive east on 300 north for 14.9 miles to a fork or a road going northeast (there is a sign that says Deer Spring Ranch and Cannoville). Turn left and drive 2.6 miles to fork with a sign reading “Deer Spring Ranch.” Stay right and drive 0.65 miles to a road on the left with a stop sign. Turn left (north) and drive 2.0 miles passing two cattle guards to a fork. Turn left (west) (far left of three-way fork) on a two track road and drive 0.2 miles through a wash to a fork. Stay right after the wash and drive another 0.2 miles up a hill to the witness post on the right (north) side of the road. From the witness post, walk 35 paces at 311°M to the 0' stake. The 0' stake is marked with browse tag #69.



Map Name: Skutumpah Creek

Diagrammatic Sketch

Township 40S, Range 4.5W, Section 29

GPS: NAD 27, UTM 12S 4129523 N 381931 E

HERBACEOUS TRENDS --

Management unit 27R, Study no: 16

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Bouteloua gracilis</i>	1	.00
G	<i>Sitanion hystrix</i>	1	.00
G	<i>Vulpia octoflora</i> (a)	84	.24
Total for Annual Grasses		84	0.24
Total for Perennial Grasses		2	0.00
Total for Grasses		86	0.25
F	<i>Cryptantha</i> spp.	7	.01
F	<i>Dalea searlsiae</i>	3	.15
F	<i>Descurainia pinnata</i> (a)	1	.00
F	<i>Draba</i> spp. (a)	3	.03
F	<i>Eriogonum cernuum</i> (a)	39	.24
F	<i>Eriogonum umbellatum</i>	86	1.77
F	<i>Gayophytum ramosissimum</i> (a)	96	.25
F	<i>Gilia</i> spp. (a)	295	5.06
F	<i>Microsteris gracilis</i> (a)	12	.66
F	<i>Polygonum douglasii</i> (a)	48	.17
Total for Annual Forbs		494	6.43
Total for Perennial Forbs		96	1.94
Total for Forbs		590	8.38

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

BROWSE TRENDS --

Management unit 27R, Study no: 16

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia tridentata</i> <i>wyomingensis</i>	9	.00
B	<i>Ephedra viridis</i>	0	-
B	<i>Gutierrezia sarothrae</i>	0	-
B	<i>Juniperus osteosperma</i>	10	6.69
B	<i>Opuntia</i> spp.	2	-
B	<i>Pinus edulis</i>	4	5.25
B	<i>Purshia tridentata</i>	0	-
Total for Browse		25	11.95

CANOPY COVER, LINE INTERCEPT --

Management unit 27R, Study no: 16

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	.36
Juniperus osteosperma	15.36
Pinus edulis	9.46

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27R, Study no: 16

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	1.1

POINT-QUARTER TREE DATA --

Management unit 27R, Study no: 16

Species	Trees per Acre	Average diameter (in)
	'05	'05
Juniperus osteosperma	268	8.2
Pinus edulis	46	3.5

BASIC COVER --

Management unit 27R, Study no: 16

Cover Type	Average Cover %
	'05
Vegetation	18.45
Rock	.00
Pavement	.07
Litter	25.70
Cryptogams	16.25
Bare Ground	54.39

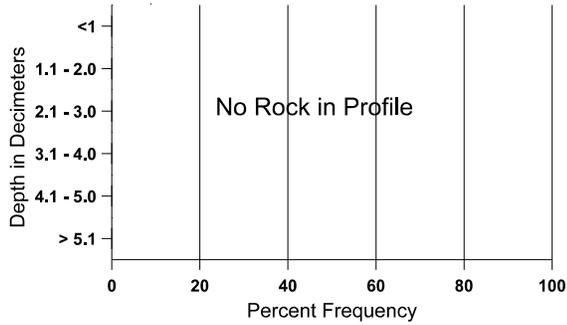
SOIL ANALYSIS DATA --

Management unit 27R, Study no: 16, Study Name: Alton/Millcreek Lop and Scatter

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
17.7	49.8 (17.2)	6.3	48.4	41.7	9.8	0.6	9.7	64.0	0.2

# Stoniness Index

Alton/Millcreek Lop and Scatter, Study # 27R-16



## PELLET GROUP DATA --

Management unit 27R, Study no: 16

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	35	-
Elk	1	2 (5)
Deer	6	8 (20)

## BROWSE CHARACTERISTICS --

Management unit 27R, Study no: 16

		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>													
05	<b>180</b>	20	-	40	140	380	0	22	78	56	56	19/19	
<i>Ephedra viridis</i>													
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	26/30	
<i>Gutierrezia sarothrae</i>													
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	9/7	
<i>Juniperus osteosperma</i>													
05	<b>220</b>	20	20	200	-	-	0	0	-	-	0	-/-	
<i>Opuntia spp.</i>													
05	<b>40</b>	-	-	40	-	-	0	0	-	-	0	3/12	
<i>Pinus edulis</i>													
05	<b>120</b>	60	80	40	-	20	0	0	-	-	0	-/-	
<i>Purshia tridentata</i>													
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	26/50	

Trend Study 27R-17-05

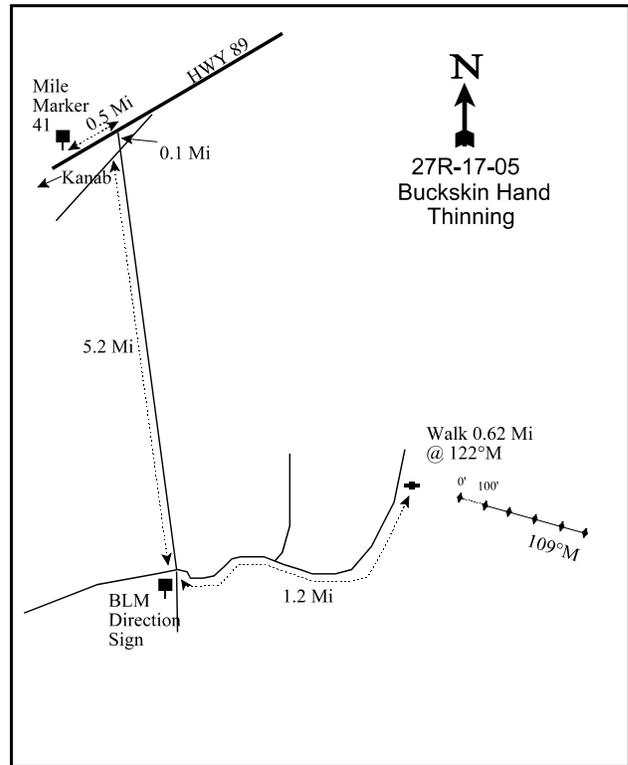
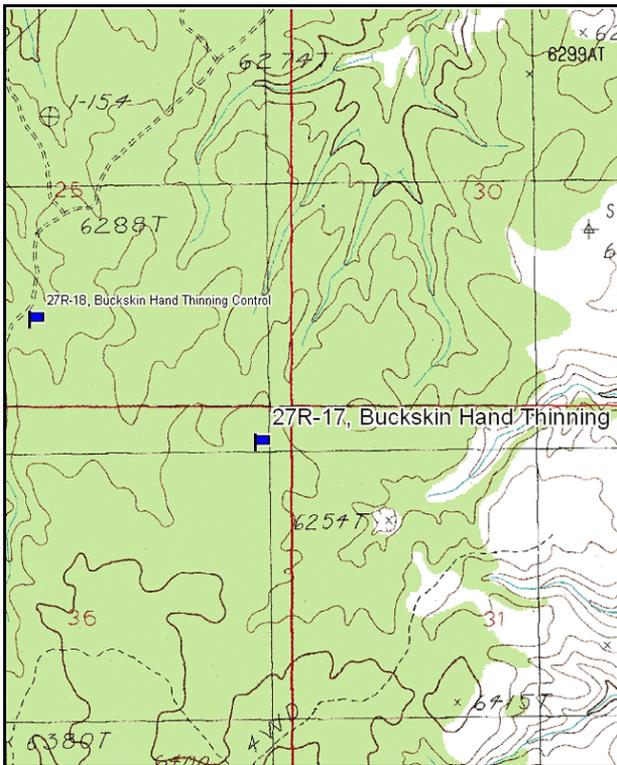
Study site name: Buckskin Hand Thinning . Vegetation type: P-J / Wyoming Big Sagebrush .

Compass bearing: frequency baseline 109 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59 ft), line 4 (71 ft), line 5 (93 ft).

LOCATION DESCRIPTION

From Kanab, drive west on US 89 to mile maker 41. Continue past the mile marker 0.5 miles to a road on the right (south). Turn right and drive 0.1 miles to a road. Continue on the main road for 5.2 miles to a three-way intersection. Turn left and then drive 1.2 miles to the witness post on right (east) side of the road. From the witness post, walk 0.62 miles at 122°M to the 0' stake (use GPS). The 0' stake is marked with browse tag #90.



