Loblolly pine growth effects and response to the spread of *Lecanosticta acicola*

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Introduction

Loblolly pine is important within the state of Alabama and the Southeast as a whole

Brown spot needle blight (BSNB) recently started causing detrimental affects to loblolly pine

Little is known about the spread of disease and impact on loblolly pine growth

Background

Photosynthesis drives forest production

More needle disease could result in less needle area

Less photosynthetic area results in less energy supplied to growth and defense mechanisms

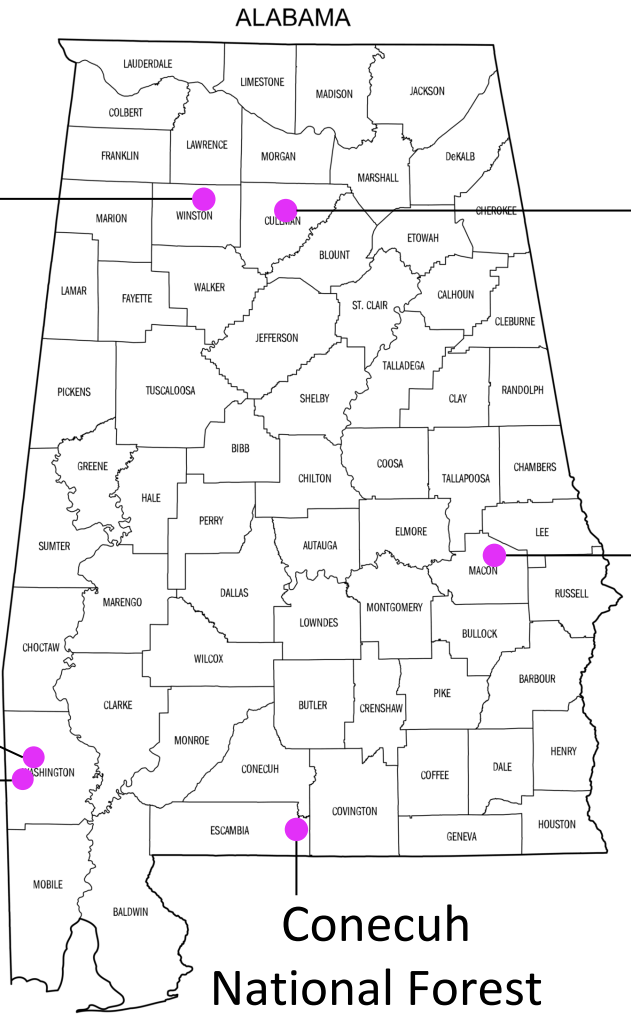
Objectives

1. Determine impacts on the vigor of loblolly pine tree growth from BSNB

2. Understand environmental factors that may increase the spread of BSNB

3. Determine physiological impacts of disease on loblolly pine

Plot Locations



Bankhead National Forest

Osko Forest and Williams Family Land (Private)

Longleaf Land and Timber Co. (Private)

Tuskegee National Forest

Stallworth Property (Private)

