

SWEPI LP

Pinedale Anticline Revegetation Project

2008 Transect Data Summary



Richard S. Carr, III - C-M Environmental Group, Inc.
H. James Sewell - Shell Exploration & Production Company
Aimee Davison - Shell Exploration and Production Company
John Steinbacher - Summit Associates, LLC



First Reclamation occurred prior to Shell Acquisition



Developed a seed mix focusing on Native plants in the area

Took Soil Samples from throughout the field

Tried different seeding application techniques

Fenced/Unfenced



Topsoil piles
Cut slopes
Fill slopes
Spoil piles
Overseeding Locations





Goal:

Understand variability of soils and potential to apply amendments

Developed soil amendments according to deficiencies

- Mineral Blend (specific to area)

- Humic Shale

- Kiwi Power

- Fiber Stronghold

- Tackifibers

- Soil-Loc



Truax Drill
Haybuster Seed Drill
Hydroseeder
Broadcast Seeder





not fenced





no fence!

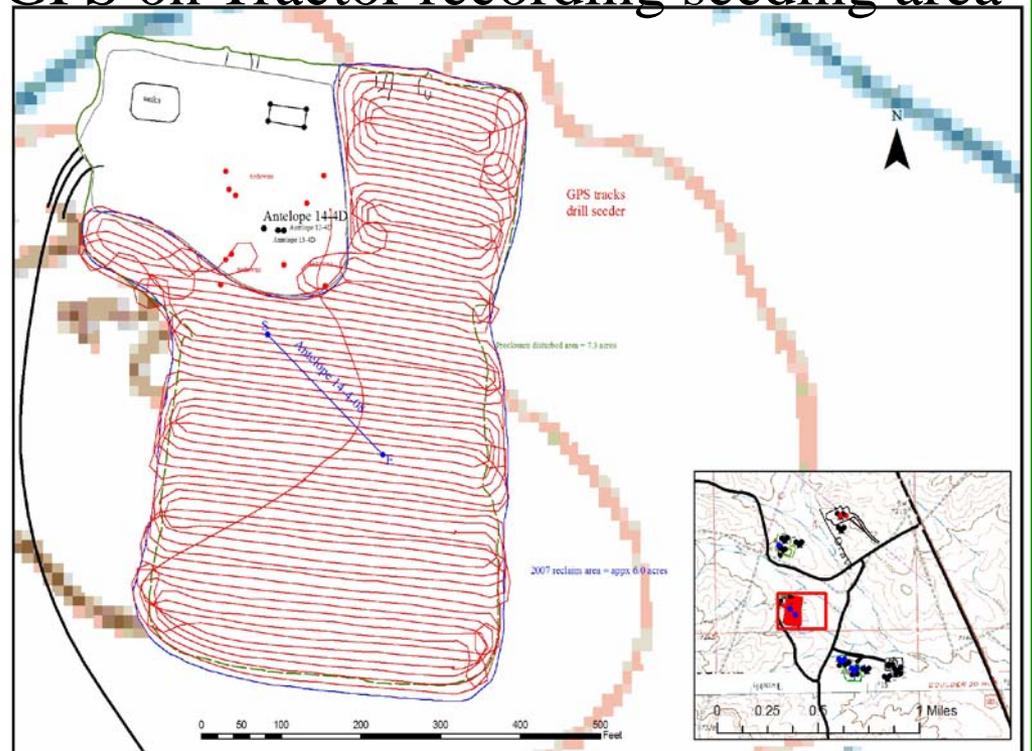
“The Spokesman”