Map Name: Pine Hollow Canyon

Diagrammatic Sketch

Township 43S , Range 3W , Section 36

GPS: NAD 27, UTM 12S 4099005 N 404950 E

## DISCUSSION

### Buckskin Hand Thinning – 27R-17

The Buckskin Hand Thinning study was established to monitor pinyon-juniper removal project in Grand Staircase-Escalante National Monument. The treatment area is dominated by pinyon and juniper trees, which have decreased browse diversity and density. The area is important winter range for the Paunsaugunt and Kaibab deer herds, but the poor browse condition is detrimental to the deer herds. The area is also valuable breeding habitat for local and migratory birds. Removal of pinyon and juniper, combined with seeding of desirable species, was performed to improve this wildlife habitat and decrease wildfire threats. The 900-acre project area was aerially seeded with a grass, forb, and browse mix in the fall of 2005. A ground crew with chainsaws thinned the pinyon and juniper trees using the “lop and scatter” technique. This technique involves cutting down trees, cutting off some of the larger branches, and spreading them out over the treatment area. This monitoring study was located within the eastern-most 100-acre section of the treatment. A comparison study, Buckskin Hand Thinning Control (27R-18), was established outside the treatment area.

The treatment areas are located 23 miles to the east of Kanab, south of Highway 89. The study site is located on a western aspect with a 4% slope at an elevation of 6,400 feet. The 2005 pellet group data was estimated at 48 elk, 12 deer, and 1 cow days use/acre (117 edu/ha, 30 ddu/ha, and 2 cdu/ha). Some of the pellets were from spring, but most were from fall and winter.

The soil is a very shallow stony loam with an apparent effective rooting depth of 7 inches. Much of the soil profile is made up of rock and 31% of the soil surface was covered in rock and pavement in 2005. The soil reaction is mildly alkaline (pH of 7.5). Bare ground cover was 16% in 2005. Litter provided the most cover with 45%. In 2005, the soil erosion condition measurement was stable.

Wyoming big sagebrush was the key browse species during the 2005 pretreatment sampling. It provided less than 2% cover and density was only 580 plants/acre. Forty-one percent of the population was mature and 52% decadent. Young individuals made up 7% and plants classified as dying made up 34% of the population. Use was light in 2005. Sagebrush leader growth average was 2.8 inches. Other browse species are scattered, but were sampled on the study site. These species include: Serviceberry, true mountain mahogany, Stansbury cliff rose, a species of echinocereus, Mormon tea, broom snakeweed, prickly pear cactus, banana yucca, and pincushion cactus. The low sagebrush, and browse as a whole, density and cover are a product of the high pinyon-juniper canopy cover.

Pinyon and juniper combined canopy cover was nearly 39% in 2005. 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. Pinyon density was estimated at 266 trees/acre with an average diameter of 2.7 inches. Juniper density was estimated at 156 trees/acre with an average diameter of 10.2 inches.

Five species of grasses were sampled in 2005, 2 of which were annuals. Cheatgrass was the dominant grass species with less than 2% cover and a quadrat frequency was 63%. All other grass species provided less than one-tenth of a percent combined. These species include: Mutton bluegrass, squirreltail bottlebrush, needle-and-thread, and sixweeks fescue.

Twenty-three species of forbs were sampled in 2005, 9 of which were annuals. An annual species of birdbeak was the dominant forb species with 4% cover. An annual species of gilia provided 1% cover, the second- most abundant forb species. All other forb species provided a combined cover of 2%.

2005 Pretreatment Assessment

Removal of pinyon and juiper will open up the treatment area for the browse, grass, and forb species to grow. The seeding of black sagebrush, cliffrose, and Mormon tea will provide the wildlife with more key browse species. The existing Wyoming big sagebrush should thrive without the competition with pinyon and juniper. The Desirable Components Index rating was very poor due to low browse cover, low perennial grass and forb cover, and some annual grass cover.

2005 winter range condition (DC Index) – very poor (4) Lower potential scale

The following browse, grass, and forb species were aerially seeded on the treatment area in the fall of 2005:

Species seeded	Bulk lbs in mix	Bulk lbs/acre
Blue Grama 'Bad River'	155	0.4
Blue Grama	480	1.1
Sandberg Bluegrass 'Toole MT'	350	0.8
Palmer Penstemon--'Washington UT'	100	0.2
Black Sagebrush--Sanpete UT	171	0.4
Stansbury Cliffrose	2	0.0
Stansbury Cliffrose	46	0.1
Stansbury Cliffrose	150	0.4
Green Ephedra	175	0.4
Indian Ricegrass 'Rimrock'	450	1.1
Western Wheatgrass	450	1.1
Needle and Threadgrass--Beaver, UT	100	0.2
<b>Total</b>	<b>2629</b>	<b>6.3</b>
PLS lbs/acre		4.2

HERBACEOUS TRENDS --  
Management unit 27R, Study no: 17

Type	Species	Nesting Frequency		Average Cover %	
		'05	'05	'05	'05
G	Bromus tectorum (a)	169		1.58	
G	Poa fendleriana	3		.01	
G	Sitanion hystrix	6		.02	
G	Stipa comata	4		.00	
G	Vulpia octoflora (a)	12		.05	
Total for Annual Grasses		181		1.63	
Total for Perennial Grasses		13		0.03	
Total for Grasses		194		1.67	
F	Astragalus utahensis	1		.00	
F	Chaenactis douglasii	1		.00	
F	Chenopodium fremontii (a)	1		.00	
F	Collinsia parviflora (a)	25		.04	

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
F	Cordylanthus spp. (a)	96	3.94
F	Draba spp. (a)	144	.72
F	Eriogonum cernuum (a)	5	.01
F	Erodium cicutarium (a)	4	.04
F	Eriogonum spp.	9	.01
F	Euphorbia spp.	5	.06
F	Gayophytum ramosissimum(a)	11	.03
F	Gilia spp. (a)	178	.98
F	Ipomopsis aggregata	3	.00
F	Lappula occidentalis (a)	62	.16
F	Lesquerella spp.	4	.00
F	Microsteris gracilis (a)	4	.01
F	Penstemon spp.	11	.04
F	Penstemon spp.	8	.08
F	Petradoria pumila	19	.61
F	Phlox longifolia	18	.04
F	Senecio multilobatus	3	.04
F	Streptanthus cordatus	2	.00
F	Swertia albomarginata	-	.00
Total for Annual Forbs		530	5.96
Total for Perennial Forbs		84	0.92
Total for Forbs		614	6.89

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

BROWSE TRENDS --

Management unit 27R, Study no: 17

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Amelanchier utahensis	0	-
B	Artemisia tridentata wyomingensis	22	1.58
B	Cercocarpus montanus	1	-
B	Cowania mexicana stansburiana	7	.18
B	Coryphantha spp.	0	-
B	Echinocereus spp.	1	.15
B	Ephedra viridis	7	.62
B	Gutierrezia sarothrae	5	.18
B	Juniperus osteosperma	9	3.13
B	Opuntia spp.	17	.70
B	Pinus edulis	11	7.40
B	Yucca baccata	1	.03
Total for Browse		81	13.98

CANOPY COVER, LINE INTERCEPT --

Management unit 27R, Study no: 17

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	.78
Cowania mexicana stansburiana	1.71
Echinocereus spp.	.13
Ephedra viridis	.76
Gutierrezia sarothrae	.06
Juniperus osteosperma	21.81
Opuntia spp.	.31
Pinus edulis	16.79

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 27R, Study no: 17

Species	Average leader growth (in)
	'05
<i>Artemisia tridentata wyomingensis</i>	2.8
<i>Cowania mexicana stansburiana</i>	3.5

POINT-QUARTER TREE DATA --  
Management unit 27R, Study no: 17

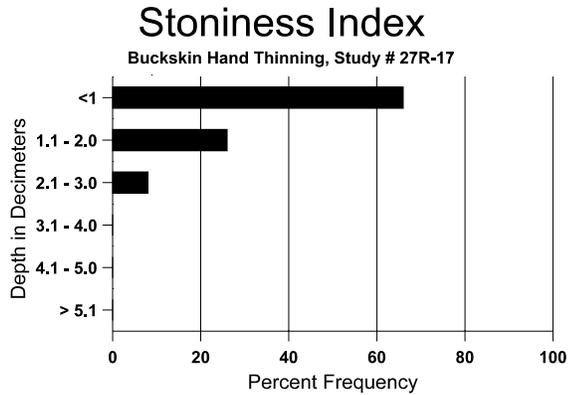
Species	Trees per Acre	Average diameter (in)
	'05	'05
<i>Juniperus osteosperma</i>	156	10.2
<i>Pinus edulis</i>	266	2.7

BASIC COVER --  
Management unit 27R, Study no: 17

Cover Type	Average Cover %
	'05
Vegetation	20.96
Rock	9.51
Pavement	22.19
Litter	45.40
Cryptogams	5.35
Bare Ground	16.32

SOIL ANALYSIS DATA --  
Management unit 27R, Study no: 17, Study Name: Buckskin Hand Thinning

Effective rooting depth (in)	Temp °F (depth)	pH	% sand	% silt	% clay	%OM	PPM P	PPM K	ds/m
7.4	65.0 (8.1)	7.5	36.4	46.7	16.8	3.4	13.0	92.8	0.6



PELLET GROUP DATA --  
Management unit 27R, Study no: 17

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	32	-
Elk	-	48 (117)
Deer	15	12 (30)
Cattle	-	1 (2)