Conecuh National Forest

Plot layout

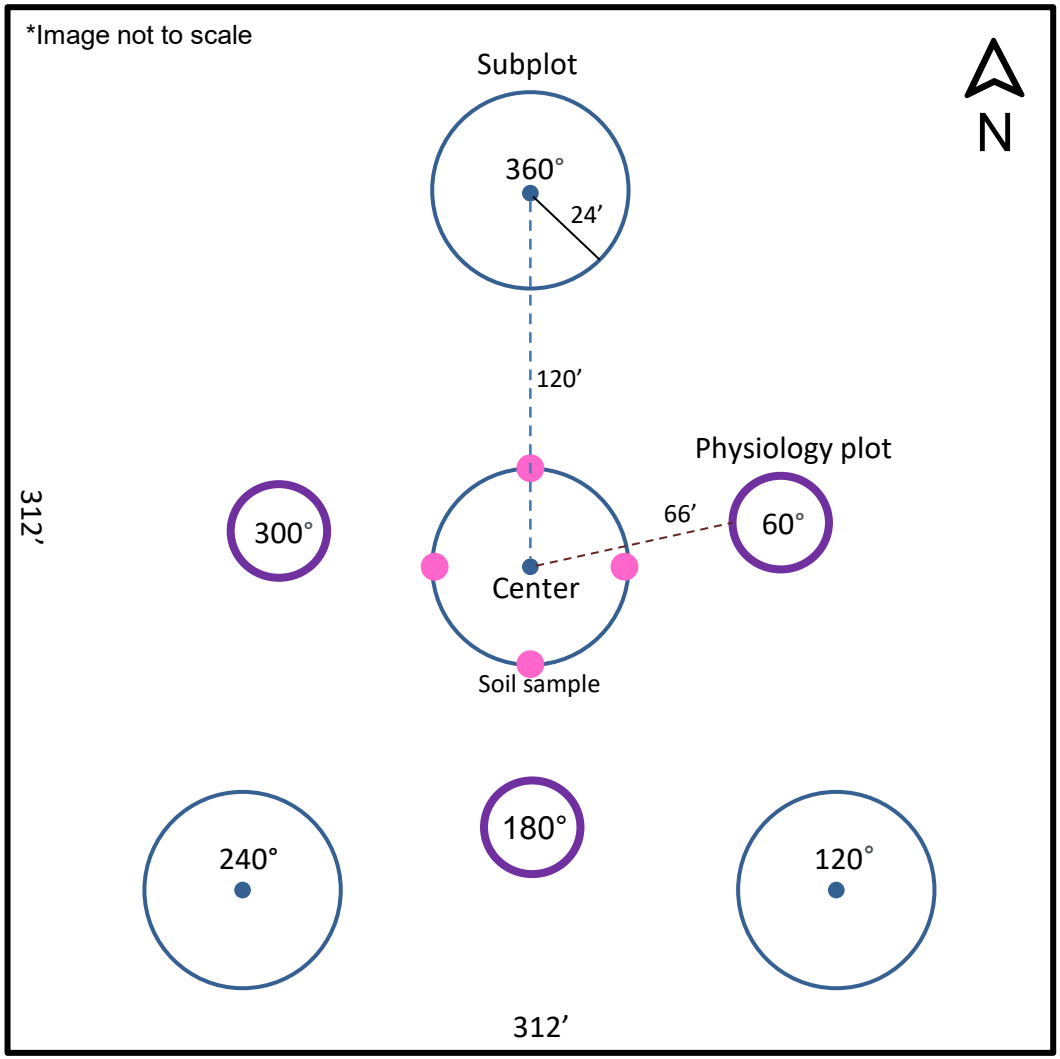


*Image not to scale
Subplot
N
360°
24’
120’
Physiology plot
66’
60°
300°
312’
Center
Soil sample
180°
240°
120°
312’

