An Overview of Lignite Mine Reforestation at Luminant’s Martin Lake Mines in Eastern Texas

June 11, 2015
Luminant Power and Mining Operations

Luminant Power Generation
(Assets as of 12/31/12)
- Nuclear 2300 MW 2 units
- Natural Gas 5100 MW 26 units
- Lignite 8017 MW 12 units
- TOTAL 15427 MW 40 units

Luminant Mining Operations
- Approximately 1850 employees in mining
- Largest lignite mining operation in Texas
- 8 actively producing mine sites near power plants
Luminant Mining Company LLC

- 9th largest mining company (tons) in U.S.
- 8 Active mines at 5 mine-mouth power plants
- Produced 29.6 million tons of coal in 2014 …all used in Luminant power plants
- 13 mine permits from Railroad Commission of Texas (over 156,000 acres)
- 117 additional permits from Texas Commission on Environmental Quality and U.S. Army Corps of Engineers combined
- Award-Winning Reclamation Efforts
<table>
<thead>
<tr>
<th>Luminant Mine</th>
<th>Permit No.</th>
<th>Original Permit Date</th>
<th>Current Permitted Acres</th>
<th>County</th>
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</thead>
<tbody>
<tr>
<td>Big Brown Mine</td>
<td>3F</td>
<td>10/17/1977</td>
<td>12,910</td>
<td>Freestone</td>
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<tr>
<td>Martin Lake Mine</td>
<td>4K</td>
<td>10/17/1977</td>
<td>30,530</td>
<td>Rusk / Panola</td>
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<tr>
<td>Monticello-Thermo Mine</td>
<td>5G</td>
<td>10/17/1977</td>
<td>4,506</td>
<td>Hopkins</td>
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<tr>
<td>Monticello-Winfield Mine</td>
<td>34F</td>
<td>10/17/1977</td>
<td>26,732</td>
<td>Titus / Franklin</td>
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<td>Oak Hill Mine</td>
<td>46C</td>
<td>07/25/1983</td>
<td>26,014</td>
<td>Rusk</td>
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<td>Bremond Mine</td>
<td>49A</td>
<td>03/23/2004</td>
<td>3,371</td>
<td>Robertson</td>
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<td>Kosse Mine</td>
<td>50A</td>
<td>04/24/2007</td>
<td>15,040</td>
<td>Robertson / Limestone</td>
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<td>Leesburg Mine</td>
<td>51</td>
<td>06/10/2008</td>
<td>4,516</td>
<td>Camp</td>
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<td>Martin Lake AIV South Mine</td>
<td>53</td>
<td>02/26/2009</td>
<td>2,403</td>
<td>Rusk / Panola</td>
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<td>Turlington Mine</td>
<td>54</td>
<td>06/22/2010</td>
<td>10,450</td>
<td>Freestone</td>
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<td>Three Oaks Mine</td>
<td>48B</td>
<td>11/30/2010</td>
<td>15,809</td>
<td>Bastrop / Lee</td>
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<td>Thermo A-1 Area Mine</td>
<td>56</td>
<td>06/26/2012</td>
<td>286</td>
<td>Hopkins</td>
</tr>
<tr>
<td>Liberty</td>
<td>58</td>
<td>12/11/2012</td>
<td>3,866</td>
<td>Rusk</td>
</tr>
</tbody>
</table>

Total Acres 156,148
Other Environmental Permits

Wetlands - U.S. Army Corps of Engineers
- 38 active Corps permits

Water – TCEQ
- 7 active Wastewater Discharge permits
- 18 Stormwater Permits
- 22 Water Rights Permits

Air - TCEQ
- 32 active permits
Luminant Mining Company
Reclamation Land Uses

Land is reclaimed to premine uses for the area:

- **Improved Pastureland**
  - Livestock
  - Hay Production
- **Forestland** that emphasizes:
  - Quality Wildlife Habitat
  - Commercial Forestland for timber production
- **Water** Resources are significantly increased
- **Industrial/Commercial** uses accommodated
Reclamation Land Use - Pastureland
Reclamation Land Use - Reforestation

- 37 million trees planted since 1975
- 1.4 million per year avg since 1995
- 1.25 million planted in 2015

Commercial Forestland

Wildlife Habitat
Reclamation Land Use - Wildlife Habitat

Reclamation of Wildlife Habitat / Wildlife Protection & Enhancement

Restoration of Wildlife Habitat is a critical part of Luminant’s reclamation effort

Wildlife Protection, Enhancement and Reintroduction Initiatives:

- American Bald Eagle
- Interior Least Tern
- Bobwhite Quail
- Eastern Wild Turkey

Grassland Habitat:

- Benefits to one of the fastest declining bird groups in America (grassland birds)
Reclamation Land Use - Water Resources

Ponds, Streams and Wetlands
Environmental Stewardship

Luminant Environmental Research Steering Committee

• Began in 1971 and continues today
• Funded by Luminant with student research directed by an Independent Advisory Board of University Professors
• 130 students have entered the program, studying various potential effects of surface lignite mining, electric power generation and electric power delivery on the environment
Martin Lake Mine encompass a combined 59,333 acres in two East Texas counties.
Post-mine Land Uses

- Commercial Forestry: 15,872 ac. (43%)
- Fish and Wildlife Habitat: 12,408 ac. (33%)
- Developed Water Resources: 2,248 ac. (6%)
- Pastureland: 5,463 ac. (13%)
- Industrial/Commercial: 2,096 ac. (5%)
MARTIN LAKE REFORESTATION

22.1 million trees planted (as of Mar. 2015)
Reforestation Planning

• Selection of species
  Commercial pine /wildlife habitat

• Habitat- Upland or Bottomland

• Challenges
  Rainfall
  Soil texture
  Moisture Regime
Pine Varieties

Loblolly Pine - NE Texas (2nd gen)
Longleaf Pine (Vernon Parrish, La.)
Upland and Bottomland Hardwood Establishment
Hardwood Varieties

- Bur Oak
- Cherrybark Oak
- Chinkapin Oak
- Nuttall Oak
- Post Oak
- Swamp Chestnut Oak
- Southern Red Oak
- Shumard Oak
- Overcup Oak
- Water Oak
- Willow Oak
- White Oak
- Bald Cypress

- Black Walnut
- Native Pecan
- Persimmon
- Water Hickory
- River Birch
- Plum
- Black Tupelo
- Water Tupelo
- Hackberry
- Button-bush
- Wax-myrtle
Longleaf Pine & Tall Prairie Grass Ecosystem

- Sand Lovegrass
- Sand Dropseed
- Switch Grass sp.
- Indian Grass
- Big Bluestem
- Little Bluestem
- Lespedeza sp.
Commercial Pine Thins and Harvests

GOAL: To systematically remove inferior stems within the stand while increasing the quality and value of the residual stand.

- Loblolly pine stands are typically first thinned for pulpwood products at year 15-16
- Conservatively remove every fifth row (20%) for equipment access and then thin the remaining rows to an 80 basal area to improve the health of stand
- Subsequent thinnings at 5-7 year intervals produce chip-n-saw logs
- Final harvest produces larger saw logs
Texas Forest Sector

- $30.3 billion to state economy annually
- One of Texas’ top 10 renewable natural resources
- Provides more than 5000 products we use daily
What is your legacy?