BROWSE CHARACTERISTICS --  
Management unit 27R, Study no: 17

		Age class distribution (plants per acre)					Utilization						
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)	
<i>Amelanchier utahensis</i>													
05	0	-	-	-	-	-	0	0	-	-	0	43/35	
<i>Artemisia tridentata wyomingensis</i>													
05	580	40	40	240	300	580	14	0	52	34	34	27/31	
<i>Cercocarpus montanus</i>													
05	20	-	-	-	20	-	100	0	100	-	0	-/-	
<i>Cowania mexicana stansburiana</i>													
05	140	-	20	60	60	40	29	57	43	14	14	48/44	
<i>Coryphantha spp.</i>													
05	0	-	-	-	-	-	0	0	-	-	0	2/2	
<i>Echinocereus spp.</i>													
05	20	-	-	20	-	-	0	0	-	-	0	6/13	
<i>Ephedra viridis</i>													
05	260	40	60	200	-	-	54	0	-	-	0	27/29	

		Age class distribution (plants per acre)					Utilization						
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)	
<i>Gutierrezia sarothrae</i>													
05	<b>140</b>	-	-	140	-	20	0	0	-	-	0	9/12	
<i>Juniperus osteosperma</i>													
05	<b>180</b>	80	40	140	-	-	0	0	-	-	0	-/-	
<i>Opuntia spp.</i>													
05	<b>680</b>	-	-	640	40	40	0	0	6	3	3	6/18	
<i>Pinus edulis</i>													
05	<b>260</b>	200	120	120	20	40	0	0	8	-	0	-/-	
<i>Yucca baccata</i>													
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	16/29	

Trend Study 27R-18-05

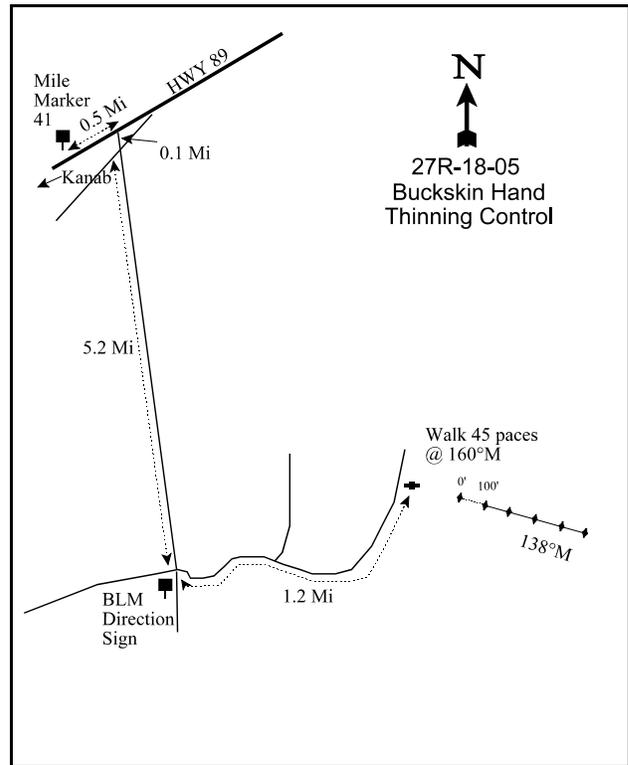
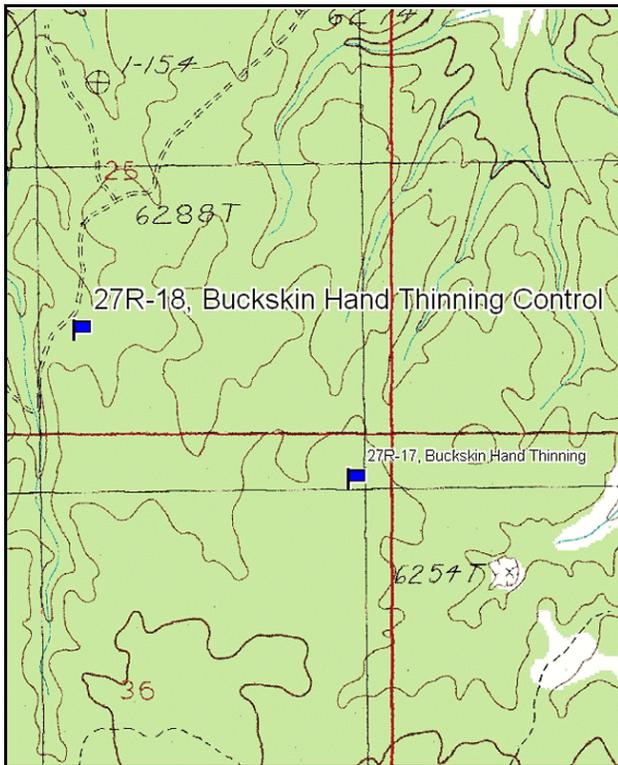
Study site name: Buckskin Hand Thinning Control. Vegetation type: P-J / Wyoming Big Sagebrush.

Compass bearing: frequency baseline 138 degrees magnetic.

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

LOCATION DESCRIPTION

From Kanab, drive west on US 89 to mile maker 41. Continue past the mile marker 0.5 miles to a road on the right (south). Turn right and drive 0.1 miles to a road. Continue on the main road for 5.2 miles to a three-way intersection. Turn left and then drive 1.2 miles to the witness post on right (east) side of the road. From the witness post, walk 45 paces at 160°M to the 0' stake. The 0' stake is marked with browse tag #91.



Map Name: Pine Hollow Canyon

Diagrammatic Sketch

Township 43S, Range 3W, Section 36

GPS: NAD 27, UTM 12S 4099471 N 404112 E

## DISCUSSION

### Buckskin Hand Thinning Control – 27R-18

The Buckskin Hand Thinning Control study was established to monitor pinyon-juniper removal project in Grand Staircase-Escalante National Monument. The treatment area is dominated by pinyon and juniper trees, which have decreased browse diversity and density. The area is important winter range for the Paunsaugunt and Kaibab deer herds, but the poor browse condition is detrimental to the deer herds. The area is also valuable breeding habitat for local and migratory birds. Removal of pinyon and juniper, combined with seeding of desirable species, was performed to improve this wildlife habitat and decrease wildfire threats. The 900-acre project area was aerially seeded with a grass, forb, and browse mix in the fall of 2005. A ground crew with chainsaws thinned the pinyon and juniper trees using the “lop and scatter” technique. This technique involves cutting down trees, cutting off some of the larger branches, and spreading them out over the treatment area. This monitoring study was located outside the eastern-most 100-acre section of the treatment and serves as the control for the treatment. The comparison study, Buckskin Hand Thinning (27R-17), was established within the treatment area.

The treatment areas are located 23 miles to the east of Kanab, south of Highway 89. The study site is located on northeastern aspect with a 4% slope at an elevation of 6,400 feet. The 2005 pellet group data was estimated at 54 elk, 3 deer, and 3 cow days use/acre (132 edu/ha, 8 ddu/ha, and 7 cdu/ha). The pellets were from fall and winter. The soil is a very shallow sandy clay with an effective rooting depth of 9 inches. Very little of the soil profile is made up of rock and 31% of the soil surface was covered in rock and pavement in 2005. The soil reaction is neutral (pH of 7.2). Bare ground cover was 19% in 2005. Litter provided the most cover with 46%. In 2005, the soil erosion condition measurement was slight due to some surface litter movement, small pedestals surrounding perennial species and shrubs, and small rills.

Browse cover is very low. The preferred browse species Wyoming big sagebrush and Stansbury cliffrose provided less than 1% combined cover in 2005. Sagebrush density was only 340 plants/acre, 59% of which were mature, 12% young, and 29% decadent. Plants classified as dying made up 24% of the population. Use was light in 2005 and leader growth averaged 3.4 inches. Cliffrose density was only 100 plants/acre. Other browse species are scattered, but were sampled on the study site. These species include: Serviceberry, true mountain mahogany, Mormon tea, broom snakeweed, prickly pear cactus, Whipple cholla, Simpson’s footcactus, banana yucca, and pincushion cactus. The low sagebrush, and browse as a whole, density and cover are a product of the high pinyon-juniper canopy cover.

Pinyon and juniper combined canopy cover was nearly 34% in 2005. 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. Pinyon density was estimated at 77 trees/acre with an average diameter of 4.5 inches. Juniper density was estimated at 127 trees/acre with an average diameter of 13.2 inches.

Four species of grasses were sampled in 2005, 2 of which were annuals. Cheatgrass was the dominant species with 1% cover and a quadrat frequency of 64%. The other 3 species sampled in 2005 were Sandberg bluegrass, squirreltail bottlebrush, and sixweeks fescue.

Twenty-six species of forbs were sampled in 2005, 11 of which were annuals. The annual species birdbeak was the dominant forb species with nearly 7% cover and quadrat frequency of 49%. All other species combined provided less than 4% cover.

### 2005 Pretreatment Assessment

Pinyon and juniper canopy cover is very high and is hindering the growth of browse, grass, and forb species.

These desired species will continue to be hindered by the continued growth of the pinyon-juniper. The Desirable Components Index rating was very poor due to low browse cover, low perennial grass and forb cover, and some annual grass cover.