Data Collection

Height

DBH

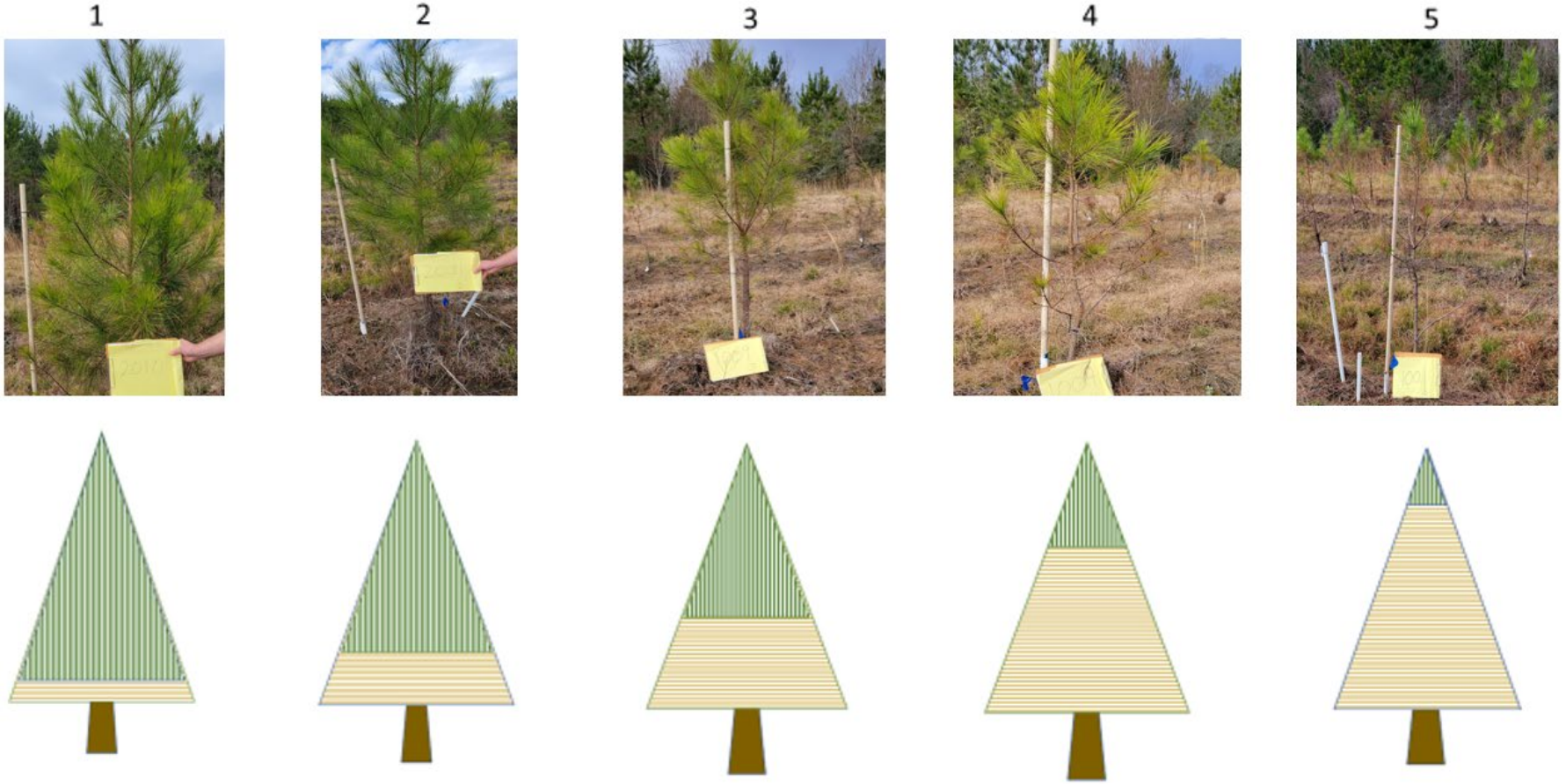
Disease Rating

Crown Rating

Whole Plot- Ceptometer readings, BA, Convexity, Slope, Elevation, and Management history

Disease Rating

Disease rating



Weyerhaeuser Company, 2024

Crown Rating

Crown Dieback

Percent of living & dead crown with dead upper & outer branches.

Crown Density

Percent of crown outline with living branches & foliage.

Foliage Transparency

Percent sunlight transmitted through the living crown.

Live Crown Ratio

Percent of total tree height containing a living crown.

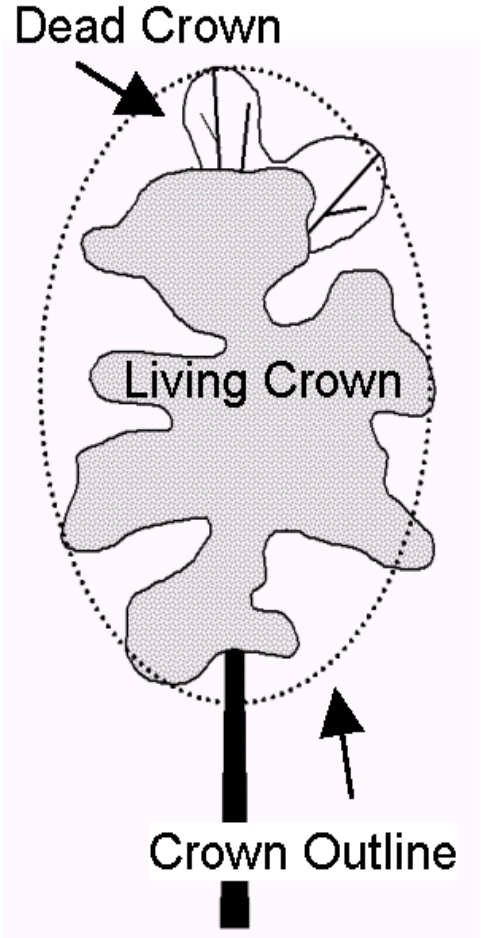
Crown Light

Percent of total tree receiving full light.

Crown Position

Relative position of each tree in relation to the main overstory canopy.

USFS, 2024



Physiology Measurements

Pressure Bomb

$$RWC\ (\%) = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Turgid weight} - \text{Dry weight}} \times 100$$

