
NORTH ANTELOPE ROCHELLE MINE'S APPROACH TO SAGE BRUSH RE-ESTABLISHMENT

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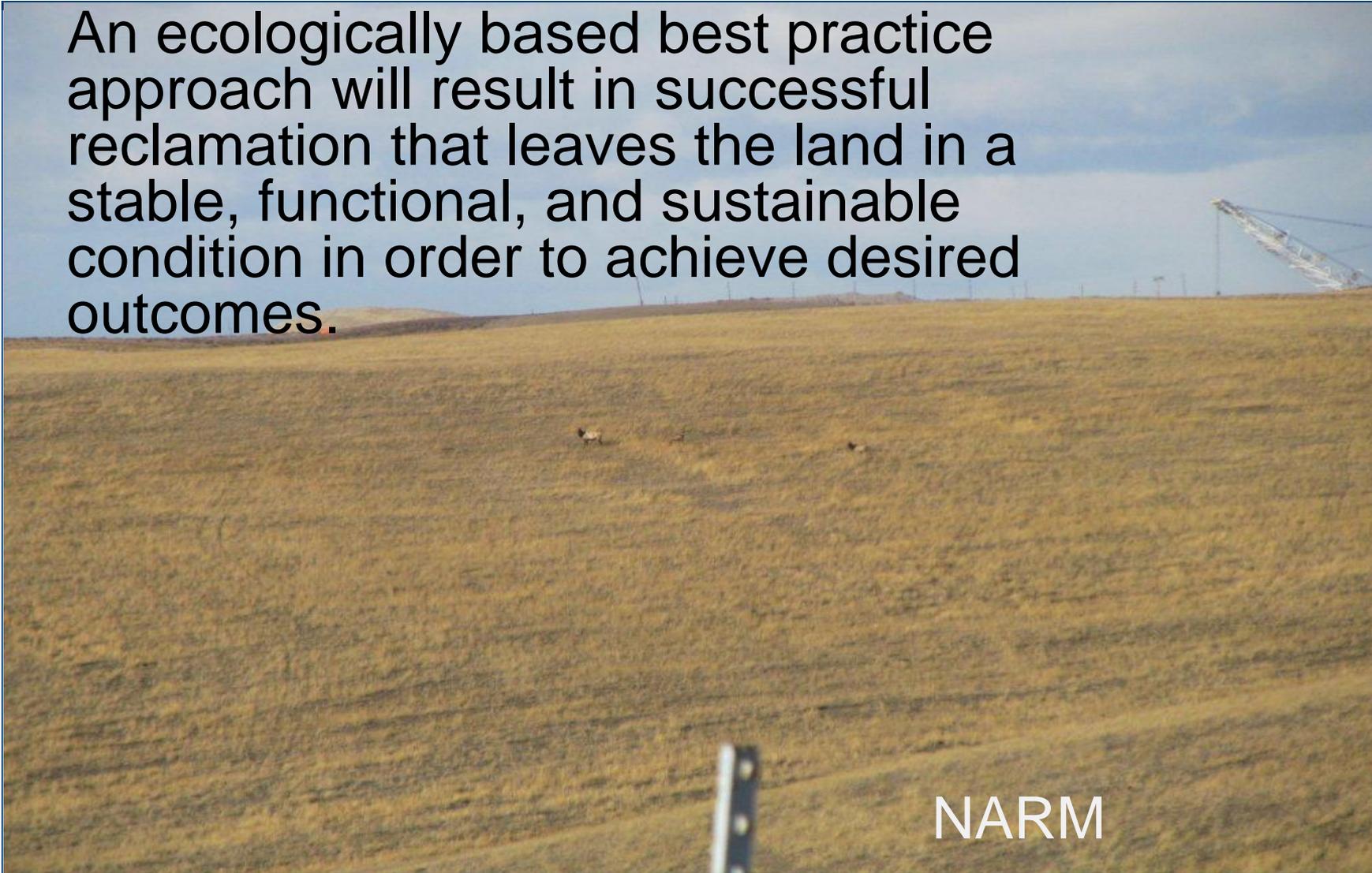


Peabody
ENERGY



ENERGIZING THE WORLD ONE BTU AT A TIME

An ecologically based best practice approach will result in successful reclamation that leaves the land in a stable, functional, and sustainable condition in order to achieve desired outcomes.

A wide-angle photograph of a vast, flat, open landscape with dry, yellowish-brown grass. In the distance, there are rolling hills and a large, white, curved structure, possibly a crane or part of an industrial facility. The sky is a pale blue with some light clouds. The text "NARM" is overlaid in the bottom right corner of the image.

NARM



Successful and Sustainable Reclamation

Seed mixes and timing of seeding will vary depending upon your desired results.

- Post-mining Land Use
- Production
- Diversity
- Shrub Density
- Special Habitats

