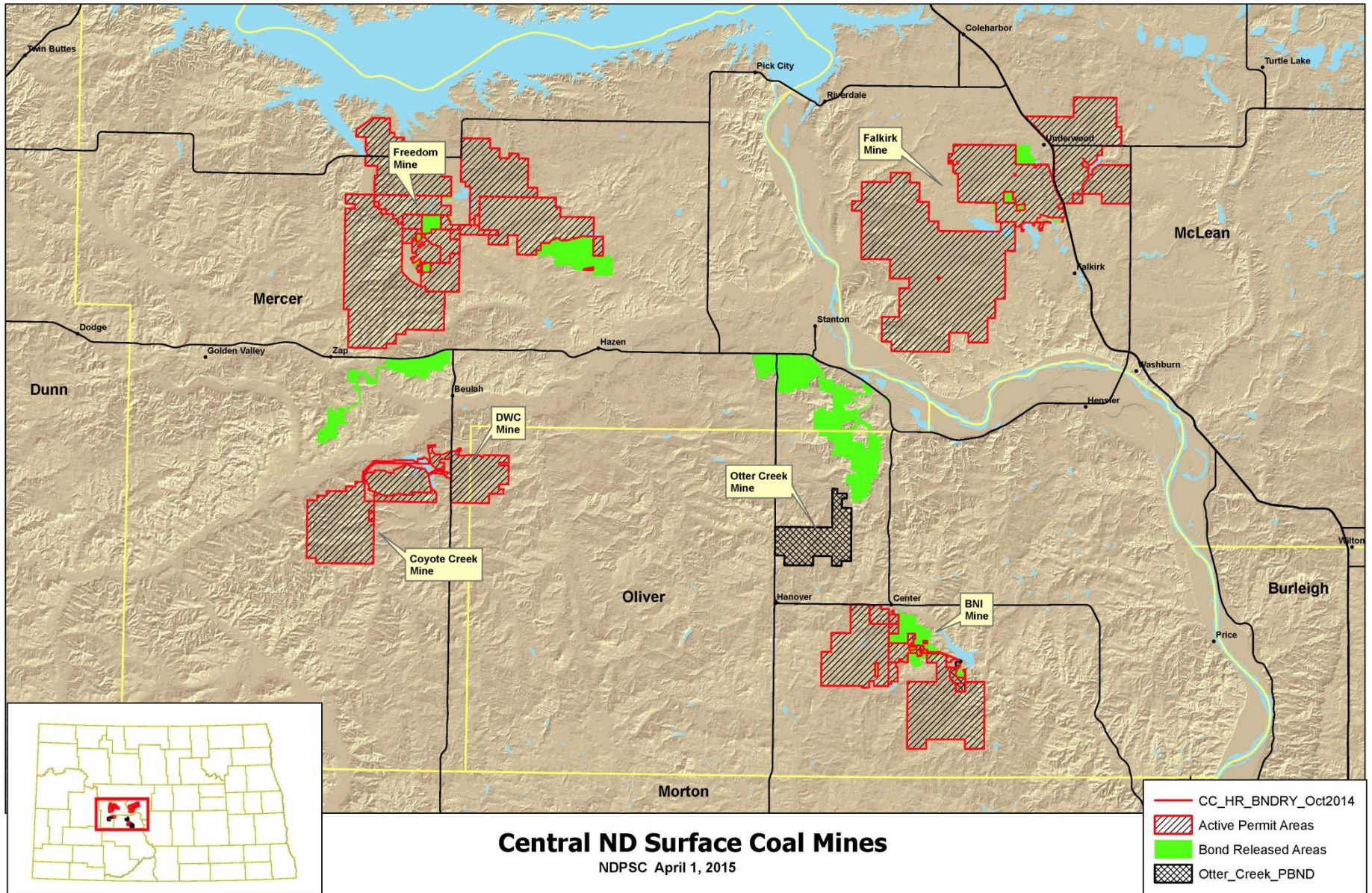


Surface Coal Mining and Reclamation in ND

Guy Welch

ND Public Service Commission





Central ND Surface Coal Mines

NDPSC April 1, 2015

Approximately 1500 acres are disturbed each year



History of Reclamation in ND

- First surface mining law passed in 1969 (topping spoil peaks)
 - Amended in 1971 (grading to gentle topography),
 - 1973 (salvage & respread of topsoil),
 - 1975 (salvage of subsoil, restore productivity)
- Federal SMCRA passed in 1977