2005 winter range condition (DC Index) – very poor (4) Lower potential scale

HERBACEOUS TRENDS --  
Management unit 27R, Study no: 18

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Bromus tectorum (a)	179	1.13
G	Poa secunda	2	.01
G	Sitanion hystrix	24	.26
G	Vulpia octoflora (a)	34	.11
Total for Annual Grasses		213	1.25
Total for Perennial Grasses		26	0.27
Total for Grasses		239	1.52
F	Arabis spp.	31	.10
F	Astragalus spp.	19	.41
F	Calochortus nuttallii	3	.00
F	Chaenactis douglasii	13	.11
F	Cordylanthus spp. (a)	128	6.75
F	Cymopterus spp.	8	.02
F	Descurainia pinnata (a)	4	.01
F	Draba spp. (a)	126	.48
F	Erodium cicutarium (a)	16	.53
F	Eriogonum spp.	10	.15
F	Eriogonum umbellatum	12	.45
F	Gayophytum ramosissimum(a)	13	.02
F	Gilia spp. (a)	124	.51
F	Ipomopsis aggregata	2	.01
F	Lappula occidentalis (a)	99	.29
F	Lesquerella spp.	3	.01
F	Microsteris gracilis (a)	7	.02
F	Penstemon spp.	7	.07
F	Penstemon spp.	1	.03
F	Petradoria pumila	7	.18
F	Phlox hoodii	-	.00
F	Polygonum douglasii (a)	2	.00
F	Ranunculus testiculatus (a)	5	.01
F	Senecio multilobatus	-	.00

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
F	Swertia albomarginata	2	.15
F	Unknown forb-annual (a)	33	.15
Total for Annual Forbs		557	8.80
Total for Perennial Forbs		118	1.74
Total for Forbs		675	10.54

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

#### BROWSE TRENDS --

Management unit 27R, Study no: 18

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	Amelanchier utahensis	0	-
B	Artemisia tridentata wyomingensis	12	.45
B	Cercocarpus montanus	0	-
B	Cowania mexicana stansburiana	4	.18
B	Coryphantha spp.	3	.00
B	Ephedra viridis	1	-
B	Gutierrezia sarothrae	9	.52
B	Juniperus osteosperma	12	2.02
B	Opuntia spp.	14	.96
B	Opuntia whipplei	7	.63
B	Pediocactus simpsonii	1	.00
B	Pinus edulis	1	.87
B	Yucca baccata	2	.45
Total for Browse		66	6.11

CANOPY COVER, LINE INTERCEPT --  
 Management unit 27R, Study no: 18

Species	Percent Cover '05
Artemisia tridentata wyomingensis	1.10
Cowania mexicana stansburiana	.13
Gutierrezia sarothrae	.61
Juniperus osteosperma	21.04
Opuntia spp.	.53
Pinus edulis	12.50
Yucca baccata	.73

KEY BROWSE ANNUAL LEADER GROWTH --  
 Management unit 27R, Study no: 18

Species	Average leader growth (in) '05
Artemisia tridentata wyomingensis	3.4
Cowania mexicana stansburiana	4.7

POINT-QUARTER TREE DATA --  
 Management unit 27R, Study no: 18

Species	Trees per Acre '05	Average diameter (in) '05
Juniperus osteosperma	127	13.2
Pinus edulis	77	4.5

BASIC COVER --  
 Management unit 27R, Study no: 18

Cover Type	Average Cover % '05
Vegetation	14.80
Rock	9.67
Pavement	21.84
Litter	45.95
Cryptogams	2.75
Bare Ground	18.84

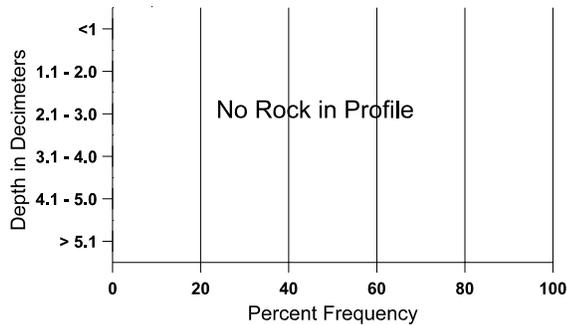
SOIL ANALYSIS DATA --

Management unit 27R, Study no: 18, Study Name: Buckskin Hand Thinning Control

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
8.8	70.4 (9.3)	7.2	45.1	18.1	36.8	1.4	18.0	108.8	0.5

### Stoniness Index

Buckskin Hand Thinning Control, Study # 27R-18



PELLET GROUP DATA --

Management unit 27R, Study no: 18

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	69	-
Elk	2	54 (132)
Deer	23	3 (8)
Cattle	1	3 (7)

BROWSE CHARACTERISTICS --

Management unit 27R, Study no: 18

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>												
05	0	-	-	-	-	-	0	0	-	-	0	53/44
<i>Artemisia tridentata wyomingensis</i>												
05	340	80	40	200	100	260	18	0	29	24	24	17/23
<i>Cercocarpus montanus</i>												
05	0	-	-	-	-	-	0	0	-	-	0	9/12
<i>Cowania mexicana stansburiana</i>												
05	100	-	-	80	20	-	0	100	20	-	0	49/45
<i>Coryphantha spp.</i>												
05	60	-	-	60	-	-	0	0	-	-	0	1/2

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Ephedra viridis</i>												
05	<b>20</b>	-	-	20	-	-	100	0	-	-	0	25/31
<i>Gutierrezia sarothrae</i>												
05	<b>420</b>	60	-	420	-	40	0	0	-	-	0	7/10
<i>Juniperus osteosperma</i>												
05	<b>240</b>	60	60	160	20	40	0	0	8	-	0	-/-
<i>Opuntia spp.</i>												
05	<b>680</b>	20	20	620	40	-	0	0	6	6	6	6/17
<i>Opuntia whipplei</i>												
05	<b>180</b>	-	20	160	-	60	0	0	-	-	0	7/23
<i>Pediocactus simpsonii</i>												
05	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
<i>Pinus edulis</i>												
05	<b>40</b>	80	-	40	-	-	0	0	-	-	0	-/-
<i>Yucca baccata</i>												
05	<b>120</b>	-	20	100	-	-	0	0	-	-	0	17/27

Trend Study 28R-8-05

Study site name: South Canyon Burn 1 .

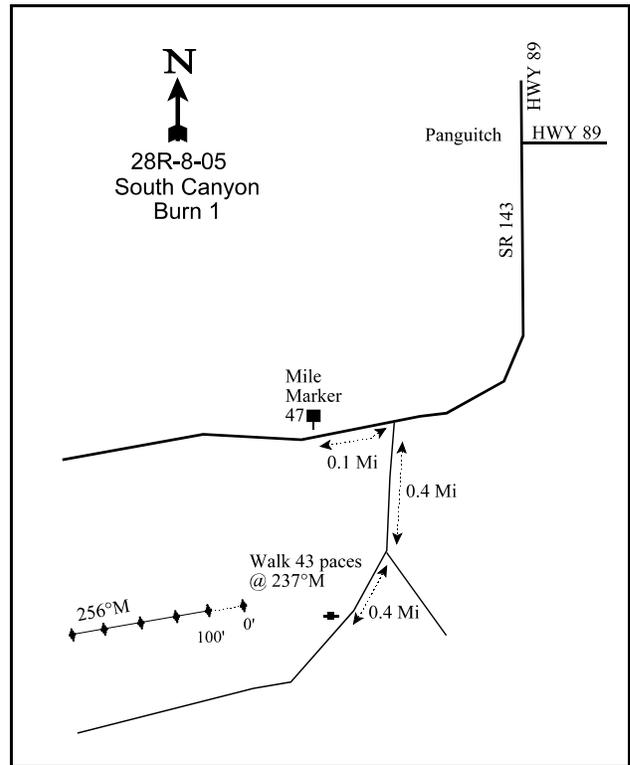
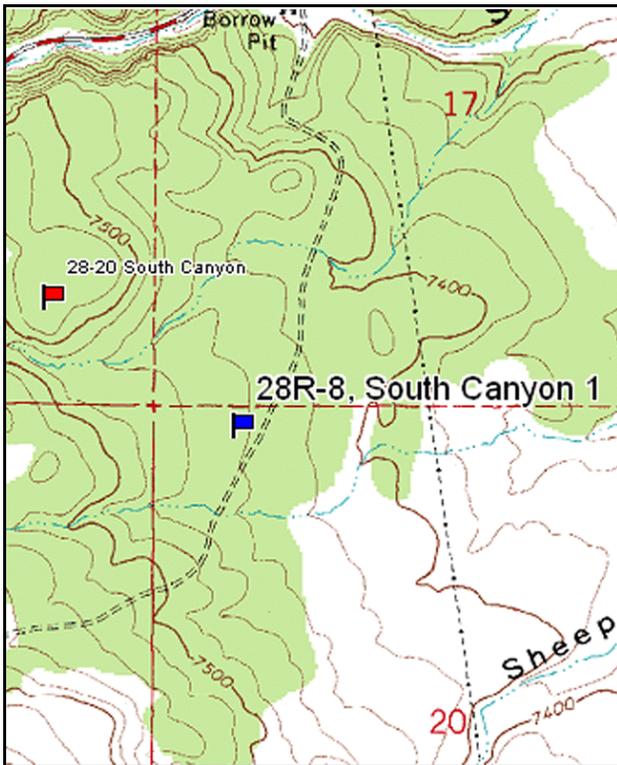
Vegetation type: P-J / Black Sagebrush .

