How does *Leptographium terebrantis* affect water transport in loblolly pine?

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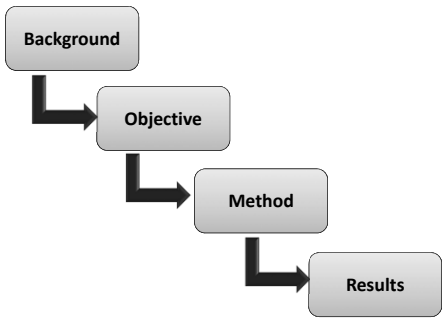

Background

- Pest and Diseases – Are threat to forest sustainability
- Southern Pine Decline (SPD) – A complex of factors that affect loblolly pine in southeast US
- SPD causes economic loss – Lower productivity and increased mortality
- *Leptographium terebrantis* –Pathogen associated with SPD

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Background

- To what extent does *L. terebrantis* affects growth and productivity of loblolly pine?
- Water status of loblolly pine as a result of *L. terebrantis* stress
- Water status of plants
  - Water potential
  - Stomatal conductance
- Water potential - The tendency of water to enter or leave a cell
  - Cell growth
  - Photosynthesis
  - Plant productivity
- Under stress conditions - Water potential value become more negative

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Background

- Growth depends on
  - Water and nutrients availability
  - Influenced by biotic and abiotic factors
- Stomatal conductance – Rate at which water vapor exits the stomata
  - A greater value means the stomata are transpiring more water per unit leaf area per second
  - An increase in transpiration rate causes an increase in water demand by the roots

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Objective

- Determine whether *L. terebrantis* affect the movement of water in loblolly pine trees

Hypothesis

- Increasing *L. terebrantis* inoculum density will significantly alter the availability and movement of water required for growth of loblolly pine

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Study Area

- Solon Dixon Forestry Education Center - Andalusia, AL
- Naturally regenerating stand
- Predominant pine species
  - Loblolly
  - Slash
  - Longleaf

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Methods

- Loblolly pine trees selected
  - Without symptoms of disease
  - Ground level diameter: 2-3 inches
- Five treatments and 15 trees per treatment
- *L. terebrantis* was cultured on toothpicks and used for inoculation
- Post inoculation assessment at 4,8,12 and 16 weeks

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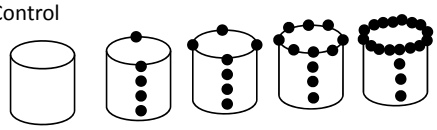
Methods

- Five treatments
  - Two inoculation points (IP) at 180^{O} apart (2IP)
  - Four at 90^{o} apart (4IP)
  - Eight 45^{o} apart (8IP)
  - Sixteen 22.5^{o} apart (16IP)
  - Control



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Pictures Showing the Inoculation Process

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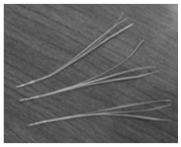
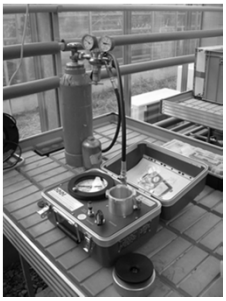
Methods – Predawn Water Potential

- Five trees per treatment were randomly selected
- Three fascicles per tree





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Methods – Mid-day Stomatal Conductance

- Stomatal conductance – Steady state porometer
- Five trees per treatment were randomly selected
- 3 readings per tree

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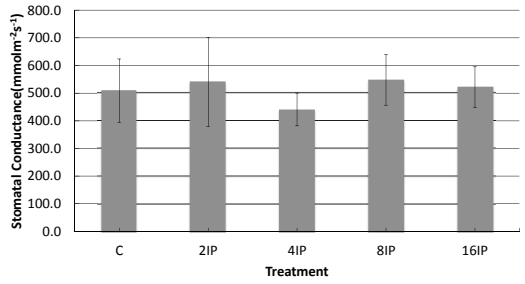
Preliminary Results – Stomatal Conductance (4 weeks)



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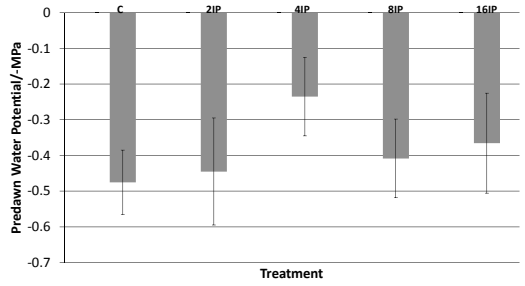
Preliminary Results – Predawn Water Potential (4 weeks)



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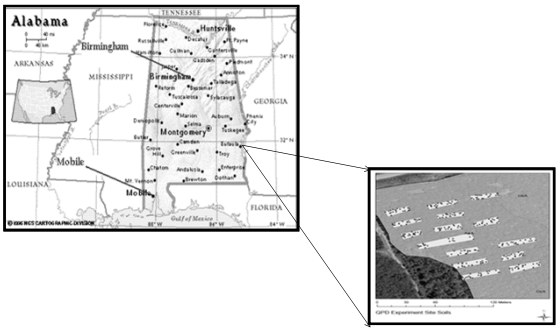
Main Project - Eufaula



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Objectives

- Determine the threshold of inoculum density of *L. terebrantis* required to cause growth reductions and/or mortality of loblolly pine
- Examine *L. terebrantis* infection and its interaction with water, nutrient and carbon relations in loblolly pine to determine the cause of growth reductions/tree mortality

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Main Project

- Quantify the impact of *L. terebrantis* infection on loblolly pine growth and productivity
- Forecast the incidence of loblolly pine decline at the stand level

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