SMCRA

- Federal Surface Mining Control and Reclamation Act (SMCRA)
- ND has a state program with rules and regulations that meet or exceed federal requirements
- The Reclamation Division within the PSC administers the program
- Office of Surface Mining (OSM) provides funding and oversight to our state program

Permitting Requirements

- Environmental Resource Information
- Company Legal & Financial Information
- Right of Entry
- Mining Operation Plan
- Reclamation Plan
- Bonding

Section 2.0 - Environmental Resource Information

[2.1 Geology](#)

[2.2 Surface Water Hydrology](#)

[2.3 Ground Water Hydrology](#)

[2.4 Pre-Mining Land Use and Vegetation](#)

[2.5 Soil Resources](#)

[2.6 Alluvial Valley Floors](#)

[2.7 Fish and Wildlife Resources](#)

[2.8 Cultural Resources](#)

[2.9 Climatological Data](#)

Coal Mining – The Process



06/25/2015

Coal Mining – The Process

An aerial photograph of a coal mining operation in a rural, green landscape. The site features a large, dark, rectangular pond of water, likely used for processing or storage. To the right of this pond is a larger, irregularly shaped pond with brownish water, possibly a settling pond. A network of dirt roads and earthen embankments connects these areas. In the foreground, a long, narrow, light-colored structure, possibly a conveyor belt or a road, runs parallel to the dark pond. The surrounding area is a mix of green fields and brown, excavated earth. The sky is clear and blue.

Surface Water Management

06/25/2015

Coal Mining – The Process



Topsoil and subsoil is salvaged separately

Coal Mining – The Process



Overburden and coal are removed

Reclamation – The Process

Backfilling and grading

06/25/2015



Reclamation – The Process



Respreading topsoil and subsoil

10.07.2008 11:01

Reclamation – The Process



Soil is chiseled and rocks are picked

12.12.2006 14:53

Reclamation – The Process



Stabilize respread topsoil

2010.09.15

Reclamation – The Process

Best Management Practices

09.18.2012

Reclaimed Land is completely altered

- Post-mine topography is different, < steep
- Soil textures are mixed during the process and soil is generally respread at a uniform depth, by land use
- Material underlying the soil is different
 - Hardpan, sandstone restrictive layers removed
 - Drainage patterns altered
 - Shallow aquifers affected

Revegetation Performance Standards

- 10-year revegetation responsibility period
- Mining company must demonstrate revegetation success
- Cropland/Hayland – restore pre-mine productivity
- Native Grassland – productivity, ground cover, species seasonality, species diversity and permanence
- Woodlands – species density and diversity

Productivity Standard

- Established using pre-mine soils capabilities
- NRCS Soil Productivity Indices (PI)
- NRCS Pasture and Hayland Suitability Groups
- NRCS Range or Ecological Site Information

- Yields climatically adjusted using reference areas or ND Agricultural Statistics Service county yield information

Reclaimed Native Grassland Species Diversity and Seasonality Standard

- 5 grass species must be present
- 4 species each comprising at least 5% relative composition by weight or 3% ground cover
- 2 warm season species and at least 1 cool season
- Warm season species at least 15% of composition
- Native species must comprise 65% of total composition