Compass bearing: frequency baseline 256 degrees magnetic.

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

LOCATION DESCRIPTION

From Panguitch, drive south on SR 143 to 0.1 miles before mile marker 47. Turn left onto a dirt road and drive 0.4 miles to a fork. Stay right at the fork and drive another 0.4 miles to the witness post on the right (west) side of the road. From the witness post, walk 43 paces at 237°M to the 0' stake. The 0' stake is marked with browse tag #68.



Map Name: Panguitch

Diagrammatic Sketch

Township 35S, Range 5W, Section 20

GPS: NAD 27, UTM 12S 4179879 N 372364 E

HERBACEOUS TRENDS --  
 Management unit 28R, Study no: 8

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Bouteloua gracilis</i>	3	.15
G	<i>Oryzopsis hymenoides</i>	13	.05
G	<i>Sitanion hystrix</i>	26	.20
G	<i>Stipa columbiana</i>	3	.03
Total for Annual Grasses		0	0
Total for Perennial Grasses		45	0.44
Total for Grasses		45	0.44
F	<i>Arabis</i> spp.	7	.05
F	<i>Astragalus convallarius</i>	5	.13
F	<i>Cryptantha</i> spp.	24	.13
F	<i>Descurainia pinnata</i> (a)	18	.06
F	<i>Leucelene ericoides</i>	7	.01
F	<i>Lesquerella</i> spp.	1	.00
F	<i>Phlox longifolia</i>	6	.01
F	<i>Senecio multilobatus</i>	83	2.48
F	<i>Trifolium</i> spp.	5	.00
Total for Annual Forbs		18	0.06
Total for Perennial Forbs		138	2.82
Total for Forbs		156	2.88

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

BROWSE TRENDS --  
 Management unit 28R, Study no: 8

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia nova</i>	65	9.15
B	<i>Chrysothamnus nauseosus</i>	1	.00
B	<i>Chrysothamnus viscidiflorus</i> <i>viscidiflorus</i>	1	-
B	<i>Gutierrezia sarothrae</i>	52	.67
B	<i>Juniperus osteosperma</i>	2	.78
B	<i>Opuntia</i> spp.	1	-
B	<i>Pinus edulis</i>	29	16.83
Total for Browse		151	27.45

CANOPY COVER, LINE INTERCEPT --  
 Management unit 28R, Study no: 8

Species	Percent Cover
	'05
Artemisia nova	7.84
Gutierrezia sarothrae	.56
Juniperus osteosperma	2.08
Pinus edulis	35.06

POINT-QUARTER TREE DATA --  
 Management unit 28R, Study no: 8

Species	Trees per Acre
	'05
Juniperus osteosperma	24
Pinus edulis	373

Average diameter (in)
'05
4.2
5.1

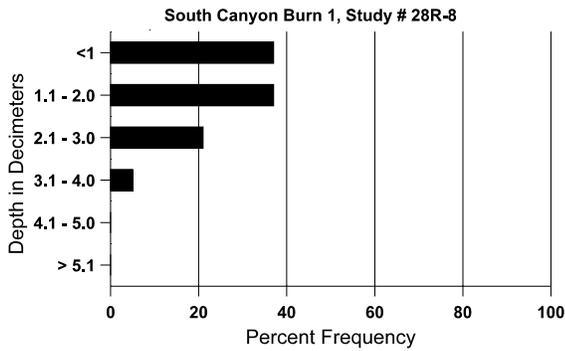
BASIC COVER --  
 Management unit 28R, Study no: 8

Cover Type	Average Cover %
	'05
Vegetation	30.29
Rock	7.31
Pavement	23.69
Litter	46.04
Cryptogams	1.83
Bare Ground	13.11

SOIL ANALYSIS DATA --  
 Management unit 28R, Study no: 8, Study Name: South Canyon Burn 1

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
14.0	44.6 (12.2)	7.1	63.1	13.1	23.8	2.1	12.3	76.8	0.6

# Stoniness Index



PELLET GROUP DATA --  
Management unit 28R, Study no: 8

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	23	-
Deer	3	1 (3)
Cattle	1	-

BROWSE CHARACTERISTICS --  
Management unit 28R, Study no: 8

		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>												
05	<b>3180</b>	80	60	1880	1240	3400	3	.62	39	14	15	15/21
<i>Chrysothamnus nauseosus</i>												
05	<b>20</b>	-	-	-	20	-	0	0	100	100	100	36/27
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
05	<b>20</b>	-	-	20	-	-	0	100	-	-	0	4/9
<i>Gutierrezia sarothrae</i>												
05	<b>3660</b>	200	820	2760	80	20	.54	0	2	1	1	9/6
<i>Juniperus osteosperma</i>												
05	<b>40</b>	-	-	40	-	-	0	0	-	-	0	-/-
<i>Opuntia spp.</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	6/8
<i>Pinus edulis</i>												
05	<b>640</b>	40	120	500	20	20	0	0	3	3	9	-/-

Trend Study 28R-9-05

Study site name: South Canyon Burn 2 .

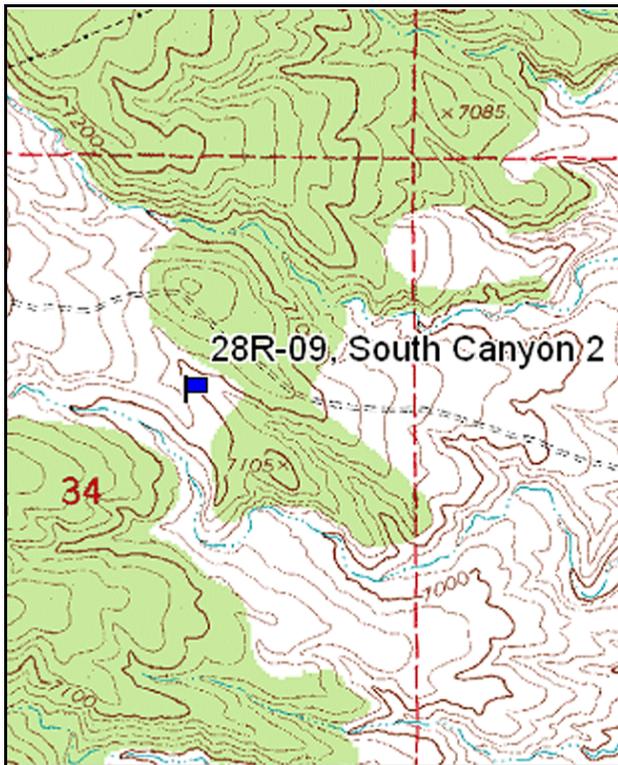
Vegetation type: P-J / Black Sagebrush .

Compass bearing: frequency baseline 298 degrees magnetic.

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

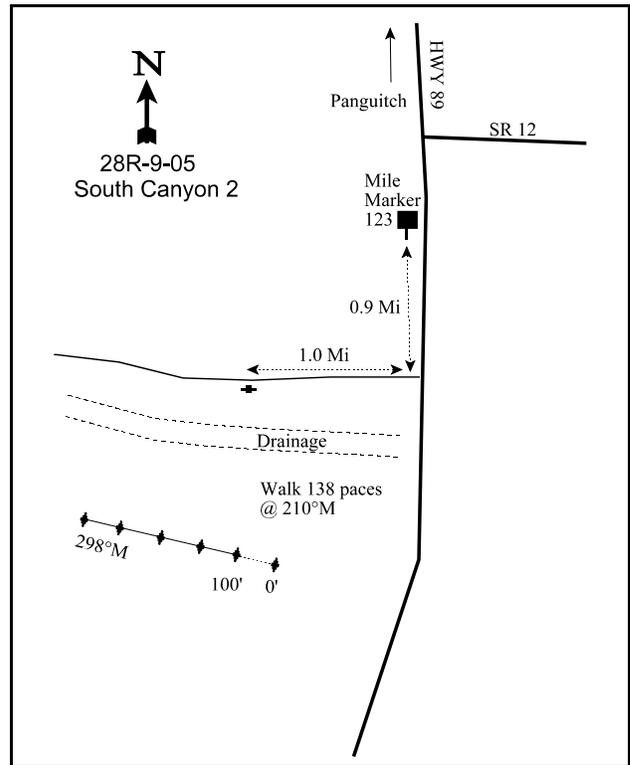
LOCATION DESCRIPTION

From Panguitch, drive west on US 89 to mile marker 123. Continue 0.9 miles to a dirt road on the left (west) with a cattleguard. Turn left and drive 1.0 miles to the witness post on the left (south) side of the road. From the witness post, walk 138 paces at 210°M to the 0' stake. The site is across a drainage on the top of a ridge to the south of the road. The 0' stake is marked with browse tag #70.