Pinedale Federal 13-19



Snowfences

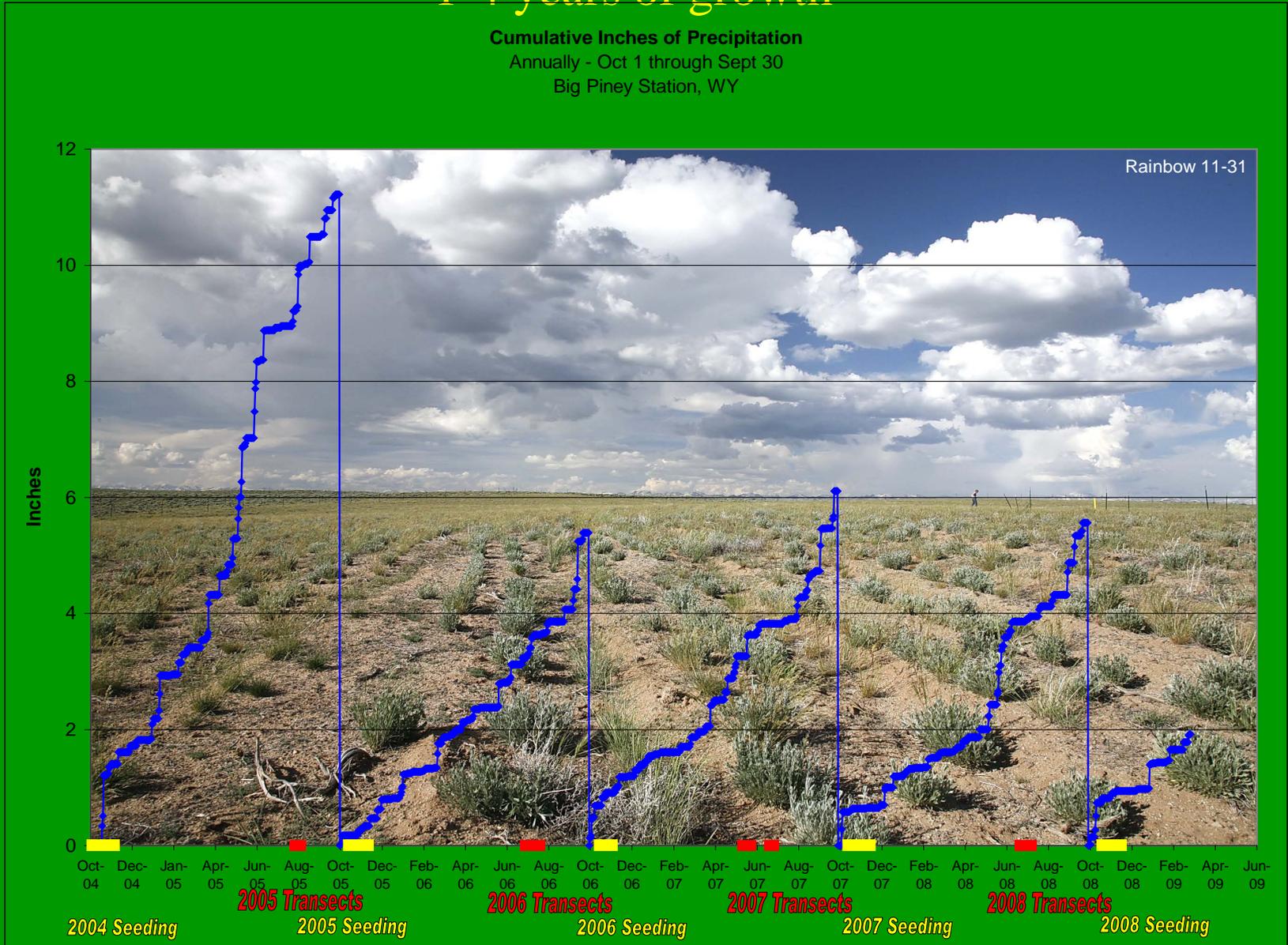
GPS on Tractor recording seeding area

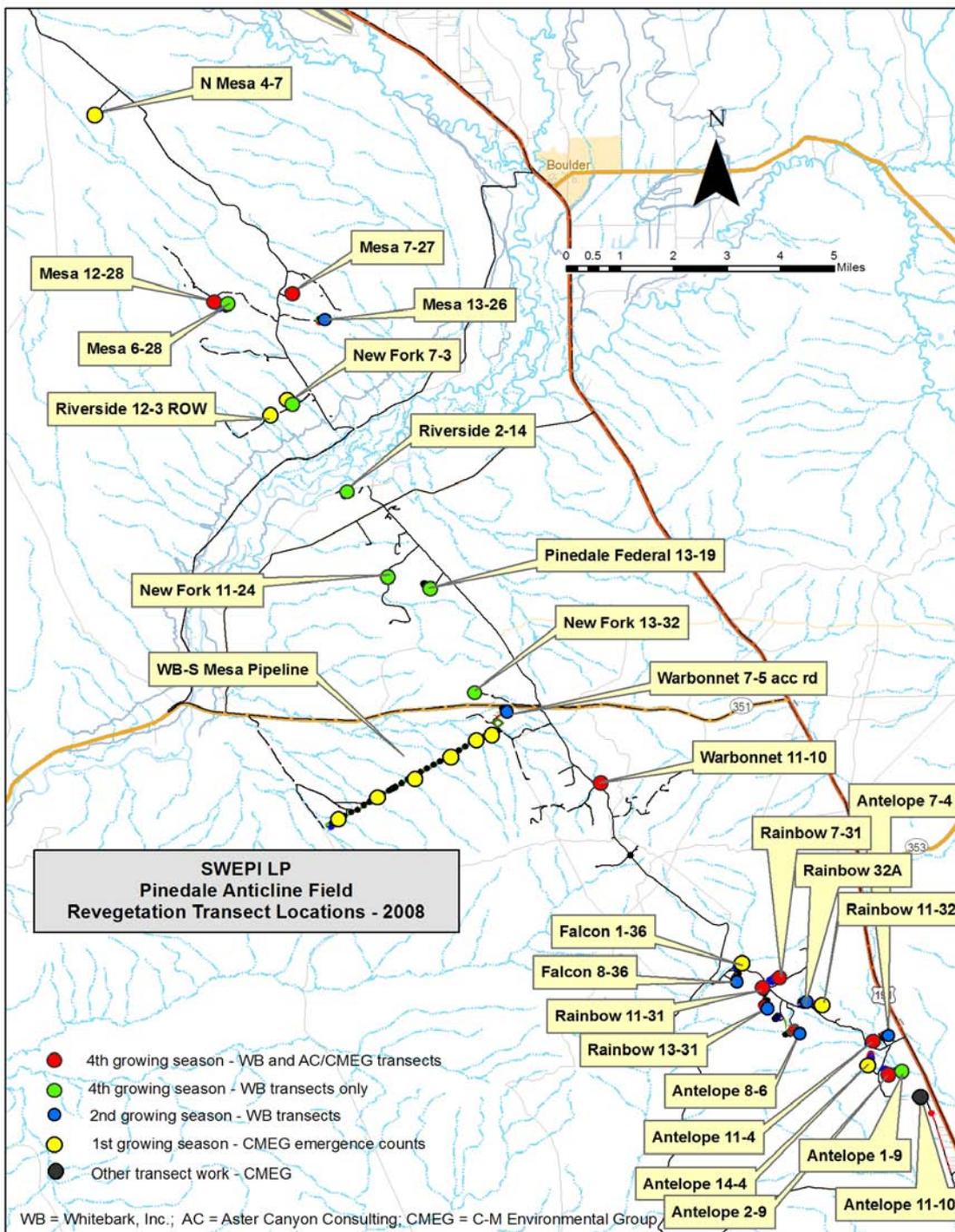


Truax Drill Design



26 pads in some phase of reclamation 1-4 years of growth



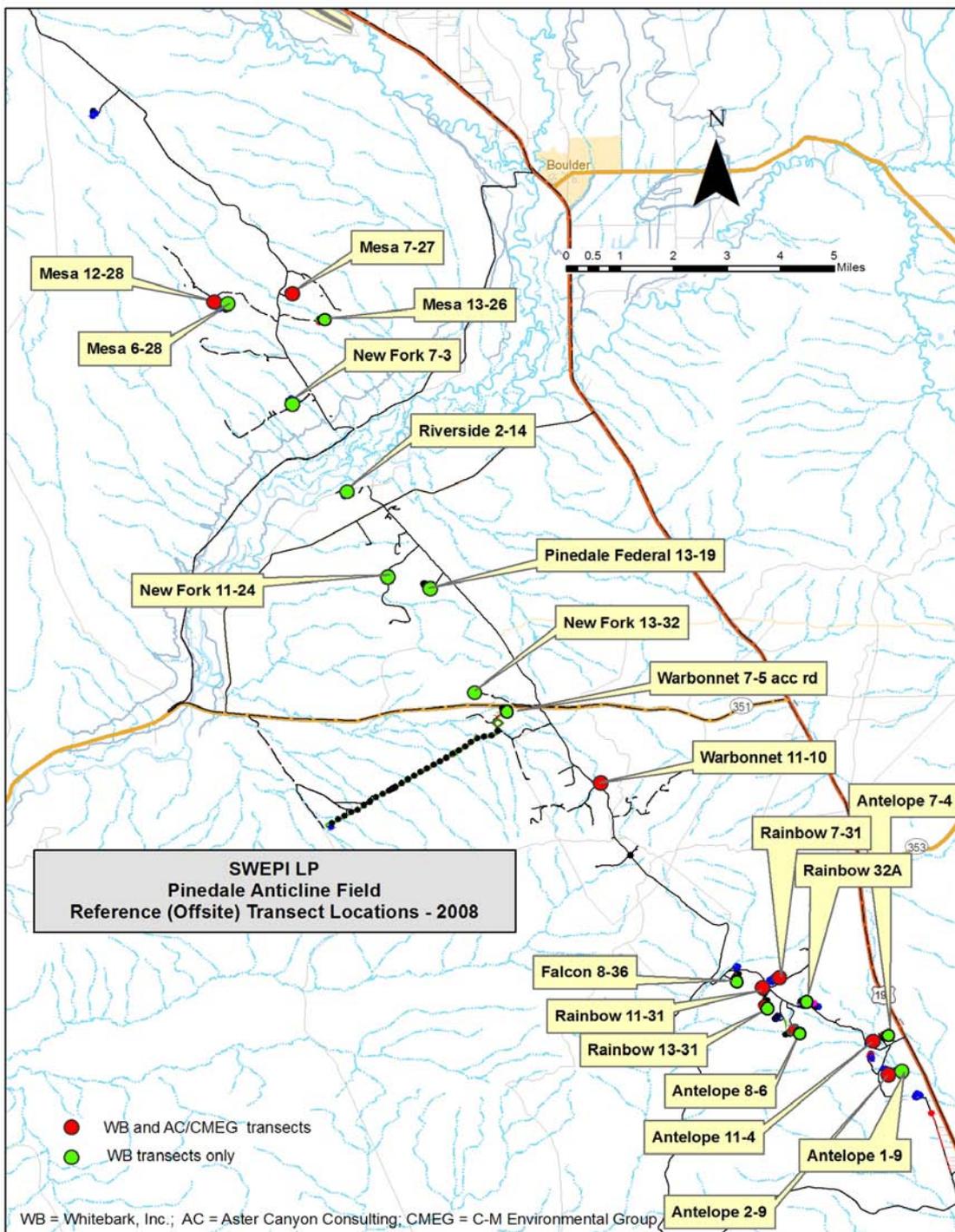




Collecting offsite transect Data

This has been done for 21 sites all along the PAPA length







10-point frame relative basal point intercept ground cover transects

200 ft long, twin 10 point frames used, resulting in 2000 points/transect

Bare ground, litter, plant species all tabulated

Shrub canopy cover (line transect)

Heights of shrub nearest to each 10' mark, within 5' radius (20 pts total)

Shrub heights and shrub density cover (belt transects- plants/acre)

Individual shrubs counted within 3' wide belt, 200' feet long.

This methodology was done in 2007 and 2008





Point Intercept Frequency (200 pts)

Two 200' lines crossed at 100' mark. Point intercept frequency measurements

Taken every 2' for both lines=200 pts.

Each plant species noted from canopy down to basal ground cover

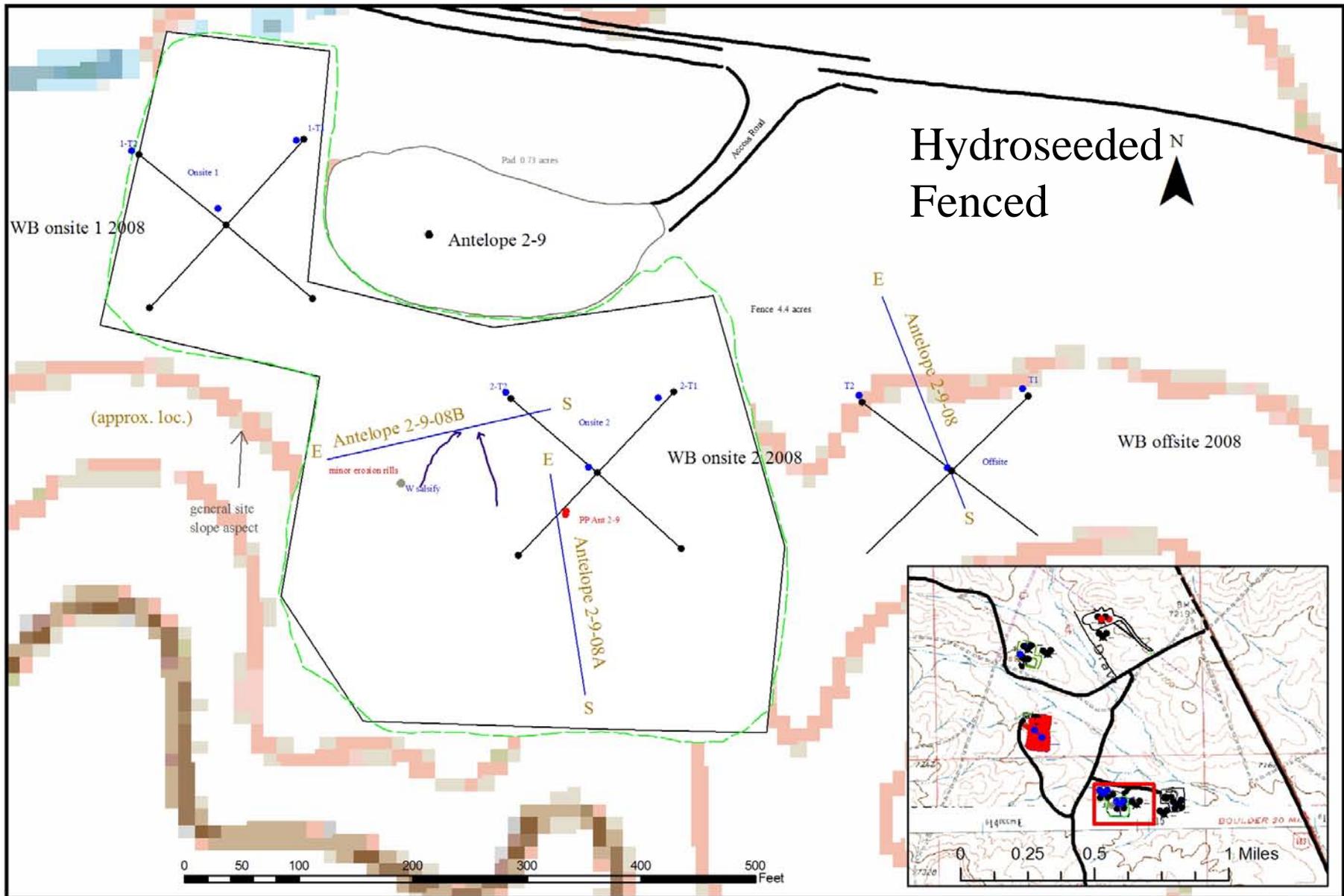
Shrub Height

Measured and averaged

Shrub Density

Individual shrubs counted within 3' wide belt, 200' total length.

Point Intercept Data results in percent frequency of bare ground, litter, rock, lichen, moss, and plant species, as well as percent canopy and relative basal point intercept ground cover.