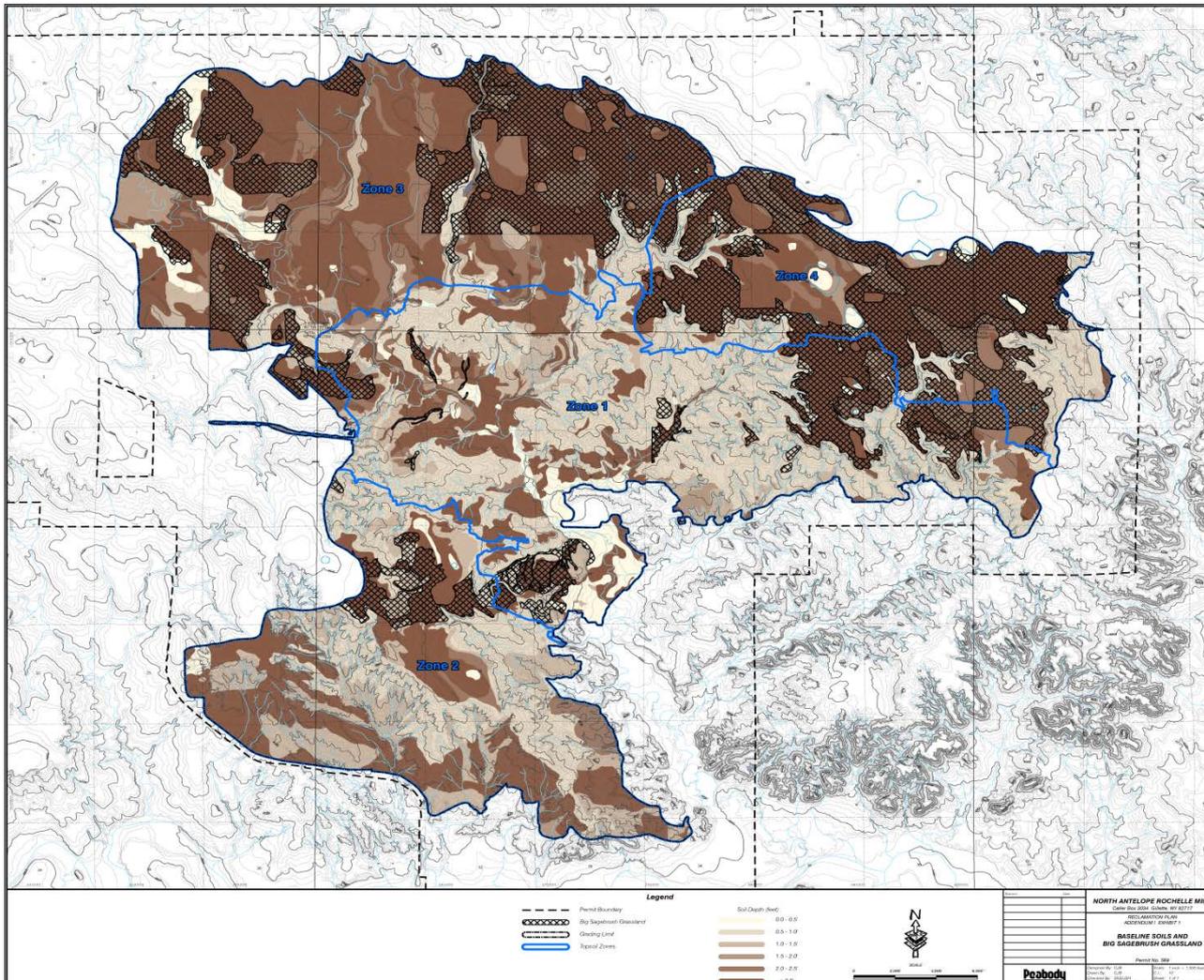


In House Reclamation Program/2007



North Antelope Rochelle Mine

Agency Collaboration: Variable Topsoil Replacement Depths



NARM was one of first mines in Wyoming to be granted approval to redistribute topsoil at varying depths. Environmental staff studied pre-mine topsoil resources and the distribution of sage grouse habitat. Demonstrating a strong correlation between these components, the team successfully petitioned the regulatory authority for approval of a variable replacement depth plan. The resulting plan will enable NARM to complete topsoil salvage and replacement more efficiently, distribute topsoil in a manner that resembles pre-mine conditions more closely and enhance reclamation of sage grouse habitat.

IMPORTANT FACTORS FOR SUCCESSFUL SPECIES ESTABLISHMENT

- Proper Planting Depth of Seed
- Proper Seed to Soil Contact for Germination
- Soil Fertility and Vigor (Tilth)
- Moisture and Temperature (Mother Nature Affect)

Shrubs:

- **Early spring seeding of shrubs (February)**
- **Snow and frost helps form surface crust**
- **Shorter duration of wind season**
- **Snow and frost also breaks down the seed coat for germination**
- **Reduce competition from other species**
- **Available moisture**
- **Timing of seeding according to precipitation events**

Factors For Shrub Establishment Failures

- Seasonal Timing of Shrub Seeding
- M.N. Affect (mother nature) Drought & Wind
- Improper seeding techniques/poor seed depth control
- Herbivory of young tender seedlings



Wildlife Exclosures



No Admittance

Free Buffet Table

Seedling Plantings

Protection and Patience



North Antelope Rochelle Mine

Reclamation



Monitoring and
husbandry

Reclamation

Domestic Grazing



Monitoring and husbandry



Weed
Control

Successful Sage Brush stand/19 yrs. old



Successful Sage Brush stand/ 10 yrs. old



Precipitation Events



The Unknowns???

How did this happen?



Superior Land Restoration Practices Frequently Honored At NARM



Peabody's Mission: 'When mining is complete, we will leave the land in a condition equal to or better than we found it.'



SEEDING TECHNIQUES AND TIMING

Broadcast seeding
Drill or Mechanical seeding
Hydro seeding



ENERGIZING THE WORLD ONE BTU AT A TIME

Seedbed Preparation



Primary
Tillage

Seedbed Preparation



Finish Tillage

Is this possible?

Before



After



Broadcast seeding



- Brillion or Trillion style Seeder

Seedboxes



Double Disk Opener Drill Seeder



- Dribble Seeding with a Mechanical Style Drill Seeder

Dribble Seeding Function



Dribble Seeding into stubble mulch with a Mechanical Style Drill Seeder



Hydro-applications of Shrubs

- Hydro seeding
- Hydro mulching
- Tackifying



Questions???









09/27/2010