### The Application of Ecological Principles to Accelerate Reclamation of Vell Pack



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# Natural Gas Pad Reclamation

### Current Challenges

Arid conditions makes reclamation more difficult.

 Invasive species dominate large tracts of the land being developed.

# Objective



Identify techniques that will improve the success of reclamation efforts on natural gas well pads on the western slope of Colorado.

# **Ecological Processes** & *Modifying Factors*

**Seed Dispersal &** Seedbed Preparation

**Resource Supply** & Soil Impoverishment

Environmental Stress & Species-Rich Mixtures

Interference & Cover Crops

### Pad Characteristics

- Two plant community types: Pinyon-Juniper and Sagebrush-Greasewood
- Five pads total (3 in Sagebrush-Greasewood and 2 in Pinyon-Juniper)
- Elevation ranges: 1609 1789 meters (5278 5870 ft)
- Total pad area ranges: 0.56 0.78 hectares (1.38 – 1.93 acres)

### Treatments

- 2 Tillage treatments
  - Rough
  - Smooth
- 2 Amendment treatments
  - Wood chips
  - No wood chips
- 2 Seeding methods
  - Island broadcasting (forbs and shrubs separated from grasses)
  - Traditional broadcasting (all life forms in same seed mix)
- 2 Seed mixes
  - Annual and perennial species combined
  - Only perennial species

### Plot Installation Photos



### Plot Installation Photos



### Monthly Precipitation Totals for Rifle, CO





Month

### Plant Cover Summer 2008



#### **Relative Plant Cover by Treatment Combination**

2007 Mean Plant Cover = 32%



#### Relative Plant Cover by Treatment Combination 2008 Mean Plant Cover = 47%



### Results



Tillage Effects on Native Planted Cover

Tillage

### Results

### Effect of Wood Chips on Non-Native Plant Cover

### Effect of Wood Chips on Total Plant Cover



# Tillage Effects

Mean Cover by Class and Tillage Treatment



% Change in Cover

- Native Planted
  Species +34%
- Non-native
  - Species +17%
- Total Plant
  - **Cover +21%**

### Wood Chip Effects

Mean Cover by Class and WC Treatment



% change in cover

- **Native Planted** Species -0.8%
- Non-native

Non-native species

Total plant cover

Species -44%

Total Plant

**Cover** -29%

### Preliminary Findings

- The rough tillage treatment significantly increases native plant cover, especially during dry years.
- The addition of wood chips significantly reduces non-native plant cover.
- Overall rough tillage increases plant cover for all cover classes, while wood chips decreases plant cover for all cover classes except the native planted species.
- Still awaiting biomass data to determine seeding method effects.

### Questions or Comments?