Antelope 2-9

Antelope 2-9-08A Onsite



200 ft Transect

6/23/08

Average shrub heights (n of 20 pts):

WB Sage = 123 mm/4.8 in (16)

Winterfat = 135 mm/5.3 in (1)

Y Rabbitbrush = 160 mm/6.3 in (2)

Relative Percent Shrub Canopy Cover:

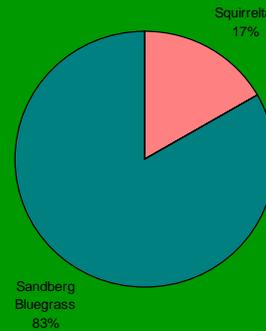
TOTAL: 2.75%

WB Sage = 2.3%



2008 belt and line transect data

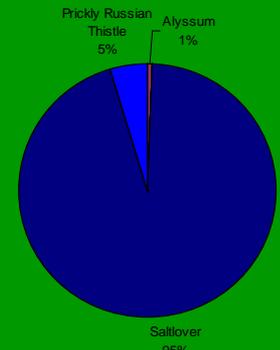
2008 relative basal ground cover data 10 point frames (2000 points total)



Grasses

NONE IN TRANSECT

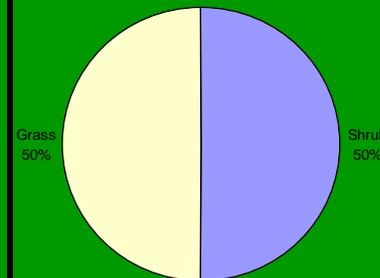
Forbs



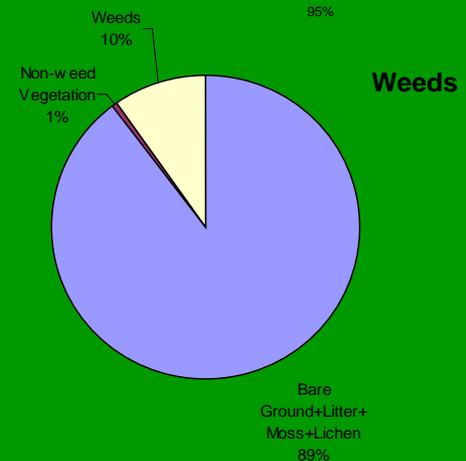
Wyoming Big Sagebrush

Shrubs

100%



Non-Weed Vegetation



Antelope 2-9-08B Onsite



200 ft Transect

6/23/08

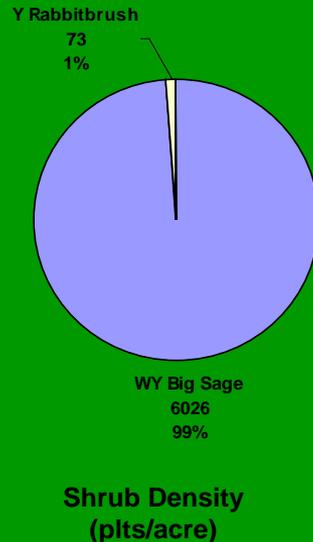
Average shrub heights (n of 20 pts):

WB Sage = 179 mm/7.0 in (19)

Relative Percent Shrub Canopy Cover:

TOTAL: 5.71%

WB Sage = 5.58%

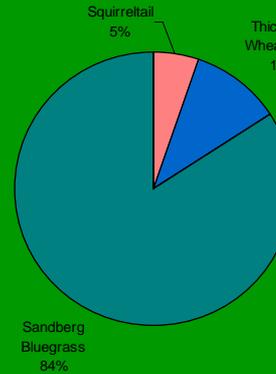


Shrub Density
(plts/acre)

2008 belt and line transect data

2008 relative basal ground cover data

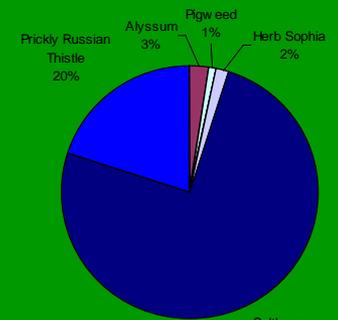
10 point frames (2000 points total)



Grasses

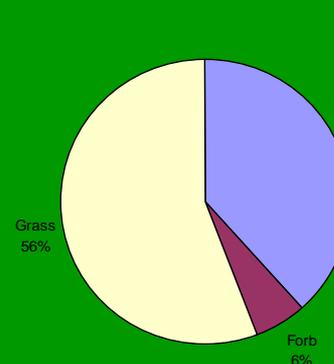
Common Yarrow
100%

Forbs

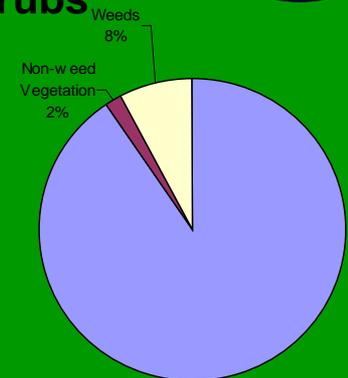


Shrubs

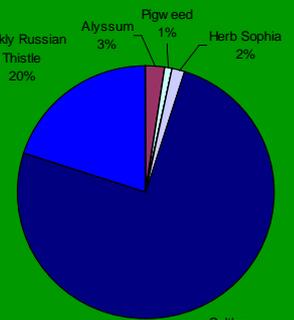
Wyoming Big Sagebrush
100%



Non-Weed
Vegetation



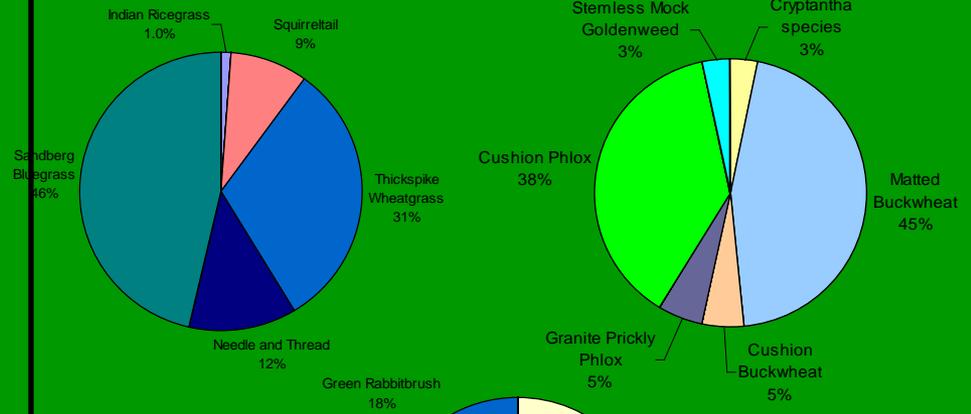
Weeds



Antelope 2-9-08-OS Offsite



2008 relative basal ground cover data 10 point frames (2000 points total)

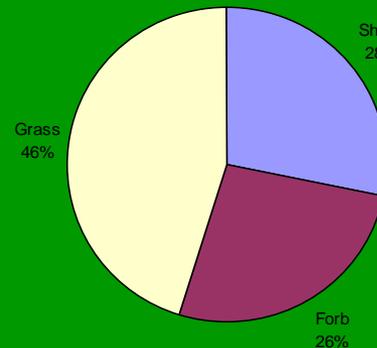


Grasses

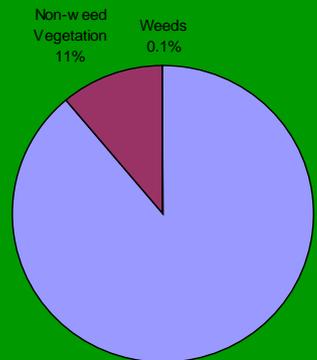
Forbs



Shrubs



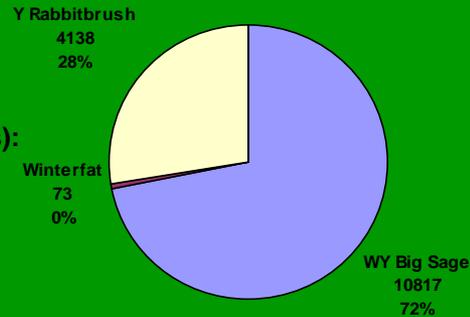
Vegetation



Bare Ground+Litter+Mosses+Lichen
89%

200 ft Transect

6/23/08



Shrub Density
(plants/acre)

Average shrub heights (n of 20 pts):

WB Sage = 299 mm/11.8 in (20)

Y Rabbitbrush = 129 mm/5.1 in (20)

Winterfat = 53 mm/2.1 in (7)

Percent Canopy Cover:

TOTAL: 21.3%

WB Sage = 20.15%

Y Rabbitbrush = 1.15%

2008 belt and line transect data

Antelope 2-9-08-OS Offsite

Whitebark, Inc. Transect Data

200 ft (x 2) Transects

6/25/08

Average shrub heights in inches:

WB Sage = 11.23

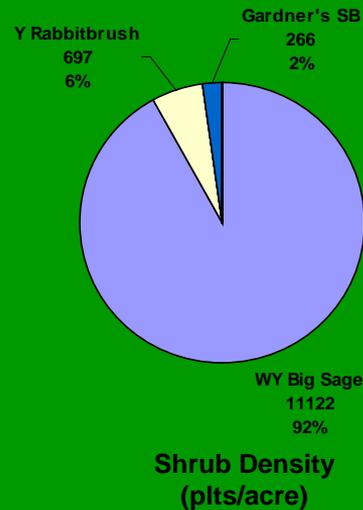
Y Rabbitbrush = 10.00

Gardner's SB = 2.00

Total Percent Shrub Cover:

TOTAL: 31.0%

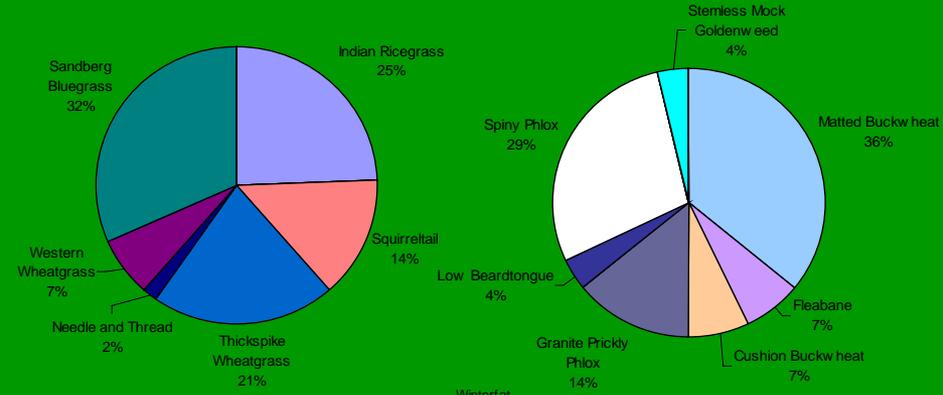
WB Sage = 29.5%



2008 belt and line transect data

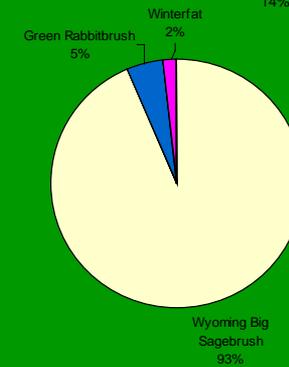
2008 Percent Frequency Point Intercept Data

(200 points - WB Data)

