Advances in Mining Stewardship

Wetlands, Native Prairie and Rare Plants
Agenda

1. Coal Mining 101
2. Wetlands
3. Native Prairie - Case Study
4. Rare Plants
Poplar River Mine utilizes draglines to uncover coal
Approximately 3.4 million tonnes per year are produced for the Poplar River Power Generating Station
• The coal is loaded out of the pits by loaders
• 150 tonne coal haulers transport the coal to the loadout facility where it is loaded into rail cars
Reclamation

1

2

3

4
Environmental Approval
The mining process leaves depressions to create wetlands and wildlife habitat.
Westmoreland Coal Company and Ducks Unlimited Canada have partnered to re-establish wetlands within the Missouri Coteau.
Ditches Unlimited re-establish wetlands with ditch plug construction.
Areas drained for agricultural purposes are plugged and re-contoured back to their natural shape.
The areas fill with natural runoff and plants and animals return to the wetland.
Ditch Plug Construction

- Ducks Unlimited Canada is committed to monitoring the progress of the wetland
- Land is sold back with a perpetual conservation easement on the re-established wetland

Ditch Plug Construction
Native prairie is crucial for biodiversity
Regulations have been developed for native prairie areas

Native Prairie
Native Prairie – Case Study
Native Prairie – Case Study
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Native Prairie – Case Study
Native Prairie – Case Study

80 acres at Poplar River North Mine were seeded in 2009 with native species.

Additional areas will be seeded using native species in the future.
3 Location – Pit 5
3 Goal

Reclamation and Approvals Guidelines for Saskatchewan Strip Mined Coal Lands

- Site dominated by native species
- Variation in vegetation structure
- Minimal establishment of weed and non-native species

Photo courtesy of Stantec
3 Background

• Site Preparation:
  ▪ 2006 – cover soil (November/December)
  ▪ 2007 – seed bed prepared and seeded oats
  ▪ 2008 – seeded oats
  ▪ 2009 – 1st herbicide application
• Seeding:
  ▪ 2009 – 6 native grass cultivar mix and 2nd herbicide application
• Reclamation Monitoring:
  ▪ 2010 to 2014 (5 years)
• Vegetation Management:
  ▪ 2014 - mowing
3 Monitoring

- Includes:
  - 19 Transect
  - 145 quadrats

- Method:
  - July monitoring
  - Record all species
  - Record ground cover (%)
3 Results

Species Categories

Native
- e.g. Moss Phlox (Phlox hoodii ssp. hoodii)

Non-native
- e.g. Crested Wheatgrass (Agropyron cristatum ssp. pectinatum)

Weed
- e.g. Canada Thistle (Cirsium arvense)

Photo courtesy of Stantec

(Phlox hoodii ssp. hoodii)

(Agropyron cristatum ssp. pectinatum)

(Stantec)
3 Results

Number of Species

<table>
<thead>
<tr>
<th>Monitoring Year</th>
<th># Weed species</th>
<th># Non-native species</th>
<th># Native species</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>8</td>
<td>17</td>
<td>31</td>
</tr>
<tr>
<td>2011</td>
<td>8</td>
<td>13</td>
<td>24</td>
</tr>
<tr>
<td>2012</td>
<td>6</td>
<td>16</td>
<td>48</td>
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<td>2013</td>
<td>6</td>
<td>13</td>
<td>45</td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td>20</td>
<td>64</td>
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</tbody>
</table>
3 Results

Percent Ground Cover

<table>
<thead>
<tr>
<th>Monitoring Year</th>
<th>% Litter</th>
<th>% Bare Ground</th>
<th>% Weed species</th>
<th>% Non-native species</th>
<th>% Native Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>11</td>
<td>30</td>
<td>17</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2011</td>
<td>16</td>
<td>17</td>
<td>6</td>
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</tr>
<tr>
<td>2012</td>
<td>50</td>
<td>38</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2013</td>
<td>55</td>
<td>33</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2014</td>
<td>46</td>
<td>36</td>
<td>9</td>
<td>2</td>
<td>11</td>
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</tbody>
</table>
3 Results

Species Highest Percent Ground Cover 2014

- Green needlegrass
- Northern wheatgrass
- Western wheatgrass
- Wild oats
- Canada thistle

![Bar chart showing ground cover percentages for different species.](chart.png)
3 Results

