



# Evaluating the Suitability of a Reforestation Growth Medium Prepared by Tractor Pulled Scraper Pans at an East Texas Lignite Surface Mine



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Luminant's reforested mined land in east Texas

## Introduction

Luminant has planted 36.4 million trees on its reclaimed surface mine operations in east Texas since 1975. Studies conducted at Luminant mines found high levels of compaction from reclamation equipment hindered reclamation success (Yao 1994). Development of new reclamation methodologies offers opportunities to improve productivity potential of planted trees. This research will evaluate soil physical and chemical properties, particularly bulk density, between two sites at the Oak Hill Mine reclaimed using different methods. A soil tillage study at a scraper-pan test site will evaluate four different tillage techniques on tree establishment and growth.

## Objectives

- Evaluate two reclamation techniques currently operating at the Oak Hill Mine (Fig. 1) in terms of physical and chemical soil properties:
  - Truck & shovel combination (or haulback method)
  - Tractor-pulled scraper pans
- Determine if the effects of mine soil compaction can be alleviated at the scraper pan test site by comparing four mine soil tillage treatments



A dragline operation at Oak Hill Mine

## Equipment Techniques



### Truck and Shovel Combination:

This is the conventional method of operation. A hydraulic excavator backhoe loads haul trucks with 244 cm cuts of oxidized overburden (step 1), which transport and dump it at a reclamation site. Bulldozers then level the overburden to approximate original contour (step 2).



### Tractor-Pulled Scraper Pans:

The transport and placement of the overburden can also be accomplished using scraper pans. This method eliminates the need for leveling by bulldozers because scraper pans grade the reclamation soil as loads are being released in 15 cm layers.

## Literature Cited

Yao, Li. 1994. Effects of compaction on reclamation of surface mined lands in east Texas. Doctoral Dissertation, Department of Soil and Crop Sciences, Texas A&M University.



Study pits will be dug with a backhoe to a depth of 120 cm

## Methods

At the each of the test sites (Fig. 2) an area of 0.30 hectares will be established for sample plots (n=5). Physical and chemical soil properties will be measured at various soil depths (0-30, 30-60, 60-90, 90-120 cm):

- Soil surface (<30 cm) and subsurface (>30 cm) bulk density using a slide hammer
- Penetration resistance at 10 cm intervals
- Infiltration rate at soil surface
- Soil water concentration
- Soil pH, texture, and nutrient content