Relative Water Content

Needle Measurements

Yearly growth

Resin Secretion

Soil Collection

Cardinal directions around center subplot

Dry weight

Soil moisture content

Chemical analysis

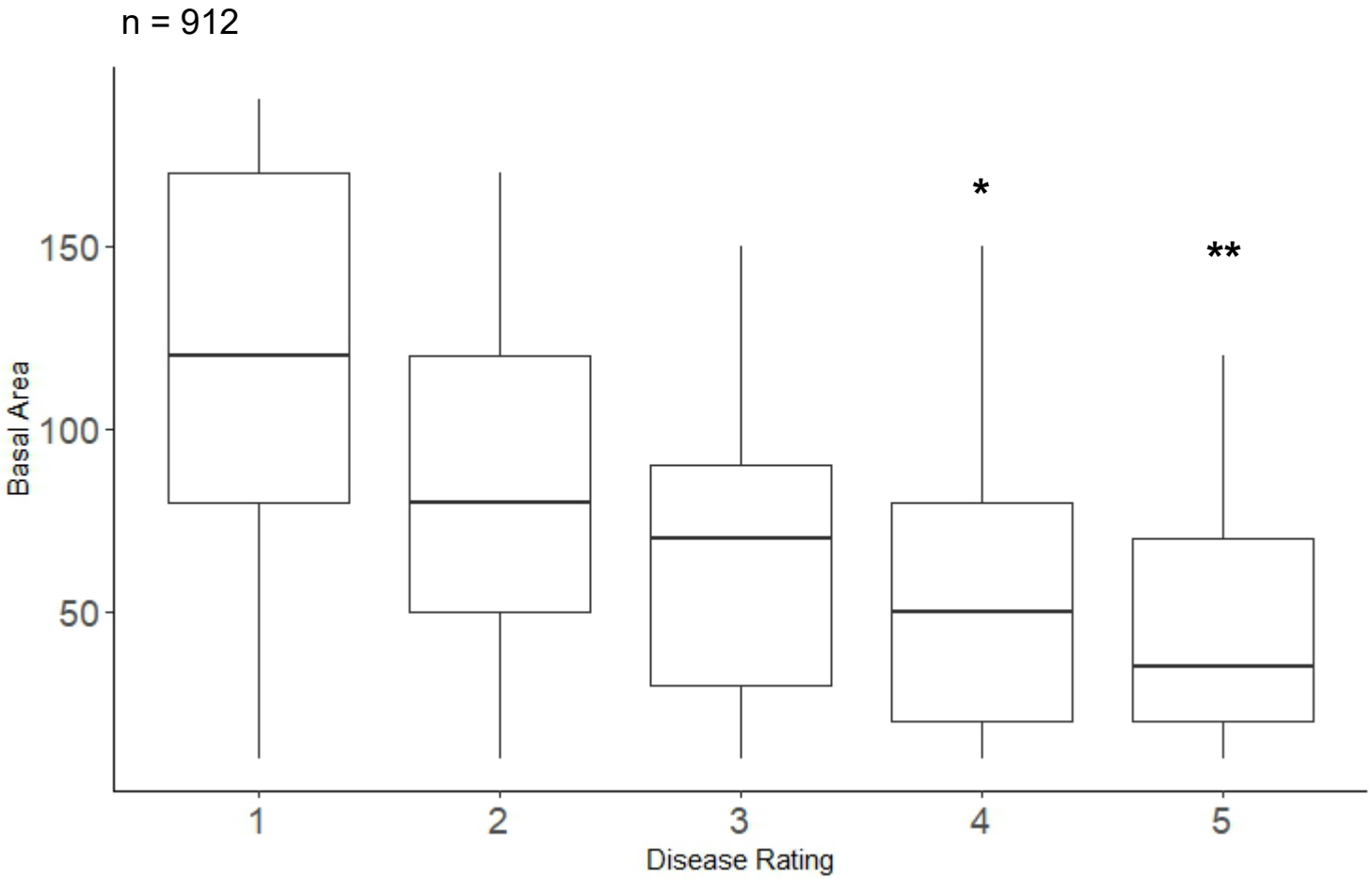
Soil pH

Penetrometer readings