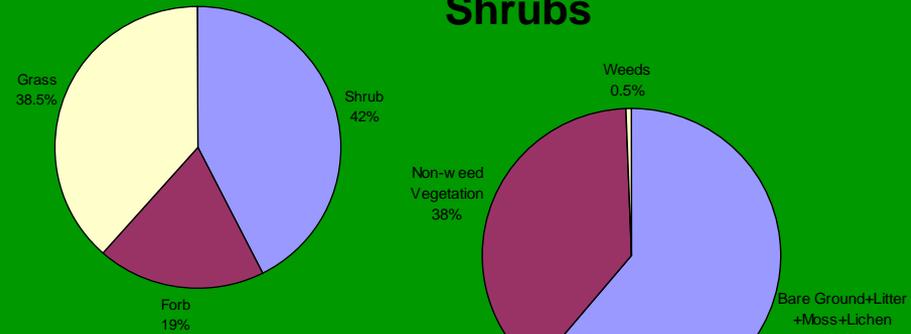


Grasses

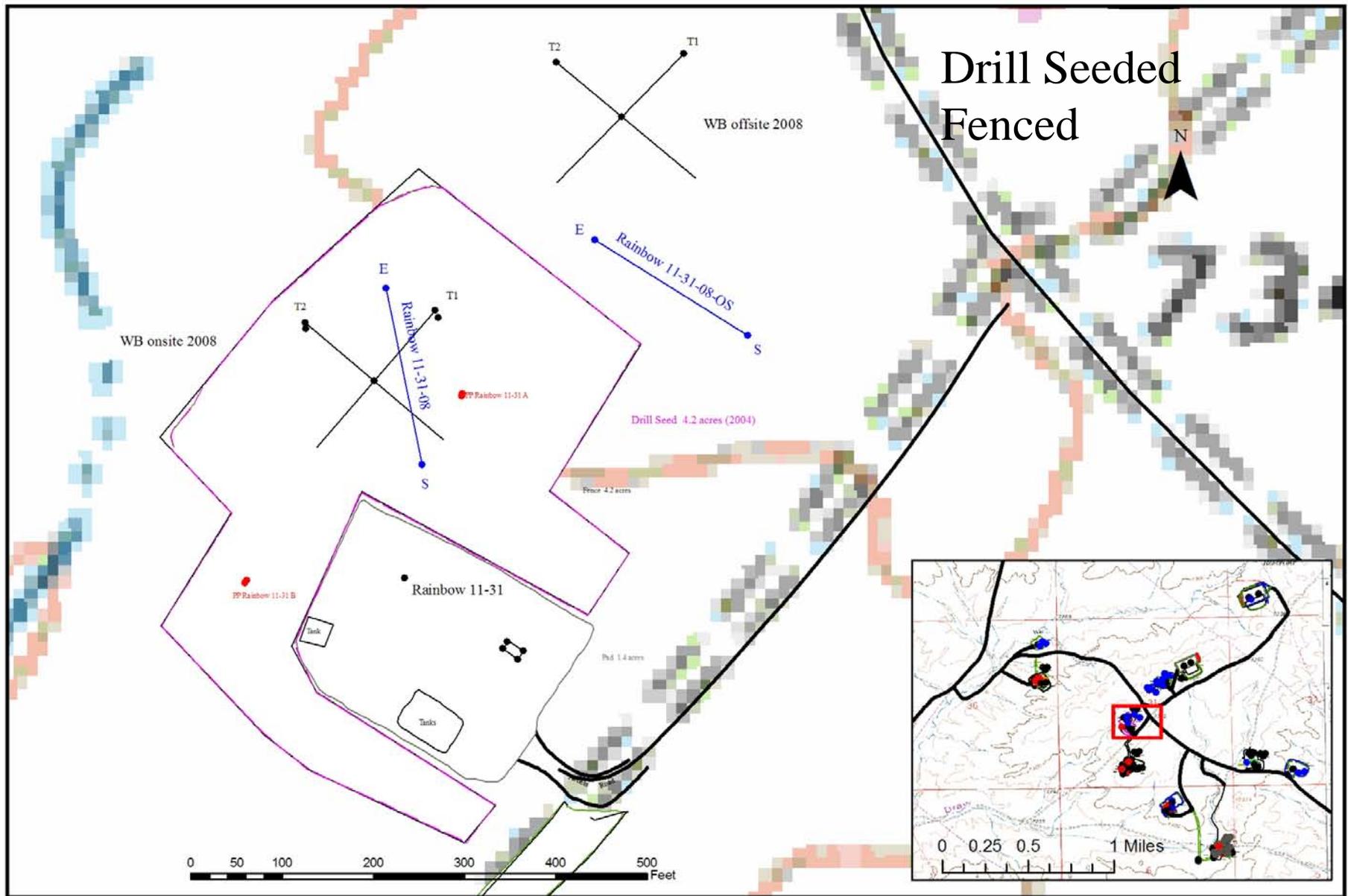
Forbs



Shrubs

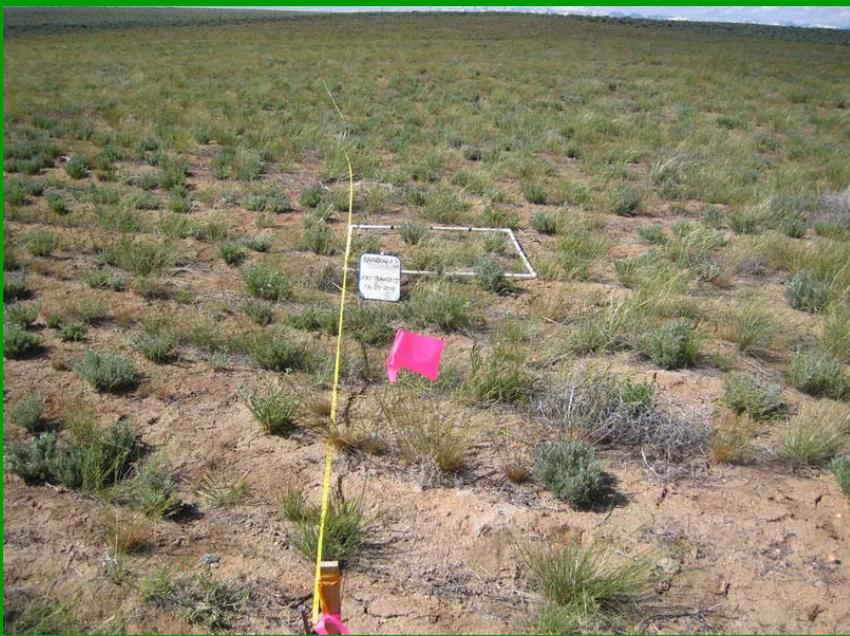


Vegetation

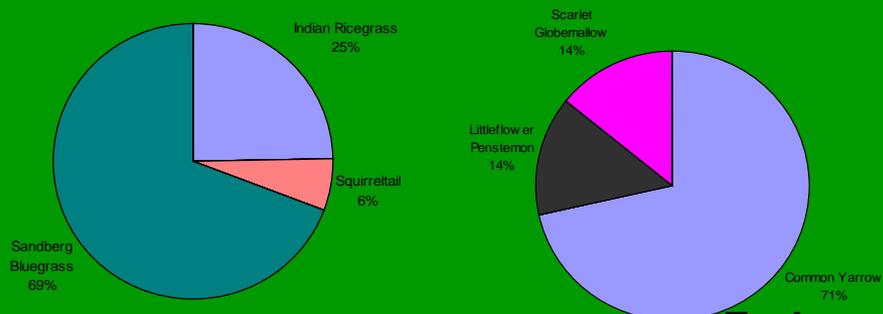


Rainbow 11-31

Rainbow 11-31-08 Onsite



2008 relative basal ground cover data 10 point frames (2000 points total)



200 ft Transect

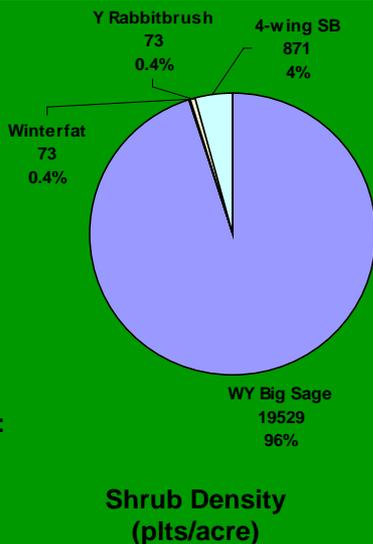
6/23/08

Average shrub heights (n of 20 pts):

- WB Sage = 160 mm/6.3 in (20)
- 4-wing Saltbush = 102 mm/4.0 in (9)
- Winterfat = 170 mm/6.7 in (1)
- Y Rabbitbrush = 113 mm/4.4 in (3)

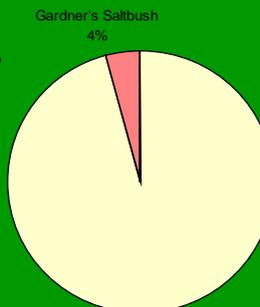
Relative Percent Shrub Canopy Cover:

TOTAL: 12.05%
WB Sage = 12.05%

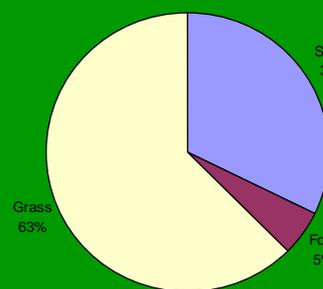
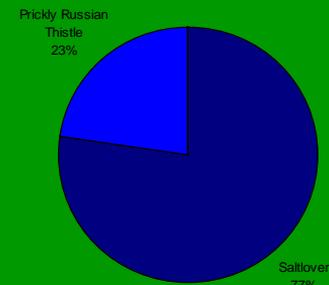