Map Name: Hatch

Township 35S, Range 5W, Section 34



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4176050 N 376355 E

HERBACEOUS TRENDS --  
 Management unit 28R, Study no: 9

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Bouteloua gracilis</i>	104	2.19
G	<i>Carex</i> spp.	3	.00
G	<i>Oryzopsis hymenoides</i>	20	.18
G	<i>Poa secunda</i>	3	.03
G	<i>Sitanion hystrix</i>	32	.23
G	<i>Stipa columbiana</i>	1	.03
Total for Annual Grasses		0	0
Total for Perennial Grasses		163	2.67
Total for Grasses		163	2.67
F	<i>Arabis</i> spp.	2	.00
F	<i>Chenopodium leptophyllum</i> (a)	1	.00
F	<i>Cryptantha</i> spp.	9	.08
F	<i>Descurainia pinnata</i> (a)	7	.02
F	<i>Gayophytum ramosissimum</i> (a)	61	.28
F	<i>Lotus</i> spp.	1	.00
F	<i>Phlox longifolia</i>	2	.00
Total for Annual Forbs		69	0.30
Total for Perennial Forbs		14	0.09
Total for Forbs		83	0.39

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

BROWSE TRENDS --  
 Management unit 28R, Study no: 9

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia nova</i>	55	3.30
B	<i>Ceratoides lanata</i>	0	-
B	<i>Chrysothamnus nauseosus</i>	0	-
B	<i>Gutierrezia sarothrae</i>	2	.01
B	<i>Juniperus osteosperma</i>	0	-
B	<i>Opuntia</i> spp.	4	.18
B	<i>Pediocactus simpsonii</i>	1	-
B	<i>Pinus edulis</i>	37	27.88
B	<i>Purshia tridentata</i>	0	-
Total for Browse		99	31.38

CANOPY COVER, LINE INTERCEPT --

Management unit 28R, Study no: 9

Species	Percent Cover
	'05
Artemisia nova	2.46
Pinus edulis	48.98

POINT-QUARTER TREE DATA --

Management unit 28R, Study no: 9

Species	Trees per Acre	Average diameter (in)
	'05	'05
Pinus edulis	365	5.4

BASIC COVER --

Management unit 28R, Study no: 9

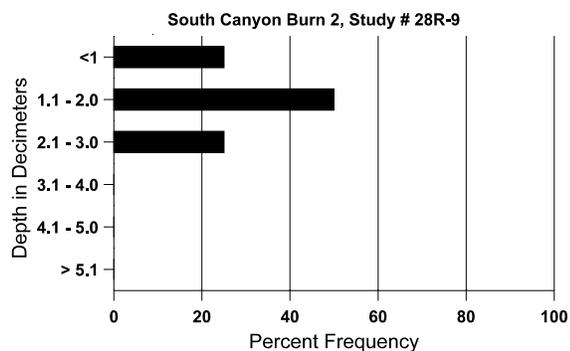
Cover Type	Average Cover %
	'05
Vegetation	35.37
Rock	9.08
Pavement	17.13
Litter	54.73
Cryptogams	1.57
Bare Ground	15.19

SOIL ANALYSIS DATA --

Management unit 28R, Study no: 9, Study Name: South Canyon Burn 2

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
9.1	54.0 (11.8)	6.5	45.1	33.1	21.8	2.4	15.2	150.4	0.5

Stoniness Index



PELLET GROUP DATA --  
 Management unit 28R, Study no: 9

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	36	-
Elk	-	1 (2)
Deer	2	3 (8)
Cattle	1	2 (4)

BROWSE CHARACTERISTICS --  
 Management unit 28R, Study no: 9

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia nova</i>												
05	<b>1940</b>	40	80	1040	820	2820	2	0	42	26	28	13/21
<i>Ceratoides lanata</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	7/10
<i>Chrysothamnus nauseosus</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	17/21
<i>Gutierrezia sarothrae</i>												
05	<b>60</b>	60	40	20	-	-	0	0	-	-	0	11/9
<i>Juniperus osteosperma</i>												
05	<b>0</b>	20	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia spp.</i>												
05	<b>80</b>	-	-	80	-	-	25	0	-	-	0	6/13
<i>Pediocactus simpsonii</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	1/2
<i>Pinus edulis</i>												
05	<b>960</b>	40	200	740	20	20	0	2	2	-	0	-/-
<i>Purshia tridentata</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	51/108

Trend Study 28R-10-05

Study site name: Buckskin Valley Dixie .

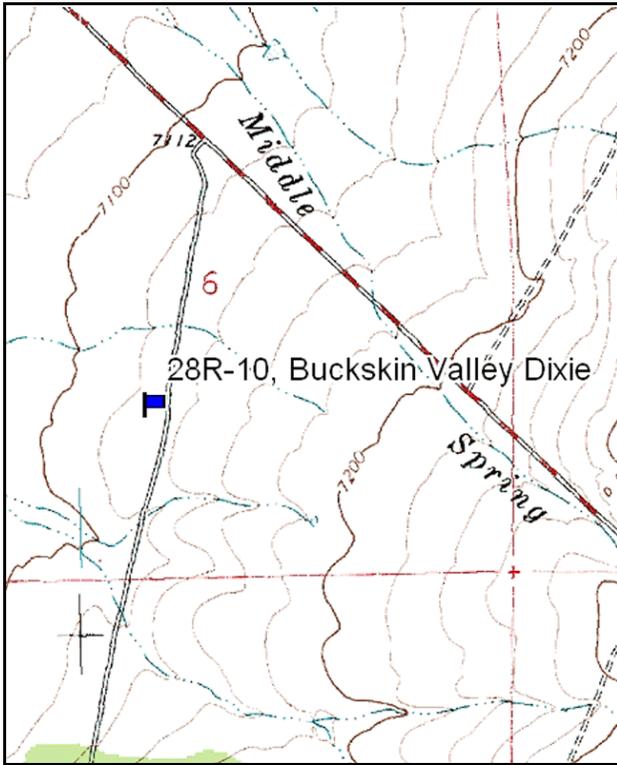
Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 280 degrees magnetic.

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

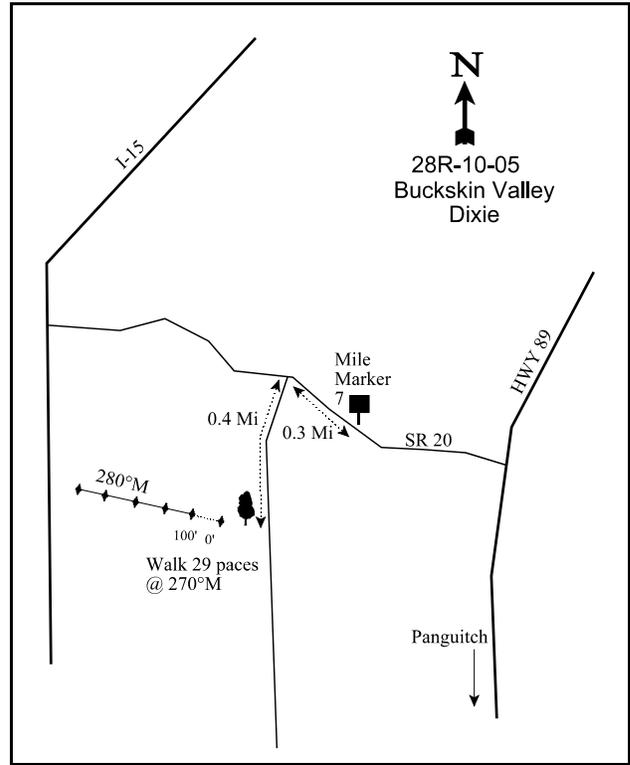
LOCATION DESCRIPTION

From Panguitch, drive north on US 89 to the junction of SR 20. Turn left (west) on SR 20 and drive to mile marker 7. Continue west 0.3 miles to a dirt road on the left (south). Turn left and drive 0.4 miles to the only big Juniper on the right (west) side of the road. From the big juniper, walk 29 paces at 270°M to the 0' stake. The 0' stake is marked with browse tag #74.



Map Name: Burnt Peak

Township 32S, Range 7W, Section 6



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4211999 N 361246 E

## DISCUSSION

### Buckskin Valley Dixie – 28R-10

The Buckskin Valley Dixie study was established to monitor a treatment within the Buckskin Utah prairie dog complex. The treatment was designed to improve Utah prairie dog habitat for possible natural expansions of existing complexes. Ideal habitat requires little to no shrub cover and high grass and forb species diversity. Improvement of patches of native grasses and forbs could also improve existing sage grouse populations. The 390-acre treatment area was Dixie pipe harrowed with a 30-foot harrow in 2 directions; the first direction before sagebrush seed was released in early fall of 2005, and the second direction in November of 2005. During the second harrowing, seed was applied on the treatment area using a broadcast seeder attached to the tractor that pulled the harrow. The area was on 270 acres of BLM land and 120 acres of private land.

The treatment area is located approximately 16 miles southeast of Beaver in Buckskin Valley, just south of SR 20. The monitoring study is located on a western aspect with a 3% slope at an elevation of 7,100 feet on BLM land. Pellet group data in 2005 was estimated at 1 deer and 36 cow days use/acre (2 ddu/ha and 90 cdu/ha). Cattle had used the area mainly in spring and fall.

The soil is a shallow loam with an effective rooting depth of 11 inches. Very little rock is in the profile and pavement provided 22% cover in 2005. The soil reaction is neutral (pH of 6.9). Bare ground cover was quite high in 2005 at 40%. In 2005, the soil erosion condition measurement was stable.

The key browse species is Wyoming big sagebrush. It provided 18% cover and 20% line intercept cover. Sagebrush density was 6,640 plants/acre in 2005, 74% of which were mature individuals, 6% were mature, and 20% were decadent. Seven percent of the population was classified as dying. Use was moderate to heavy in 2005. In 2005, leader growth averaged 1.6 inches. Broom snakeweed, prickly phlox, and prickly pear cactus were also identified during the pretreatment sampling in 2005.