## Study Location

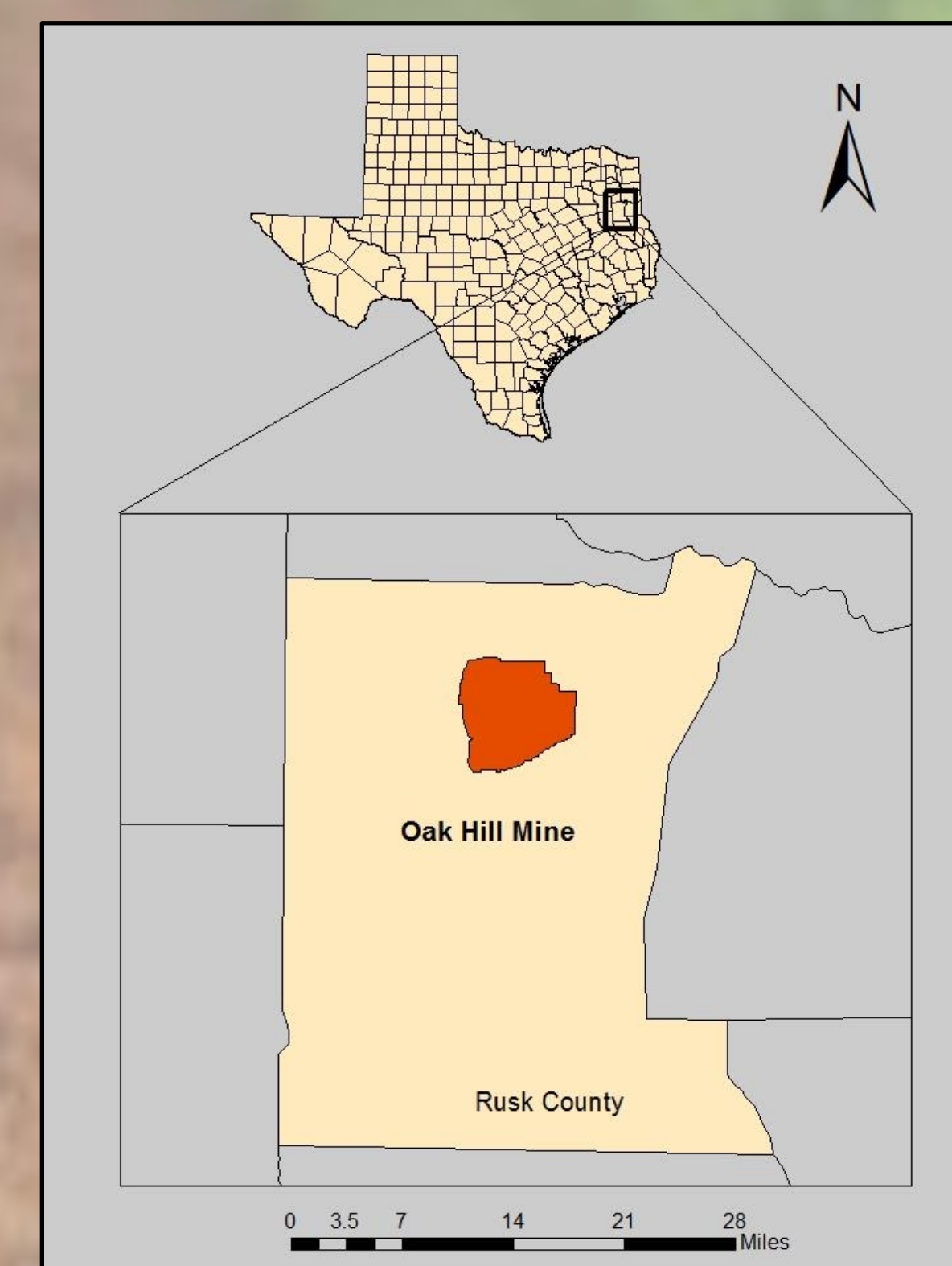


Fig. 1. Oak Hill Mine in Henderson, Texas

## Test Sites

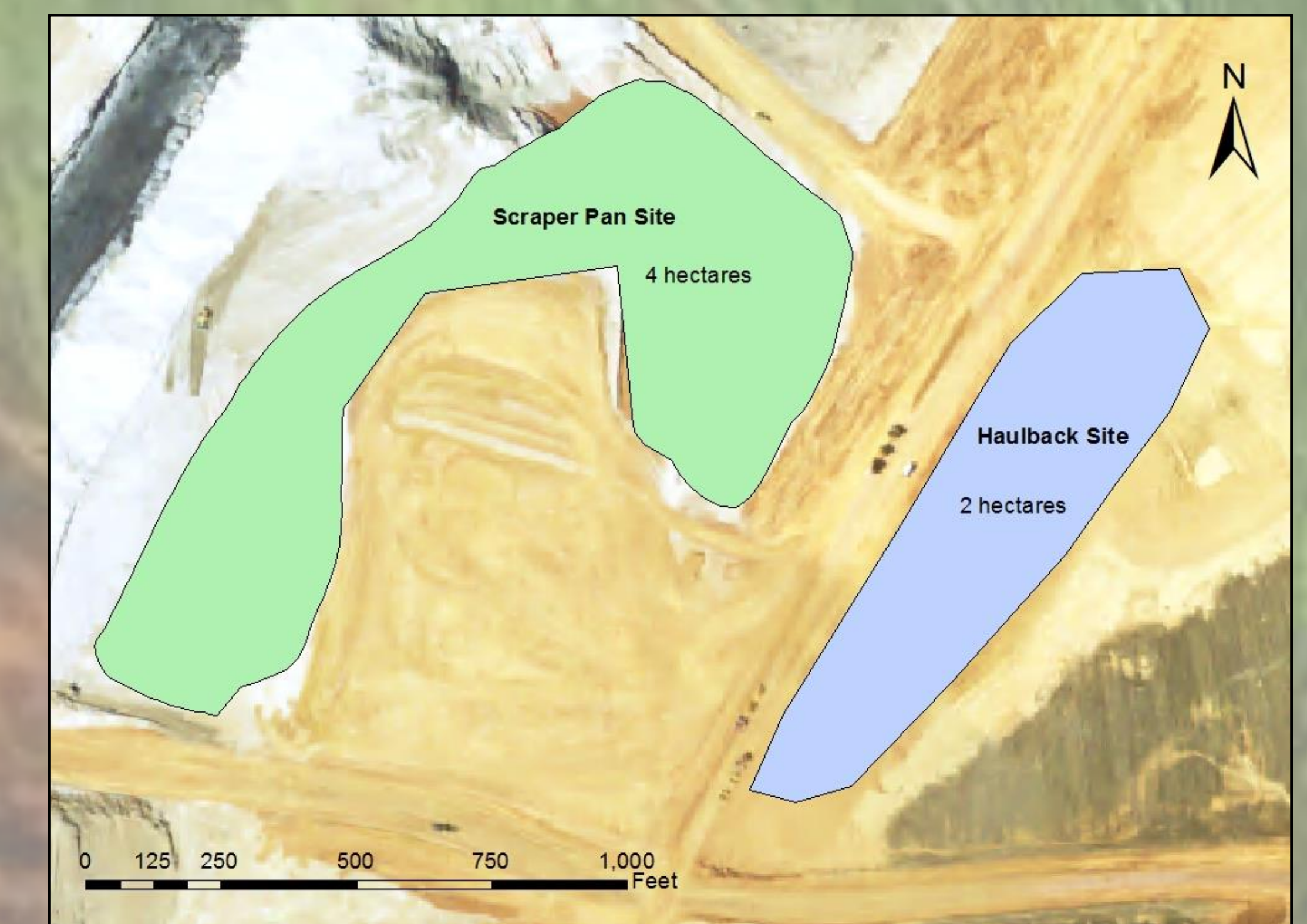


Fig. 2. Test site locations for the two equipment methods

## Soil Tillage Study

At the scraper pan test site, four soil tillage treatments were implemented and will be sampled for the properties listed in the methods section, and loblolly pine (*Pinus taeda*) survival and growth. Treatments include: 1) Disking (30-35 cm depth); 2) Ripping (120 cm depth) and disking; 3) Cross-ripping and disking; and, 4) No tillage (control)



Control (no till) vs disking only



Single ripping vs cross-ripping



Ripping + disking

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