2008 belt and line transect data

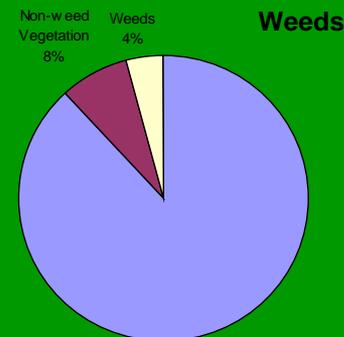
Grasses



Shrubs



Non-Weed Vegetation

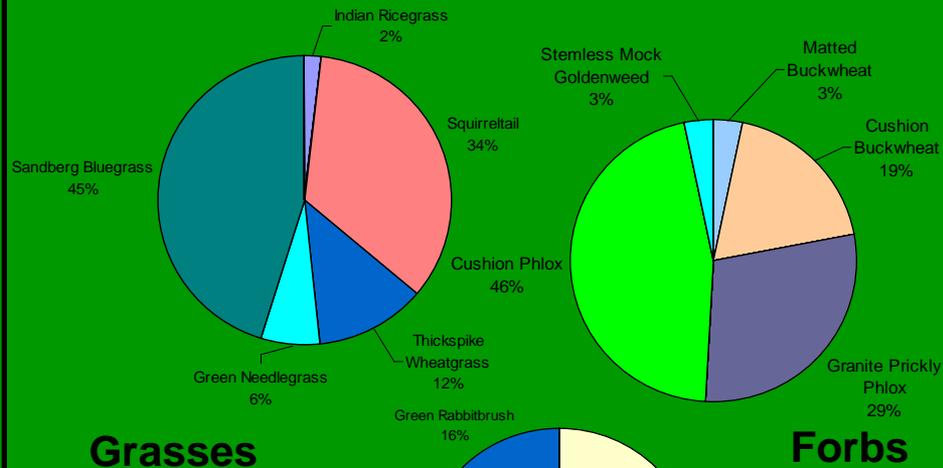


Weeds

Rainbow 11-31-08-OS Offsite

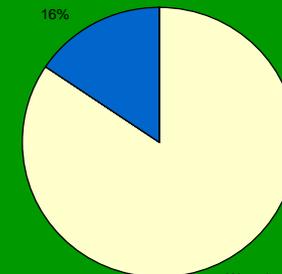


2008 relative basal ground cover data 10 point frames (2000 points total)



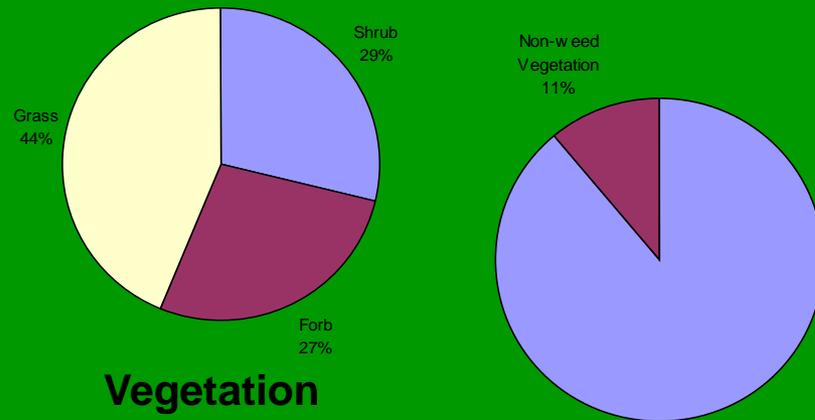
Grasses

Forbs



Shrubs

Rainbow 11-31 AC



Vegetation

Bare Ground+Litter
+Moss+Lichen
89%

200 ft Transect

6/23/08

Average shrub heights (n of 20 pts):

WB Sage = 278 mm/10.9 in (20)

Y Rabbitbrush = 113 mm/4.4 in (16)

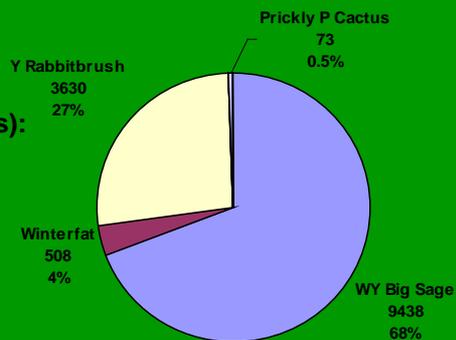
Winterfat = 40 mm/1.6 in (1)

Percent Canopy Cover:

TOTAL: 20.28%

WB Sage = 19.63%

Y Rabbitbrush = 0.65%



Shrub Density
(plants/acre)

2008 belt and line transect data

Rainbow 11-31-08-OS Offsite

Whitebark, Inc. Transect Data

200 ft (x 2) Transects

6/27/08

Average shrub heights in inches:

WB Sage = 13.22

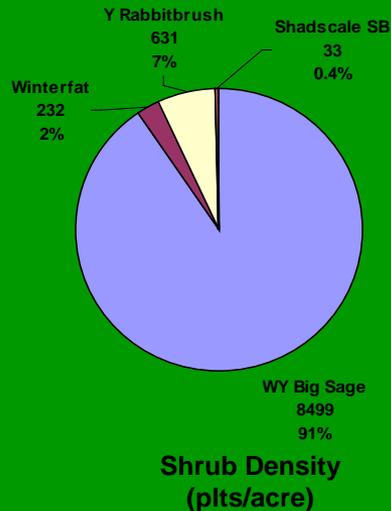
Y Rabbitbrush = 4.00

Winterfat = 2.00

Total Percent Shrub Cover:

TOTAL: 36.5%

WB Sage = 35.5%

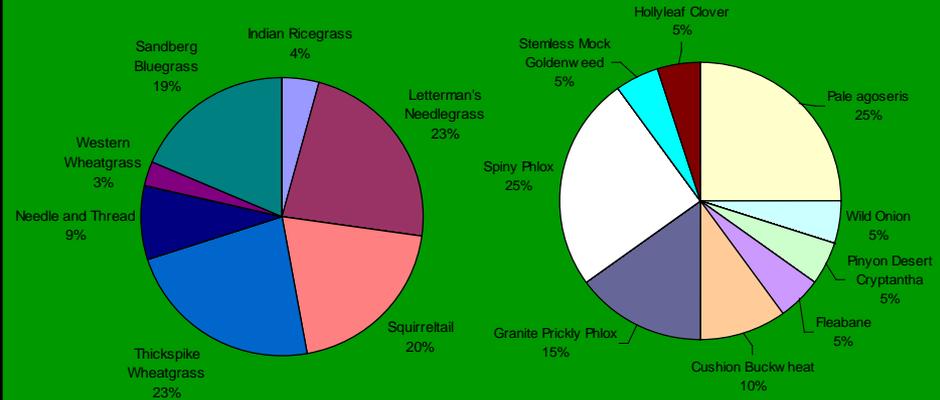


Shrub Density
(pfts/acre)

2008 belt and line transect data

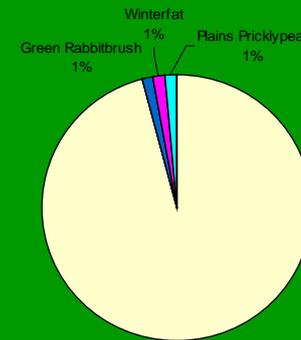
2008 Percent Frequency Point Intercept Data

(200 points - WB Data)