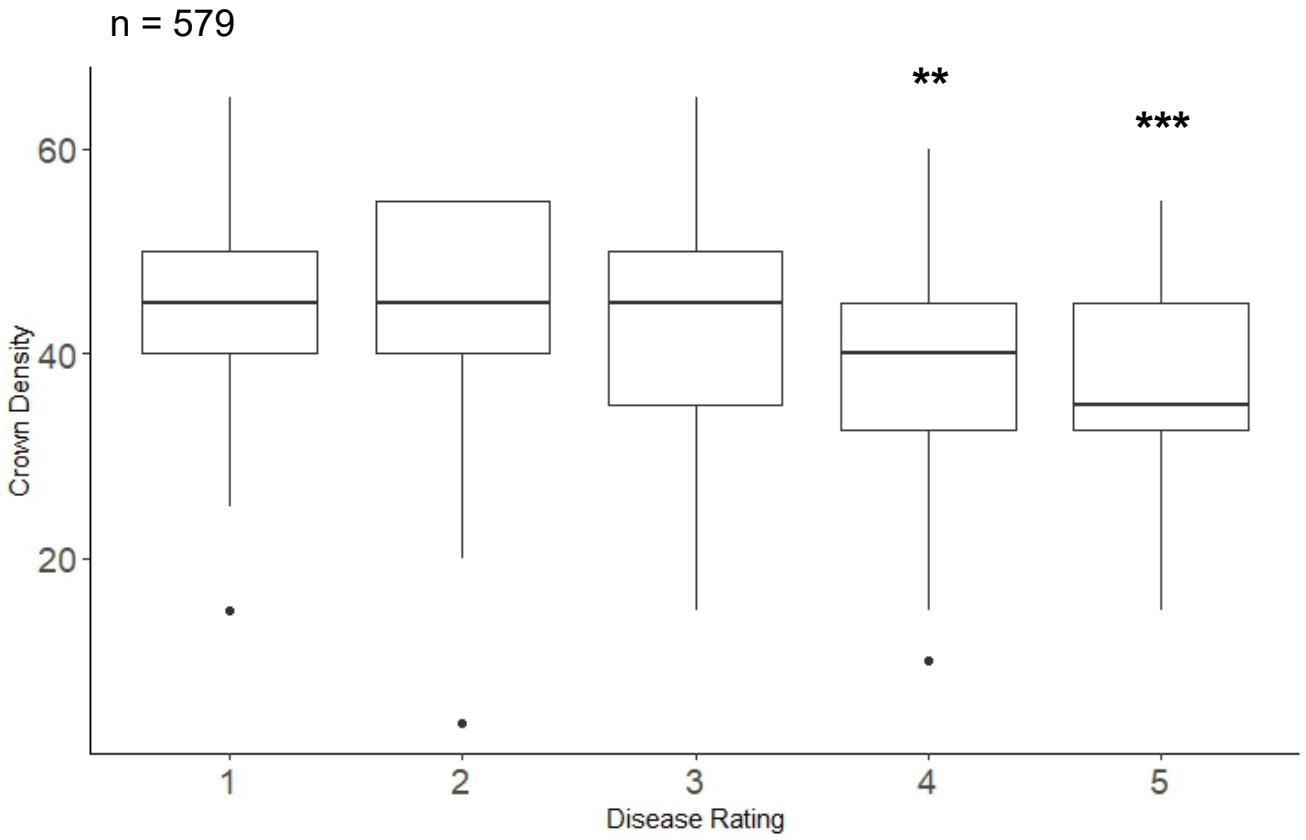
Plot Updates

Forest	Time since establishment	Number of plots	Number of trees	Total deaths
Conecuh	0.5 years	2	189	2
Bankhead	0.5 years	3	135	44
Tuskegee	0.5 years	3	134	2
Osko	1.5 years	5	209	10
Longleaf	1.5 years	2	236	29
Stallworth	1.5 years	6	580	49