Pre- Post-Mining Land Use Acreage

Land Use	Pre-Mining Acres	Post-Mining Acres
Cropland	86,304	88,650
Native Grassland	54,994	50,564
Tame Pastureland	3,647	2,643
Wetland	2,803	2,819
Woodland	1,578	1,500
Shelterbelt	675	622
Stockponds	145	433
Industrial	1,623	4,765
Roads	3,410	3,209
Miscellaneous	2,730	1,732

General Reclamation Practices

- Rocks picked on all land uses to facilitate management during responsibility period
- Some mines initially plant cropland to a grass/legume mix and manage as hayland
- Trees typically planted a year or two after topsoil respread
- Wetlands reclaimed as prairie pothole basins

Reclaimed Native Grassland

- **Seeding rates (lbs PLS/acre)**

BNI – 7.9

Coyote Creek – 11

Coteau Freedom - 20

Dakota Westmoreland – 13.6

Falkirk – 18

- **Spring seedings**

- **Management**

09/16/2014

Reclaimed Woodlands



- **Diverse mixture of trees and tall and low shrubs**
- **Planting density (2,700 plants/acre)**

Reclaimed Wetlands

An aerial photograph showing a large, rectangular area of brown, reworked earth in a green landscape. The brown area is surrounded by green fields and a small pond. The text "Reclaimed Wetlands" is overlaid on the top half of the image.

Pre-mine acreage replaced

Reclamation Challenges

- Reclaimed cropland

Differential Settling: Surface irregularity 06/25/2015

Reclamation Challenges



Soil compaction

Deep Ripping



08/31/2015

Reclamation Challenges

- Native Grassland
 - Invasive Species
 - Kentucky bluegrass
 - Smooth bromegrass
 - Crested wheatgrass
 - Management – small isolated tracts

06/25/2015

Lessons Learned

- Cropland

Deep ripping to reduce compaction

Minimize flat areas

Takes a few years to restore productivity

Can restore productivity

08.01.2006



Lessons Learned

- Native Grassland
 - Management after seeding is essential
 - Desirable and undesirable species establish with direct respread of topsoil – forbs vs Kentucky Bluegrass
 - Forbs and western snowberry can re-establish with direct respread of native grassland topsoil, but...invasive species
 - Prescribed grazing can reduce the rate of spread of smooth brome grass
 - Tall warm season grasses persist on upland sites
 - Little bluestem establishment success variable
 - Slender wheatgrass excellent for quick establishment
 - Spring seedings preferred vs fall seedings

Lessons Learned

- Wetlands
 - Wetland vegetation establishes rapidly where water ponds
 - Hydric soils develop
 - Wildlife utilize
 - Cattails and Reed Canarygrass
 - Cattle utilization
 - Vegetative buffer zone

Lessons Learned

- Woodlands
 - Species diversity is critical – i.e. Western X
 - Silverberry (*Elaeagnus commutata*) establishes much easier than western snowberry
 - Buffaloberry (*Shepherdia argentea*) is tough – pioneer species
 - Plant on concave north and east facing slopes
 - Weed control – mulch – wood chips
 - Can tolerate cattle if enough acreage & species

Dave Nilson – Glenharold Mine



We can reclaim functional native grasslands, but we cannot restore pre-mine plant communities

Dave Nilson – Glenharold Mine

- Soil moisture recharge
- Delay seedings (annual)
- Avoid convex slopes
- Rock in drainages
- Soil compaction -ripping
- Fertilize - Phosphorous
- Species diversity
- Woodland reclamation



Terence Schmidt – Freedom Mine

- Seed native grass into cover crop or mulch
- Seed only when conditions allow (moisture)
- Pick rocks to facilitate future management
- Erosion – “washouts don’t fix themselves”
- Thick stands of vegetation reduces weed invasion and erosion
- Soil respread can introduce invasive species
- Weed control (noxious) on stockpiled soil
- Management after seeding is critical

Conclusion

Mining companies are successfully reclaiming affected lands;

but

reclamation challenges continue to exist; and

therefore

**mining companies must continue improving their
reclamation practices.**