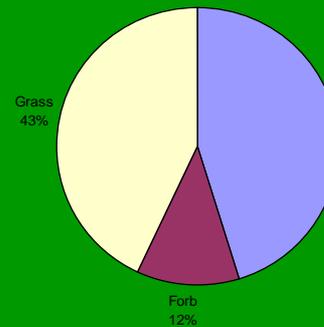


Grasses

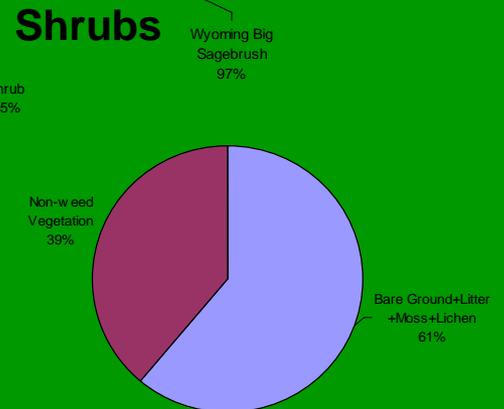
Forbs

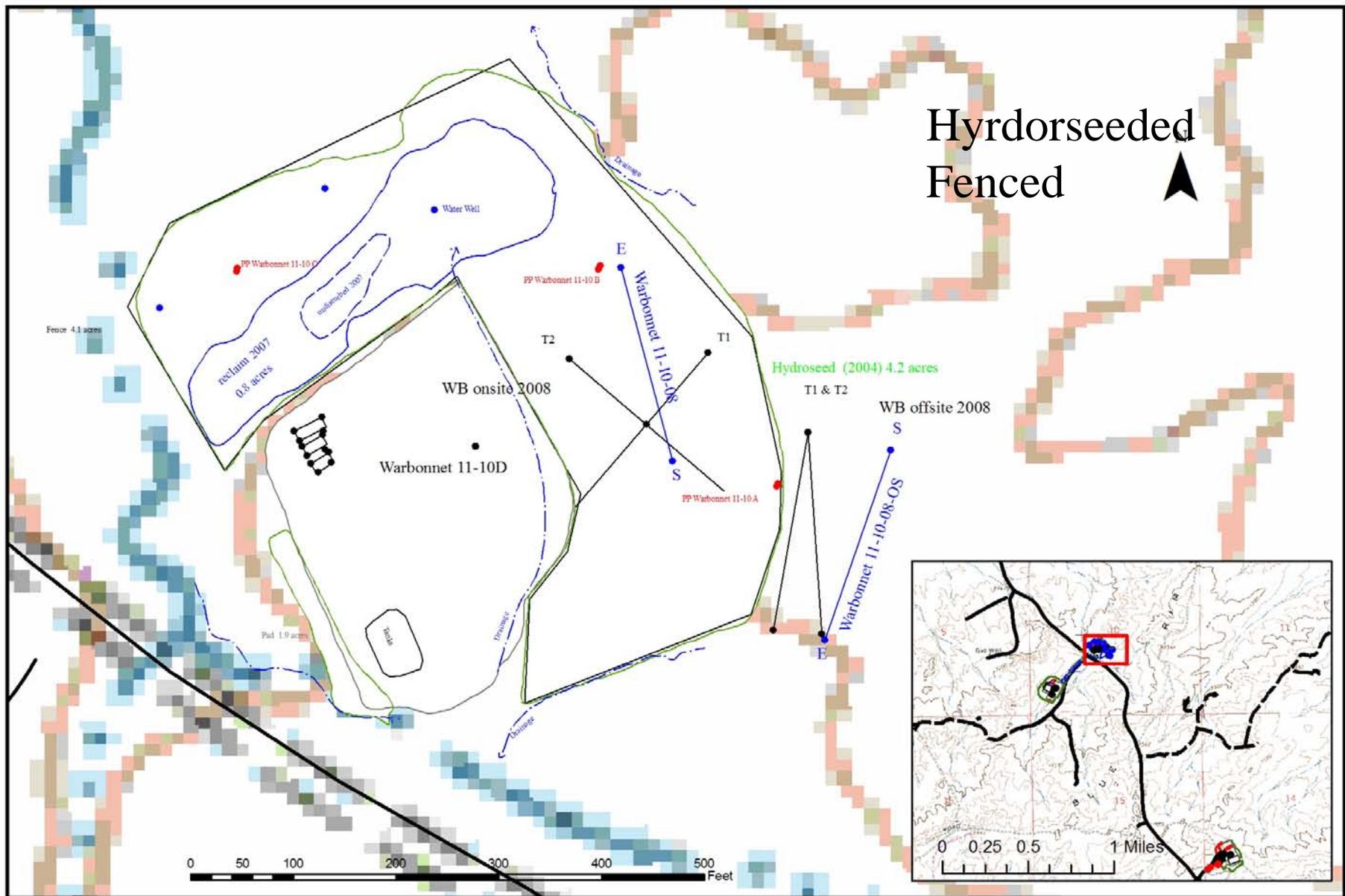


Shrubs



Vegetation





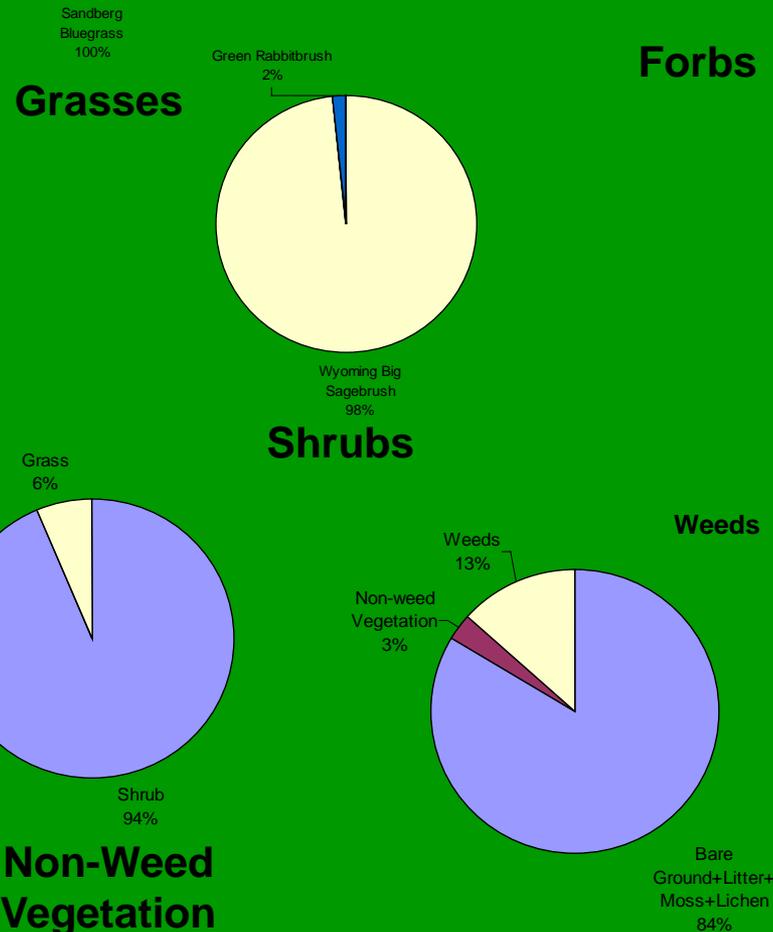
Warbonnet 11-10D

Warbonnet 11-10-08 Onsite



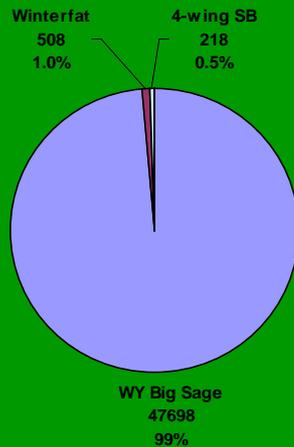
2008 relative basal ground cover data 10 point frames (2000 points total)

NONE IN TRANSECT



200 ft Transect

6/24/08



**Shrub Density
(plts/acre)**

Average shrub heights (n of 20 pts):

WB Sage = 100 mm/3.9 in (20)

Winterfat = 78 mm/3.1 in (4)

4-wing Saltbush = 130 mm/5.1 in (4)

Y Rabbitbrush = 80 mm/3.1 in (2)

Relative Percent Shrub Canopy Cover:

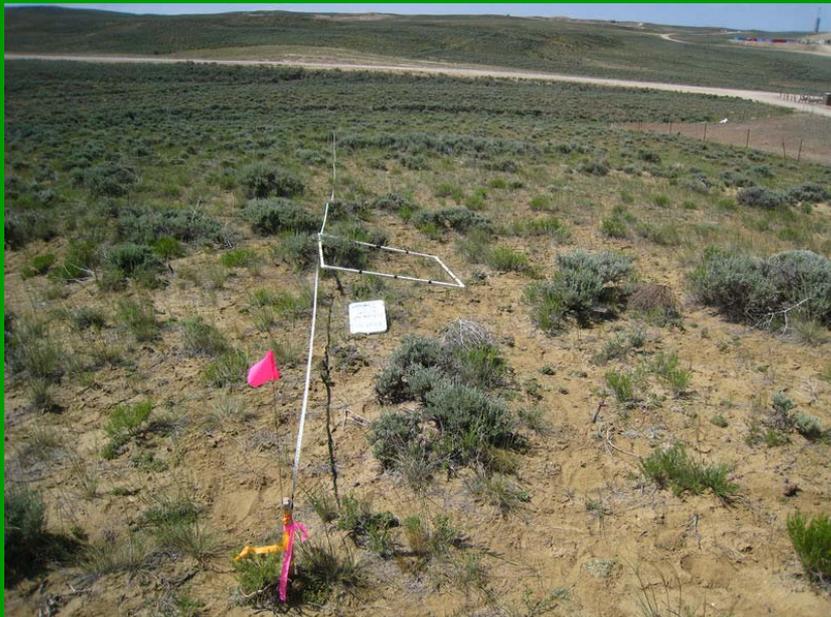
TOTAL: 8.20%

WB Sage = 8.1%

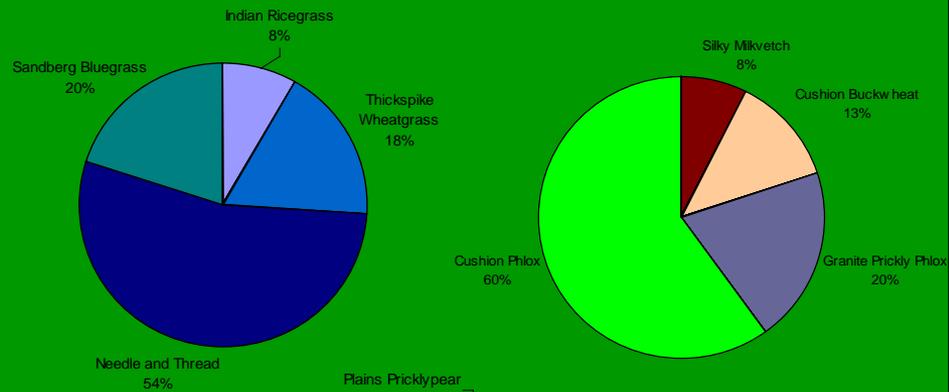
Winterfat = 0.1%

2008 belt and line transect data

Warbonnet 11-10-08-OS Offsite



2008 relative basal ground cover data 10 point frames (2000 points total)



Grasses

Forbs

200 ft Transect

6/24/08

Average shrub heights (n of 20 pts):

WB Sage = 254 mm/10.0 in (20)

Y Rabbitbrush = 147 mm/5.8 in (20)

Fringed Sage = 160 mm/6.3 in (1)

Winterfat = 100 mm/3.9 in (1)

Gardner's Saltbush = 140 mm/5.5 in (1)

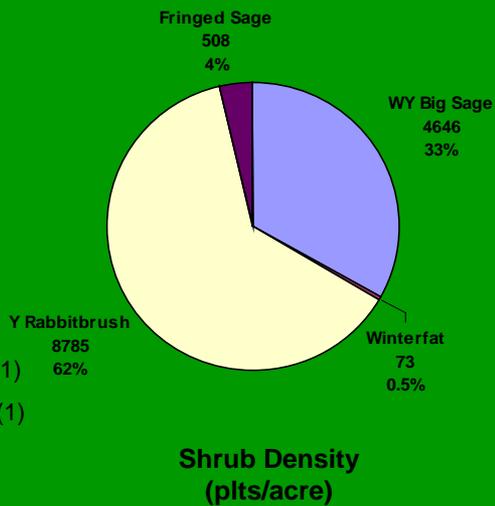
Prickly Pear Cactus = 160 mm/6.3 in (1)

Percent Canopy Cover:

TOTAL: 11.15%

WB Sage = 6.9%

Y Rabbitbrush = 3.95%

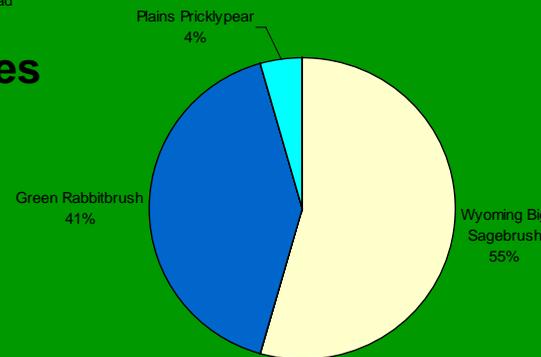


Shrub Density
(plants/acre)