Whole Plot Results

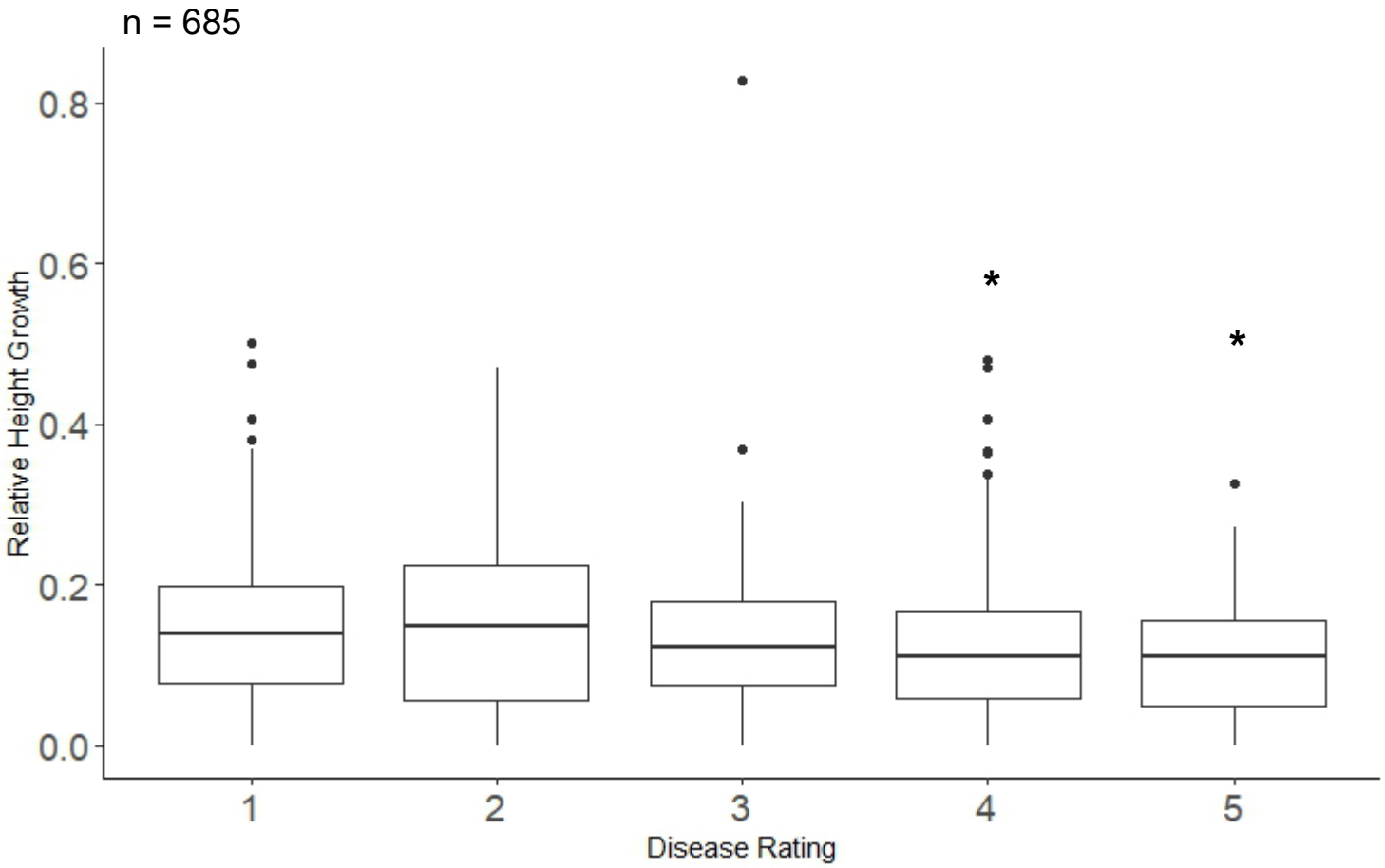


Crown Rating Results



Is premature needle shed affecting this?

Height Growth Results- South Plots



Next Steps

Continue to monitor spread of disease within plots disease

Analyze 2024 crown rating data

Finish analyzing soil samples

Summary

Discover the means of transmission of this disease and its impact on the growth and health of trees




Acknowledgements

Committee
Dr. Lori Eckhardt
Dr. Jonathan Cale
Dr. Timothy Shearman
Dr. Joseph Fan

Collaborators
Dr. Emily Carter
Dr. Brian Via
Dr. Iris Vega
Dr. Janna Willoughby
Dr. Lana Narine
Ryan Mitchell
Kris Bradley
Susan Turner

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Christian Rivera
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Gabriel Silva
Swati Singh

Facilities
Forest Health Dynamics Lab
Geospatial Analytics Lab
Forest Products Lab

Landowners
Stallworth Land Company
Longleaf Land & Timber Co.
Glover Family (Osko Forest)
Williams Family
US Forest Service

Undergraduates
Angel Cagle
Andrew Howard
Maddox Golden
Drew Conway
Nathan Kurtz
Garrett Gaar
Gracey Goldsby
Skylar Alvarez
Lillian Avis
Caleb McCrory
Blake Johnson

Forest Health Cooperative

Forest Products Development Center

REGIONS

FOREST SERVICE US DEPARTMENT OF AGRICULTURE

Thank you!

Questions?