Two species of grasses were sampled in 2005, both of which were perennials. Crested wheatgrass was the dominant species in 2005 with 15% cover and a quadrat frequency of 98%. Blue grama was sampled in 2% of the quadrats.

Sixteen species of forbs were sampled in 2005, 4 of which were annuals. Combined forb cover was less than 2% in 2005. Every species provided less than 1% cover individually. The following species (or species the same genera) have been shown to be beneficial to sage grouse: Timber poisonvetch, wing eriogonum, redroot buckwheat, silvery lupine, clover, and longleaf phlox (Martin 1970; Barnett and Crawford 1994; Drut et al. 1994; Wallstad 1975; Klebenow and Gray 1968).

### 2005 Pretreatment Assessment

The harrow treatment should decrease the sagebrush density and prepare the soil for the forb and grass seed mix. The Desirable Components Index rating was excellent due to excellent perennial grass and browse cover.

2005 winter range condition (DC Index) – excellent (73) Lower potential scale

The following is the seed mix broadcast on the treatment area:

Seeded species	Bulk lbs in mix	Bulk lbs/acre
Bottlebrush Squirreltail	100	0.4
Small Burnet 'Delar'	100	0.4
Galleta	140	0.5
Snake River Wheatgrass 'Secar'*	200	0.7
Snake River Wheatgrass 'Secar'*	50	0.2
Western Wheatgrass 'Rosana'*	152	0.6
Sandberg Bluegrass*	100	0.4
Indian Ricegrass 'Nezpar'*	400	1.5
Canby Bluegrass 'Canbar'	100	0.4
Bottlebrush Squirreltail*	50	0.2
Sand Dropseed*	50	0.2
Blue Grama 'Alma'*	200	0.7
Alfalfa 'Ladak'*	200	0.7
Small Burnet*	150	0.6
Lewis Flax 'Appar'*	250	0.9
Winterfat--Duchesne UT	125	0.5
Rocky Mtn. Penstemon*	50	0.2
Western Yarrow*	30	0.1
Sainfoin 'Eski'*	500	1.9
Palmer Penstemon 'Washington, UT'	50	0.2
<b>Total</b>	<b>2997</b>	<b>11.1</b>
PLS lbs/acre		8.1

\* Seed provided by Cedar City BLM

HERBACEOUS TRENDS --

Management unit 28R, Study no: 10

Type	Species	Nested Frequency	Average Cover %
		'05	'05
G	Agropyron cristatum	350	14.94
G	Bouteloua gracilis	6	.06
Total for Annual Grasses		0	0
Total for Perennial Grasses		356	15.00
Total for Grasses		356	15.00
F	Astragalus convallarius	4	.06
F	Comandra pallida	6	.01
F	Cryptantha spp.	9	.02
F	Cymopterus spp.	8	.01
F	Eriogonum alatum	4	.03
F	Eriogonum racemosum	16	.10
F	Gayophytum ramosissimum(a)	20	.07
F	Lappula occidentalis (a)	1	.00

Type	Species	Nested Frequency	Average Cover %
		'05	'05
F	Lotus spp.	11	.03
F	Lupinus argenteus	8	.21
F	Phlox longifolia	80	.32
F	Polygonum douglasii (a)	8	.01
F	Ranunculus testiculatus (a)	3	.03
F	Sphaeralcea coccinea	96	.66
F	Trifolium spp.	8	.02
F	Zigadenus paniculatus	2	.00
Total for Annual Forbs		32	0.12
Total for Perennial Forbs		252	1.49
Total for Forbs		284	1.61

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

#### BROWSE TRENDS --

Management unit 28R, Study no: 10

Type	Species	Strip Frequency	Average Cover %
		'05	'05
B	Artemisia tridentata wyomingensis	91	18.35
B	Gutierrezia sarothrae	12	.06
B	Juniperus osteosperma	0	-
B	Leptodactylon pungens	1	.00
B	Opuntia spp.	0	-
Total for Browse		104	18.42

#### CANOPY COVER, LINE INTERCEPT --

Management unit 28R, Study no: 10

Species	Percent Cover
	'05
Artemisia tridentata wyomingensis	20.45
Gutierrezia sarothrae	.08

KEY BROWSE ANNUAL LEADER GROWTH --  
Management unit 28R, Study no: 10

Species	Average leader growth (in)
	'05
Artemisia tridentata wyomingensis	1.6

BASIC COVER --  
Management unit 28R, Study no: 10

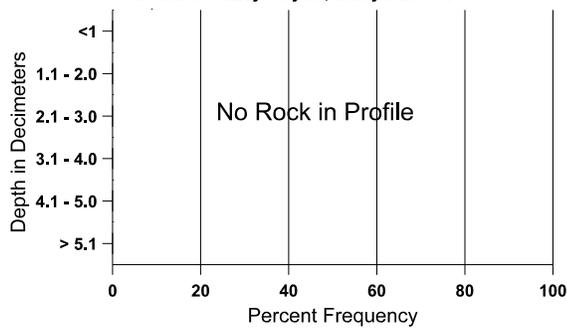
Cover Type	Average Cover %
	'05
Vegetation	31.26
Rock	1.11
Pavement	22.16
Litter	19.10
Cryptogams	.63
Bare Ground	40.09

SOIL ANALYSIS DATA --  
Management unit 28R, Study no: 10, Study Name: Buckskin Valley Hwy 20

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
11.2	57.2 (13.3)	6.9	47.1	31.1	21.8	2.2	11.3	131.2	0.6

### Stoniness Index

Buckskin Valley Hwy 20, Study # 28R-10



PELLET GROUP DATA --  
Management unit 28R, Study no: 10

Type	Quadrat Frequency	Days use per acre (ha)
	'05	'05
Rabbit	46	-
Deer	2	1 (2)
Cattle	6	36 (90)

BROWSE CHARACTERISTICS --  
 Management unit 28R, Study no: 10

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Artemisia tridentata wyomingensis</i>												
05	<b>6640</b>	20	380	4940	1320	60	22	39	20	7	7	21/28
<i>Gutierrezia sarothrae</i>												
05	<b>300</b>	-	20	280	-	-	0	0	-	-	0	9/6
<i>Juniperus osteosperma</i>												
05	<b>0</b>	20	-	-	-	-	0	0	-	-	0	-/-
<i>Leptodactylon pungens</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	4/3
<i>Opuntia spp.</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	7/13

Trend Study 28R-11-05

Study site name: Five Mile Hollow .

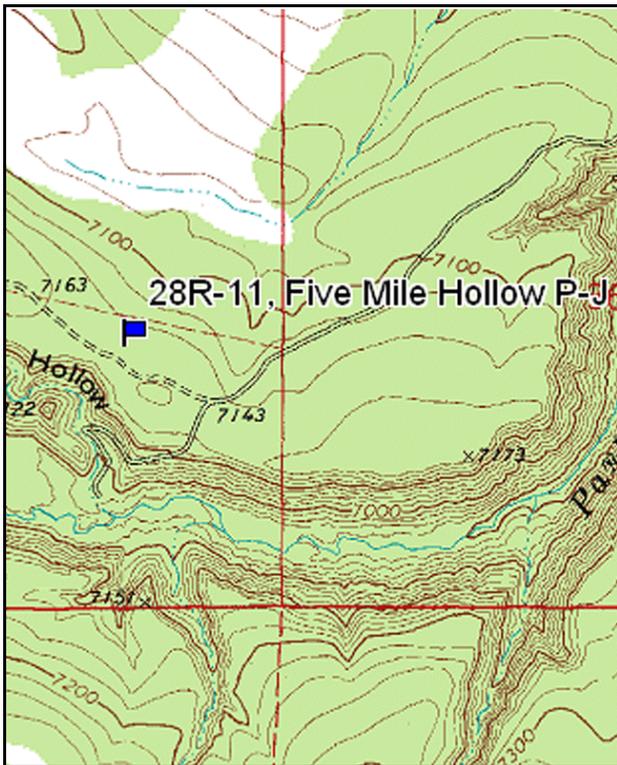
Vegetation type: P-J / Black Sagebrush .

Compass bearing: frequency baseline 0-100' 8 and 0-300' 100 degrees magnetic.