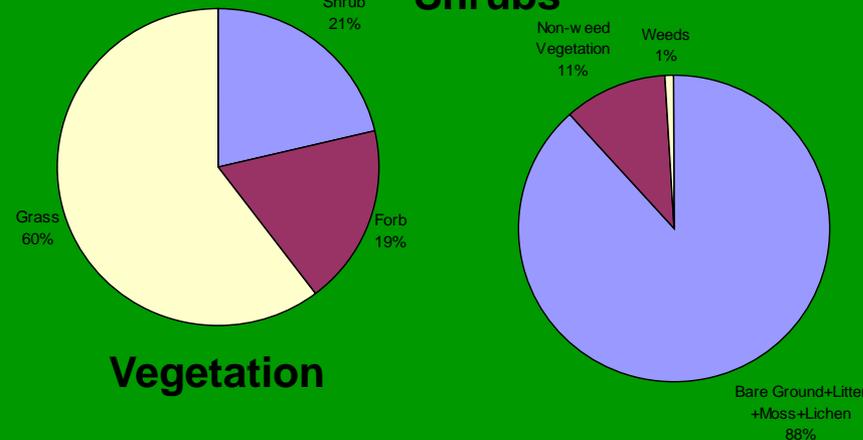
2008 belt and line transect data

Grasses

Forbs



Shrubs



Vegetation

Bare Ground+Litter
+Moss+Lichen
88%

Warbonnet 11-10-08-OS Offsite

Whitebark, Inc. Transect Data

200 ft (x 2) Transects

6/27/08

Average shrub heights in inches:

WB Sage = 7.10

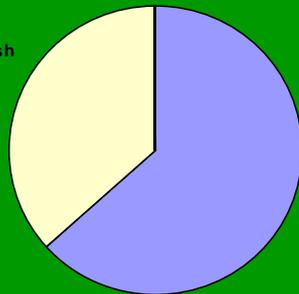
Y Rabbitbrush = 4.89

Total Percent Shrub Cover:

TOTAL: 18.5%

WB Sage = 12.0%

Y Rabbitbrush
2822
37%



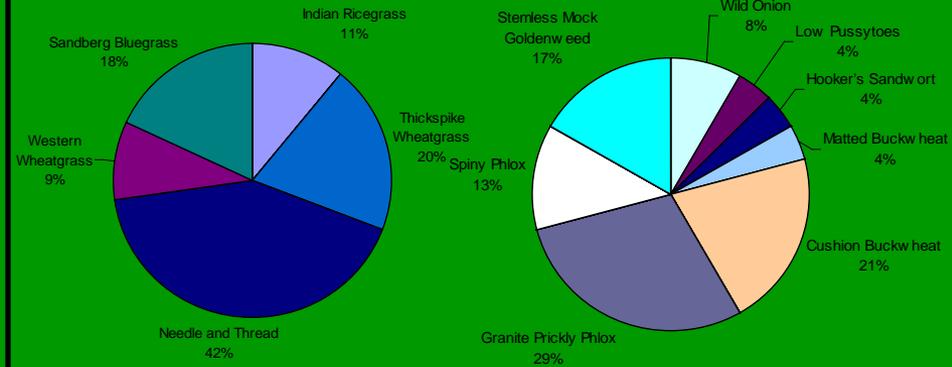
Shrub Density
(plants/acre)

WY Big Sage
4847
63%

2008 belt and line transect data

2008 Percent Frequency Point Intercept Data

(200 points - WB Data)

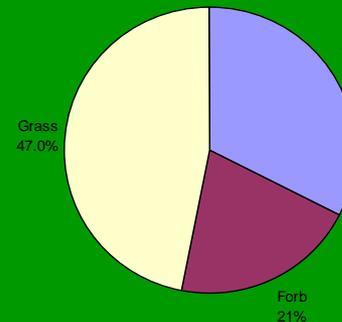


Grasses

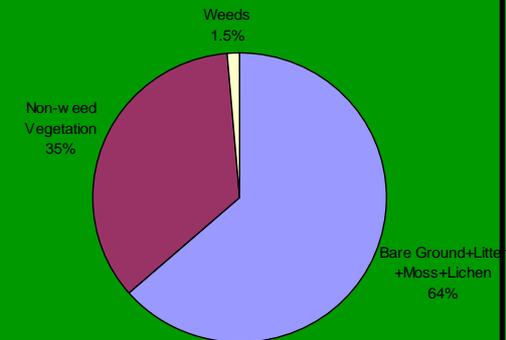
Forbs



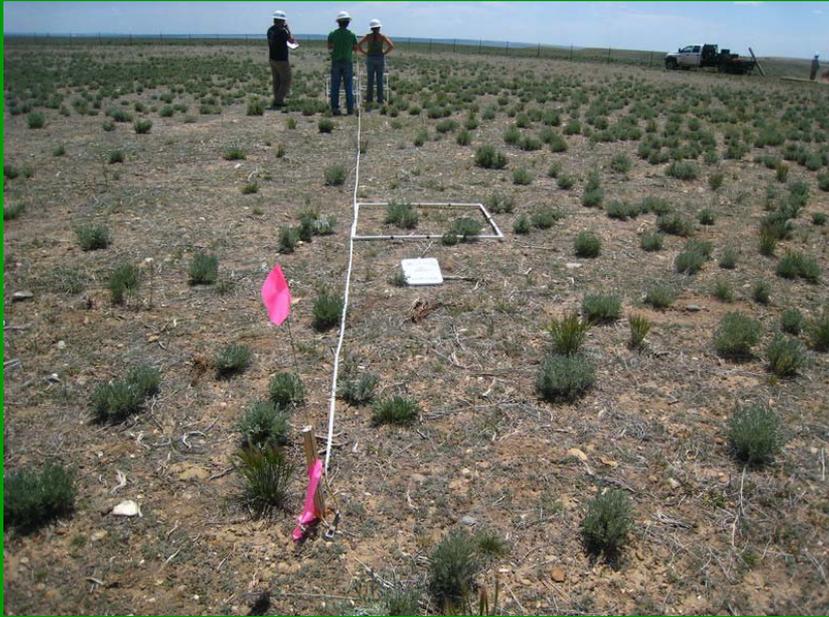
Shrubs



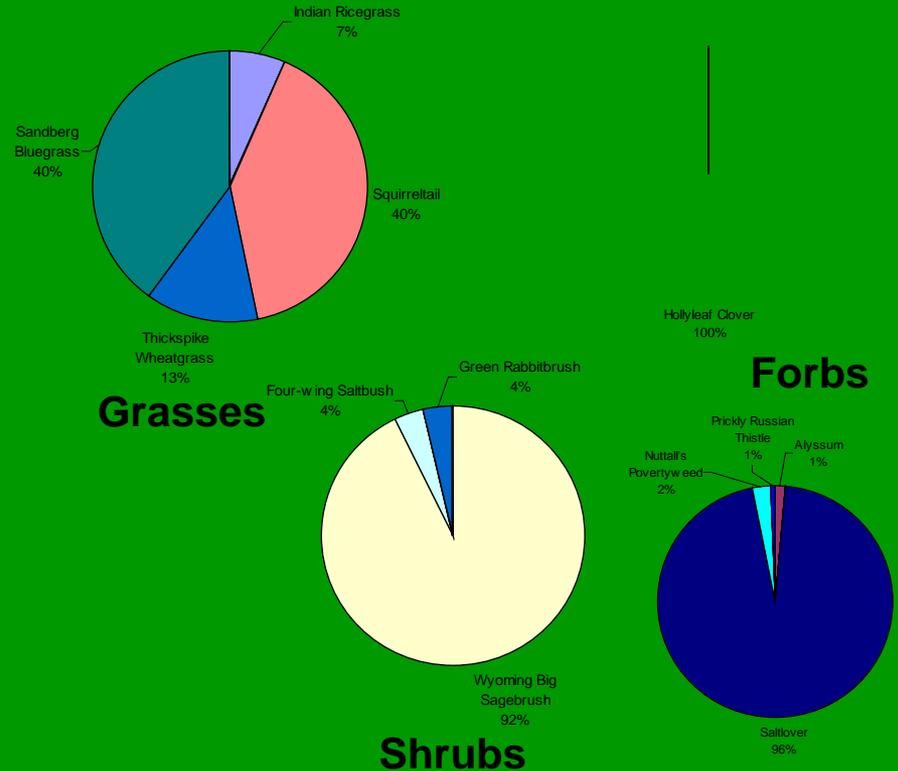
Vegetation



Mesa 12-28-08 Onsite



2008 relative basal ground cover data 10 point frames (2000 points total)



200 ft Transect

6/24/08

Average shrub heights (n of 20 pts):

WB Sage = 152 mm/6.0 in (20)

4-wing Saltbush = 77 mm/3.0 in (3)

Relative Percent Shrub Canopy Cover:

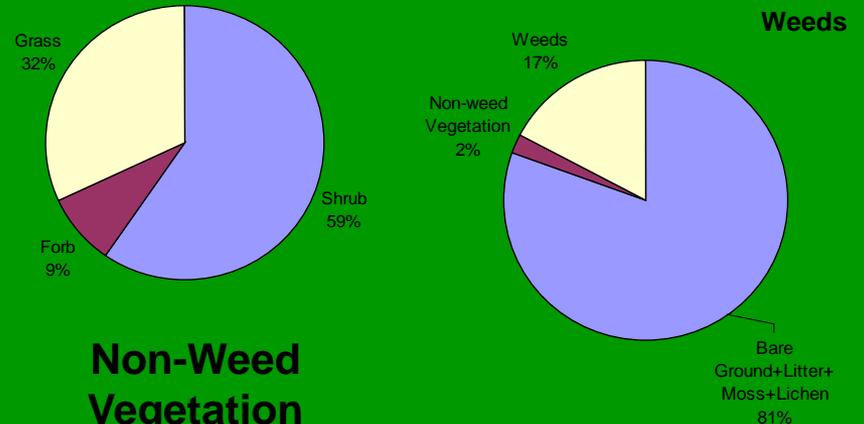
TOTAL: 3.68%

WB Sage = 3.68%



2008 belt and line transect data

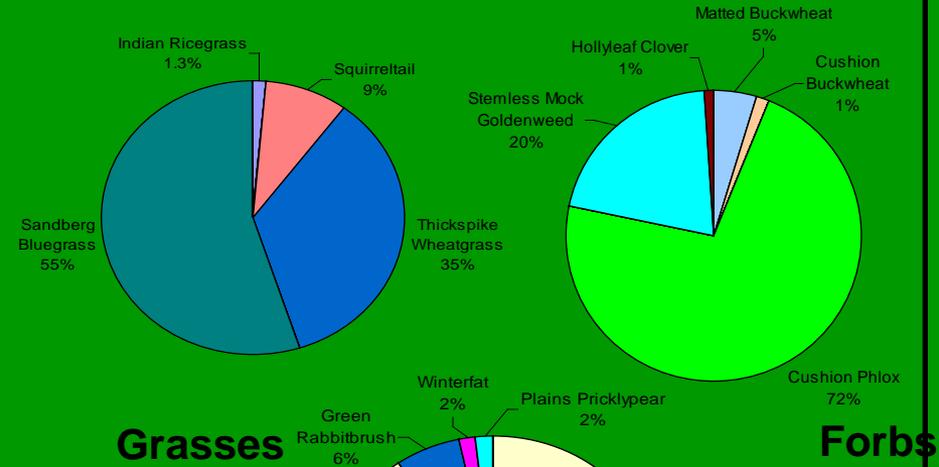
Non-Weed Vegetation



Mesa 12-28-08-OS Offsite



2008 relative basal ground cover data 10 point frames (2000 points total)