Percent Ground Cover for Seeded Species

[Bar chart showing ground cover for different species over years, with green needlegrass, needle-and-thread grass, northern wheatgrass, slender wheatgrass, June grass, and western wheatgrass.]
3 Results

Weed Percent Ground Cover

<table>
<thead>
<tr>
<th>Seeded Grass Species</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada thistle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narrow-leaved hawk's-beard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creeping wild rye</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fox-tail barley</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kochia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Prickly lettuce</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dandelion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 Conclusion

- Native Species
  - 2014 results suggest continued increasing in variability in species diversity
- Seeded Species
  - There appears to be a shift to western wheatgrass as the dominant seeded species
- Weeds
  - Canada thistle
- Vegetation Management
  - Mowing?
  - Grazing?
  - Burning?
Rare Plants
4 Rare Plant for Mitigation

- SKCDC ranked S1 (extremely rare) or S2 (rare)
- *The Wildlife Act*, provincially listed as a Wild Species at Risk
- SARA identified schedules 1, 2 or 3 species
- COSEWIC recognized as being at risk

- Least Mousetail (*Myosurus minimus*) S2S3
- Blue Wild Phlox (*Phlox alyssifolia ssp. alyssifolia*) S2
- Prairie Dunewort (*Botrychium campestre*) S1
4 Location – Pit 8
4 Goal

- Abide by *Mineral Industry Environmental Protection Regulations, 1996*
  - Section 12
    - Decommissioning and Reclamation Plan

- Follow Reclamation and Approvals Guidelines for Saskatchewan Strip Mined Coal Lands
  - Establish rare species present prior to mining
    - Create rare plant mitigation plan
4 Rare Plant Mitigation Plan

- Sod Transplant
  - trial blue wild phlox
  - prairie dunewort
- Seed Bank Collection
  - least mousetail
- Seed Collection/Plug Planting
  - blue wild phlox
4 Sod Transplants

Blue Wild Phlox

- Completed 2011
- Excavated 13 patches (~3.3 m x 3.7 m and 12 cm deep)
- Recipient site: Native prairie reclamation site (cover soil)
4 Sod Transplants

Blue Wild Phlox

Photo courtesy of Stantec
Sod Transplants

Prairie Dunewort

- Complete mid to late May 2015
- Recipient site: native prairie grassland
- Sod must maintain specific mychorrhizal soil
- Monitoring up to 20 years

Photo courtesy of Stantec
4 Seed Bank Collection

Least Mousetail
- Originally focused on seed collection
- Complete mid to late May 2015
- Recipient site: Pit 5 native prairie reclamation wetland

Photo courtesy of Stantec
4 Seed Collection

Blue Wild Phlox
- Annual June surveys
- 2012 to 2014

Photo courtesy of Stantec
4 Plug Planting

Blue Wild Phlox

- Completed 2013 and 2014
- Plots ~ 9 to 10 plugs
- Spacing ~10 to 30 cm
- Watered
4 Plug Planting

Recipient Site 1 (Native Prairie)

- 2013 - Planted 243 plugs
- 2014 – Planted 60 plugs

Photo courtesy of Stantec
Plug Planting

Recipient Site 2 (Pit 5)

- 2013 - Planted 38 plugs
- 2014 – Planted 477 plugs
## Results

Blue Wild Phlox Plug Observed 2014

<table>
<thead>
<tr>
<th>Recipient Site</th>
<th>Planting Year</th>
<th>Aspect</th>
<th>Percent Survival (%)</th>
<th>Average Plant Stem(s)</th>
<th>Average Plant Width (cm)</th>
<th>Percent Plants with Seeds (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2013</td>
<td>East to Southeast</td>
<td>73</td>
<td>4</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>1</td>
<td>2014</td>
<td>South</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2013</td>
<td>South</td>
<td>92</td>
<td>9</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2014</td>
<td>West</td>
<td>80</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2014</td>
<td>South</td>
<td>68</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>
4 Lessons Learned

Sod transplants

- Recipient site preparation
- Mark transplant boundary
- Develop standard monitoring program
- Know your plants/sod transplant

Photo courtesy of Stantec
4 Lessons Learned

Prairie Dunewort
- Sod transplant only potential mitigation option

Least Mousetail
- Seed collection challenge
- Seed bank salvage
4 Lessons Learned

Seed Collection
• Monitor flowering

Plug Planting
• Recipient site selection
• Mark plot boundary
• Develop standard monitoring program

Photo courtesy of Stantec
Questions?