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

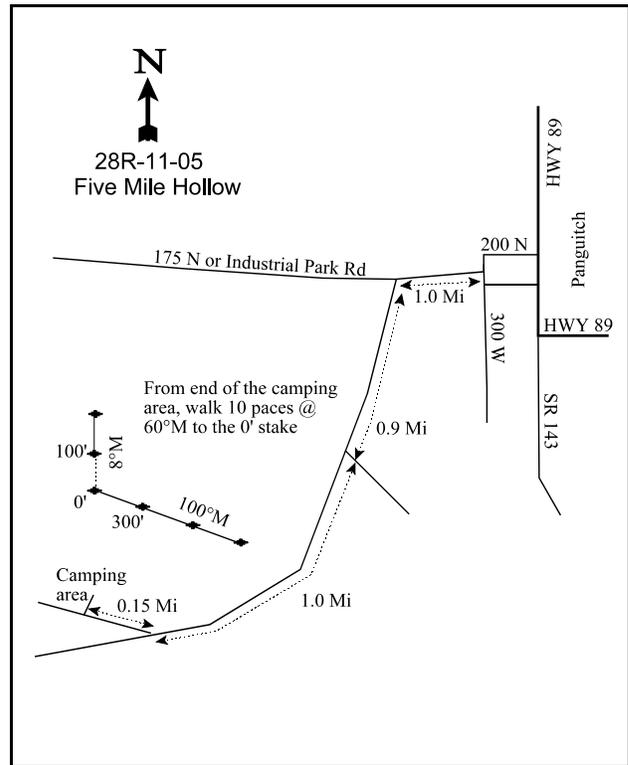
LOCATION DESCRIPTION

From US 89 in Panguitch, head west on 200 north. Drive to 300 west and turn left (south) and make an immediate right (west) onto 175 north (Industrial Park Rd). Drive 0.5 miles to a four-way intersection. Continue straight (west) for 0.5 miles to a fork in the road. Take the left fork and drive 0.9 miles to another fork in the road. Take the right fork and drive 1.0 miles staying on the main road to a another fork. Take the right fork and drive 0.15 miles to a campground right (north). Turn right into the campground and from the end of the camping area, walk 10 paces at 60°M to the 0' stake. The 0' stake is marked with browse tag #75.



Map Name: Panguitch

Township 34S, Range 6W, Section 35



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4185502 N 368772 E

## DISCUSSION

### Five Mile Hollow Control – 28R-11

The Five Mile Hollow Control study monitors a pinyon-juniper forest area outside the Five Mile Hollow Sagebrush Restoration treatment area. The project was designed to prevent further encroachment of pinyon and juniper into sage grouse brooding and wintering habitat. The area, which is also critical winter range, is increasing in pinyon-juniper canopy cover and decreasing in sagebrush cover. The sagebrush is critical for sage grouse and deer habitat. The BLM had designated the area a greenwood-harvesting area, which allowed permitted tree removal, but this did not reach the objectives of tree removal. Therefore, a more intensive treatment was required to prevent sagebrush die-off. The project involves a 6,700-acre pinyon-juniper removal over 4 years, around 1,675 acres/year, on BLM land located 1 mile west of Panguitch. The project began in 2005 with pinyon and juniper tree removal by hand thinning, or “lop and scatter,” with chainsaws. This technique involves cutting down trees, cutting off some of the larger branches, and spreading them out over the treatment area. The Five Mile Hollow Control study was established just outside the treatment area in a dense pinyon-juniper forest and will serve as a comparison to a study, which will be placed within the treatment area in 2006 or 2007.

The monitoring study location was established on the far south end of the treatment area west of Panguitch. The site is on a northeast aspect with a 3% slope at an elevation of 7,100 feet. The treatment area is within 2 BLM grazing allotments. The upper portion is within the Three Mile Creek allotment, which allows grazing of 50 cattle from August 1 to September 30 and November 1 to December 31. The lower portion is within the Shearing Corral allotment, which allows 13 cattle to graze from July 15 to February 28. The 2005 pellet group data was estimated at 3 elk and 39 deer days use/acre (8 edu/ha and 96 ddu/ha). The pellets sampled were mainly from winter use.

The soil is a shallow loam with an effective rooting depth of 11 inches. The soil profile contains between 30-50% rock and pavement cover was 26% in 2005. The soil reaction is mildly alkaline (7.4 pH). Litter provided 51% cover and vegetation 19%. In 2005, the soil erosion condition measurement was stable.

The key browse species is black sagebrush. It provided 9% cover in 2005 and had a density of 3,900 plants/acre. Mature individuals made up 63% of the population in 2005, decadents made up 33%, and young made up 4%. Plants classified as dying made up 9% of the population in 2005. Use was mostly light and average leader growth was 1.9 inches. Mountain big sagebrush, prickly pear cactus, Simpson’s footcactus, and broom snakeweed were also sampled in small densities.

Pinyon pine was sampled in 2005 with an estimated canopy cover of 20%. Tausch and West (1994) showed that as pinyon-juniper cover increases, the herbaceous and browse understories decrease. Generally, pinyon-juniper cover of over 15% greatly diminishes the understory cover. The estimated pinyon tree density was 566 trees/acre with a trunk diameter of 3.2 inches in 2005. The high pinyon canopy cover has prevented the growth of herbaceous understory species.

Two species of grasses were sampled in 2005, blue grama and squirreltail bottlebrush. Both species are perennials and provided a combined cover of less than 1% in 2005.

Seven species of forbs were sampled in 2005, 3 of which were annuals. All seven species combined provided one-half percent cover in 2005.

### 2005 Pretreatment Assessment

Pinyon canopy cover is very high and is hindering the growth of grass and forb species. Browse species are being affected by the pinyon canopy, but not to the extent of the herbaceous species. These desired species

will continue to be hindered by the continued growth of the pinyon. The Desirable Components Index rating was poor due to moderate browse cover, low perennial grass, and low forb cover.

2005 winter range condition (DC Index) –poor (22) Lower potential scale

HERBACEOUS TRENDS --

Management unit 28R, Study no: 11

T y p e	Species	Nested Frequency	Average Cover %
		'05	'05
G	<i>Bouteloua gracilis</i>	9	.08
G	<i>Sitanion hystrix</i>	16	.11
Total for Annual Grasses		0	0
Total for Perennial Grasses		25	0.19
Total for Grasses		25	0.19
F	<i>Arabis</i> spp.	6	.07
F	<i>Astragalus lentiginosus</i>	12	.03
F	<i>Cryptantha</i> spp.	17	.11
F	<i>Descurainia pinnata</i> (a)	4	.07
F	<i>Gayophytum ramosissimum</i> (a)	1	.00
F	<i>Ipomopsis aggregata</i>	14	.05
F	<i>Lappula occidentalis</i> (a)	12	.19
Total for Annual Forbs		17	0.27
Total for Perennial Forbs		49	0.27
Total for Forbs		66	0.54

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

BROWSE TRENDS --

Management unit 28R, Study no: 11

T y p e	Species	Strip Frequency	Average Cover %
		'05	'05
B	<i>Artemisia nova</i>	70	9.28
B	<i>Artemisia tridentata vaseyana</i>	1	.00
B	<i>Gutierrezia sarothrae</i>	13	.06
B	<i>Opuntia</i> spp.	2	-
B	<i>Pediocactus simpsonii</i>	1	-
B	<i>Pinus edulis</i>	29	9.36
B	<i>Rhus trilobata</i>	0	-
Total for Browse		116	18.71

CANOPY COVER, LINE INTERCEPT --

Management unit 28R, Study no: 11

Species	Percent Cover
	'05
Artemisia nova	11.53
Gutierrezia sarothrae	.15
Pinus edulis	20.48

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 28R, Study no: 11

Species	Average leader growth (in)
	'05
Artemisia nova	1.9

POINT-QUARTER TREE DATA --

Management unit 28R, Study no: 11

Species	Trees per Acre	Average diameter (in)
	'05	'05
Pinus edulis	566	3.2

BASIC COVER --

Management unit 28R, Study no: 11

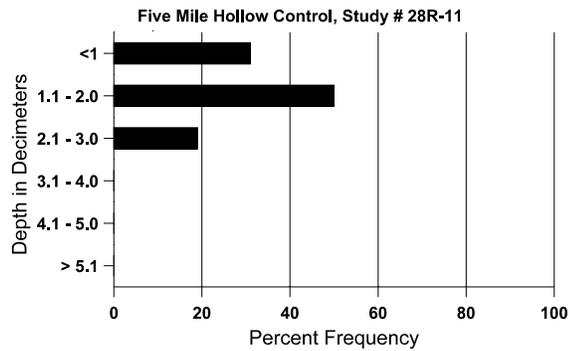
Cover Type	Average Cover %
	'05
Vegetation	19.21
Rock	5.81
Pavement	26.46
Litter	51.25
Cryptogams	.42
Bare Ground	11.30

SOIL ANALYSIS DATA --

Management unit 28R, Study no: 11, Study Name: Five Mile Hollow Control

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
10.6	57.2 (9.3)	7.4	47.7	30.4	21.5	2.5	11.3	188.8	0.7

## Stoniness Index



### PELLET GROUP DATA --

Management unit 28R, Study no: 11

Type	Quadrat Frequency '05	Days use per acre (ha) '05
Rabbit	34	-
Elk	1	3 (8)
Deer	23	39 (96)

### BROWSE CHARACTERISTICS --

Management unit 28R, Study no: 11

Y e a r	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 nova</i>												
05	<b>3900</b>	100	140	2460	1300	420	11	11	33	9	11	15/25
<i>Artemisia tridentata vaseyana</i>												
05	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
05	<b>660</b>	-	60	600	-	-	0	0	-	-	0	10/6
<i>Opuntia spp.</i>												
05	<b>40</b>	-	-	40	-	-	0	0	-	-	0	4/7
<i>Pediocactus simpsonii</i>												
05	<b>20</b>	-	-	20	-	-	0	0	-	-	0	2/3
<i>Pinus edulis</i>												
05	<b>820</b>	80	420	360	40	200	0	0	5	-	5	-/-
<i>Rhus trilobata</i>												
05	<b>0</b>	-	-	-	-	-	0	0	-	-	0	16/27