200 ft Transect

6/24/08

Average shrub heights (n of 20 pts):

WB Sage = 226 mm/8.9 in (20)

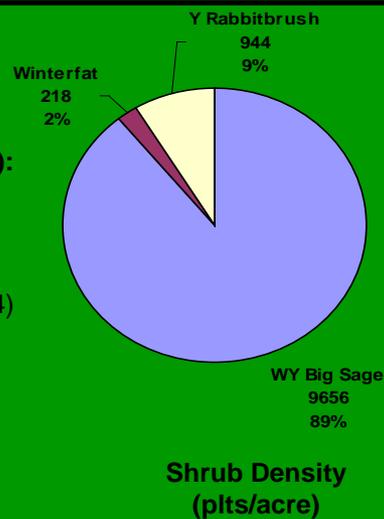
Y Rabbitbrush = 95 mm/3.7 in (4)

Prickly Pear Cactus = 83 mm/3.3 in (4)

Percent Canopy Cover:

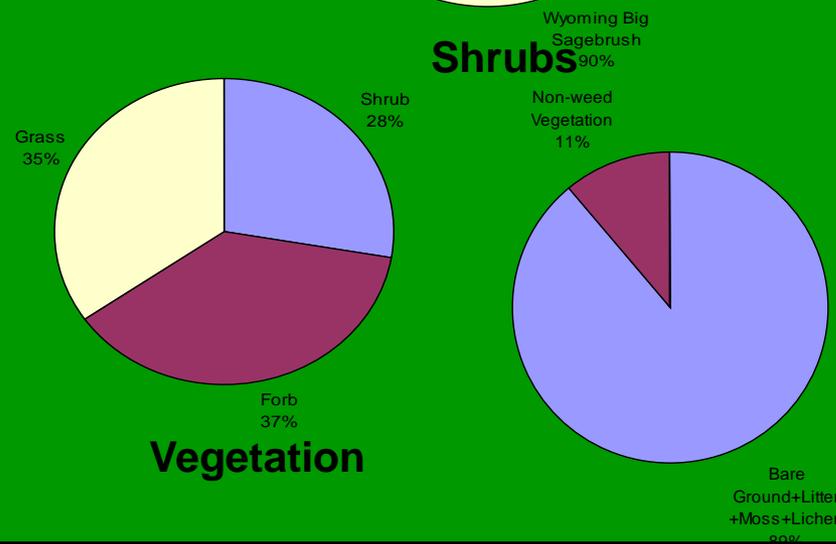
TOTAL: 24.0%

WB Sage = 24.0%



Shrub Density
(plants/acre)

2008 belt and line transect data



Mesa 12-28-08-OS Offsite

Mesa 6-28-08-OS Offsite

Whitebark, Inc. Transect Data

200 ft (x 2) Transects

6/28/08

Average shrub heights in inches:

WB Sage = 7.38

Y Rabbitbrush = 3.00

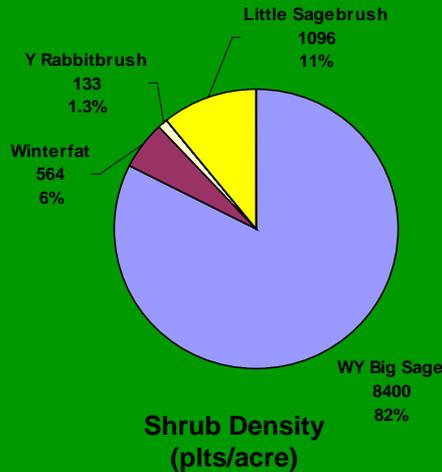
Little Sagebrush = 4.88

Winterfat = 2.33

Total Percent Shrub Cover:

TOTAL: 29.5%

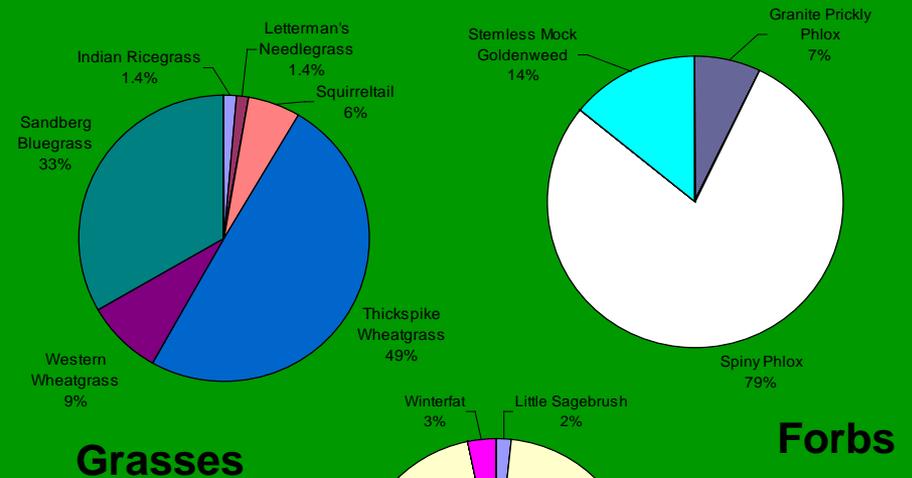
WB Sage = 28.0%



Shrub Density
(plts/acre)

2008 belt and line transect data

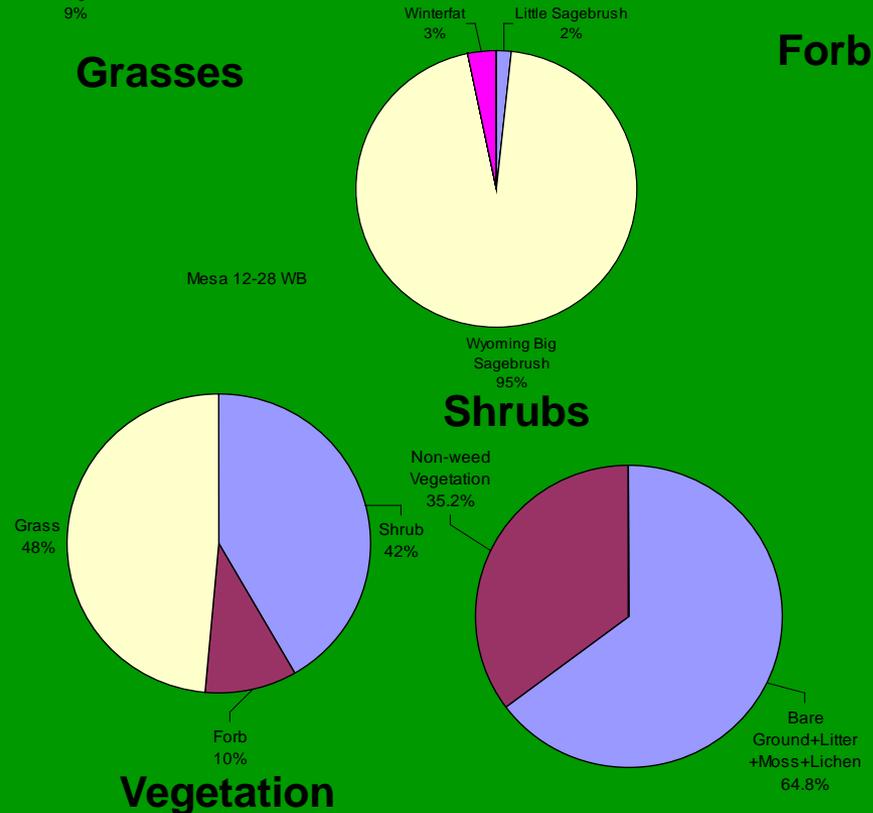
2008 Percent Frequency Point Intercept Data (200 points - WB Data)



Grasses

Forbs

Mesa 12-28 WB



Vegetation

Shrubs



**Sage Shrub Density
(2008 belt transects):**

Onsite = 2.8 plts/m²

Offsite = 2.5 plts/m²

2008

Mesa 12-28

'08 Avg Sage Ht = 5.3 inches



2007 Offsite

Mesa 12-28

Dominate Offsite Vegetation

Shrubs	Grasses	Forbs
Wyoming Big Sage <i>Artemisia tridentata</i>	Sandberg Bluegrass <i>Poa secunda</i>	Spiny Phlox <i>Phlox hoodii</i>
Green Rabbitbrush <i>Chrysothamnus viscidiflorus</i>	Needle and Thread <i>Hesperostipa comata</i>	Granite Prickly Phlox <i>Linanthus pungens</i>
Winterfat <i>Krascheninnikova lanata</i>	Thickspike Wheatgrass <i>Elymus lanceolatus</i>	Stemless Goldenweed <i>Stenotus acaulis</i>
Plains Prickly Pear <i>Opuntia polyacantha</i>	Indian Ricegrass <i>Achnatherum hymenoides</i>	Matted Buckwheat <i>Eriogonum caespitosum</i>



- **The Shell/BLM Pinedale Anticline Revegetation Pilot Project has been successful in restoring significant sage stands to the sites.**
- **The effectiveness of soil amendments is not clear at this point in the project.**
- **While there may be conditions where hydroseeding is necessary, the Truax Rough Rider range drill is currently our preferred method of seeding in the project area.**
- **Fencing of sites, at least for the first few growing seasons, has made a difference in native plant establishment, particularly in areas more heavily grazed.**
- **Overseeding the habitat blend seed mix into previously seeded grass-dominated sites has shown limited initial success.**
- **Offsite Transects running the length of Anticline in 2008.**



Reducing amount of weeds present in reclaim
topsoil plantings
better soil management
weed free seed and mulches

Obtaining 75% Forb Density within 5 years
Single stem verses mat forming
Seed Availability/cost

Thanks to those on our Team:

Shell Management

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BLM – Pinedale, WY Field Office

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SHELL received the 2006 BLM Environmental BMP Award for this Project Work