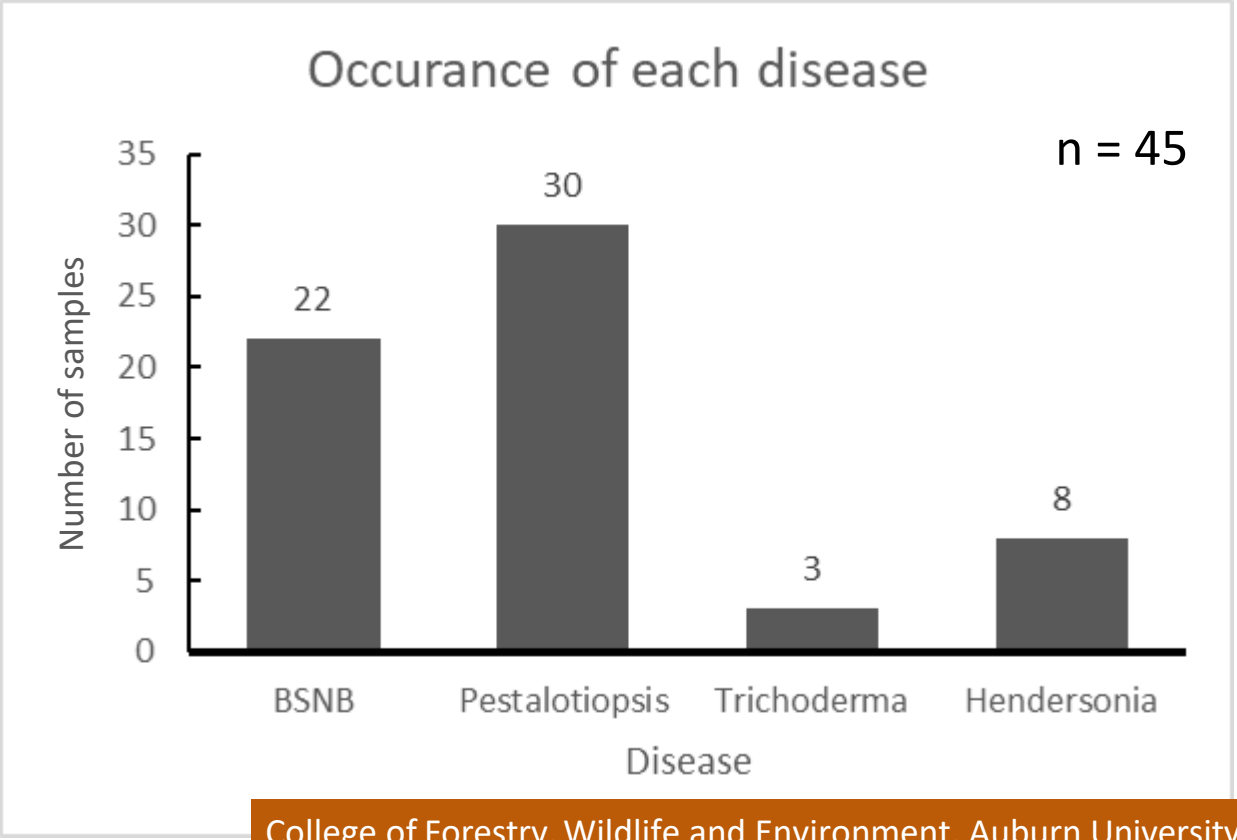
Results-physiology pairing

Samples with disease: 35

Samples with no disease: 10

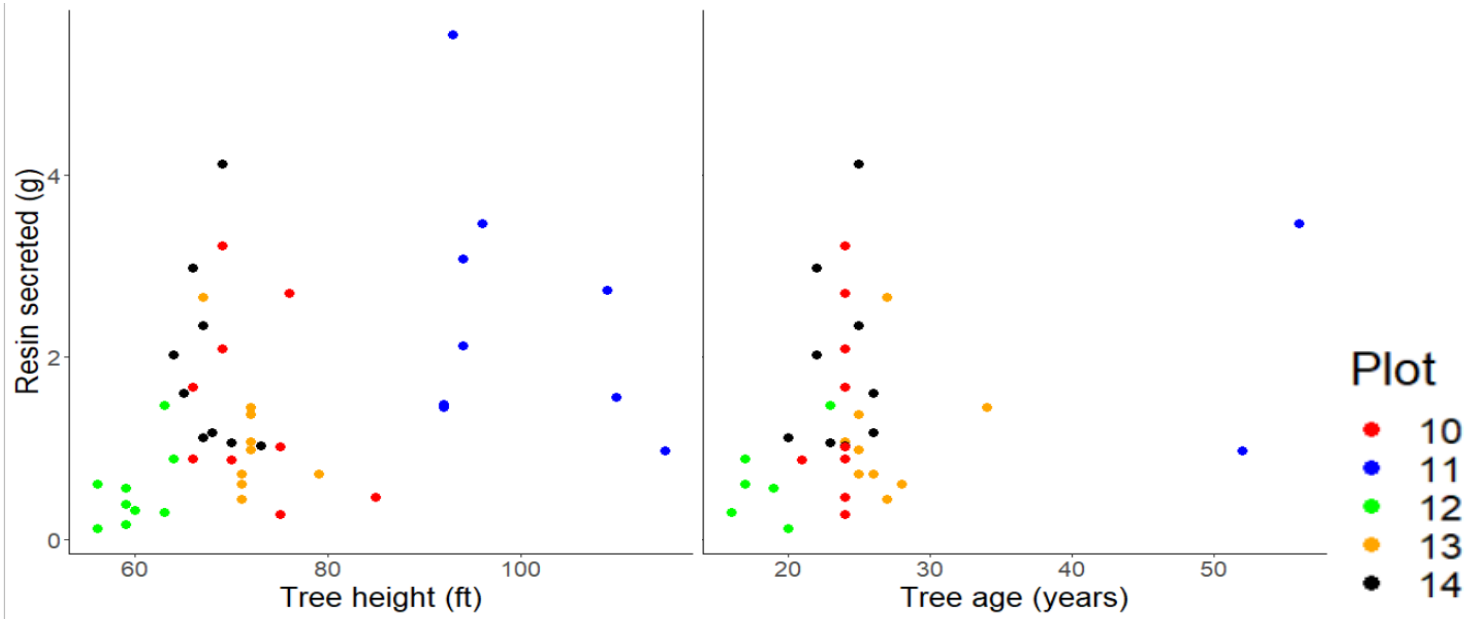
Most on 1 samples: 3

Least on 1 sample: 0

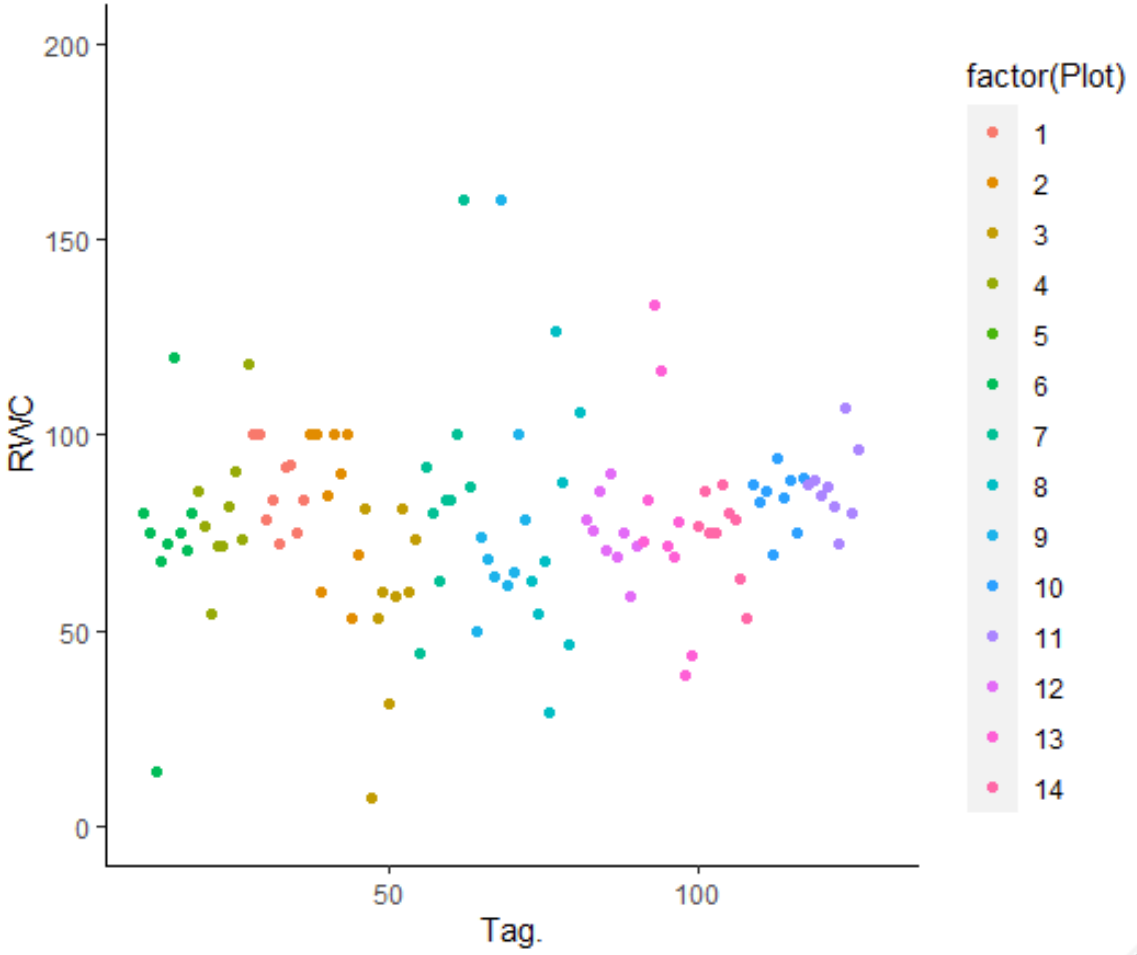


Results- resin

Resin secretion increases in trees with higher disease rating, height, and age



Relative water content preliminary results



Resin analysis

α-pinene

β-pinene

Camphene

Limonene

Limonene-α-phellandrene

β-myrcene

4-allylanisole

sandaracopimaric acid

isopimaric acid

neoabietic acid

palustric acid

merkusic acid

dehydroabietic acid

abietic acid