

Forest Health Cooperative Science Meeting Update

Lori G Eckhardt, Ph.D.

June 23, 2021

Forest Health Dynamics Laboratory

School of Forestry and Wildlife Sciences – Auburn University



Agenda

- Welcome and Call Meeting to Order
- Needle Blight Update
 - Extent of Spread
 - Pathogen Update
- Potential New Funding
- Annual Meeting Update
- Additional Comments
- Adjourn

What we are seeing in the field...



Cullman County



Crenshaw County



Lamar County



Madison County



Washington County, AL





Lowndes County, MS

What we found after laboratory analysis...

Results

Region of occurrence

Washington, Choctaw, Colbert, Elmore*, Madison, Crenshaw, Bullock, Macon, Lamar, Cullman, Wilcox, Pickens, Greene*, Butler, Marshall, Winston, Walker, Morgan, Lawrence, Clarke, Marengo (AL)

Lowndes, Clarke, Clay, Oktibbeha, Noxubee, Lauderdale (MS)

Nachitoches (LA)

Symptoms

Yellow to brown spots, premature defoliation, thin crown

Pathogens recovered

Brown-spot needle blight, *Lecanosticta acicola*
Rhizosphora needle cast, *Rhizosphora kalkhoffii*

{ *Sydowia polyspora* (?)
Neopestalotiopsis clavispora
Epicoccum nigrum

Endophyte



Results



Region of occurrence

Bibb & Pickens (AL)
Ware & Camden (GA)

Symptoms

Dead and dying needles, football shaped fruiting bodies, needle defoliation

Pathogen (s) recovered

Brown-spot needle blight, *Lecanosticta acicola*
Lophodermium needle cast, *Lophodermium* spp.

{ *Sydowia polyspora* (?)
Hendersonia pinicola

Endophyte

Results



Region of occurrence

Upton (GA)
Hampton (SC)

Symptoms

Brown needles at the tip, death of the terminal buds, needle defoliation

Pathogens recovered

Diplodia tip blight, *Diplodia sapinea*
Diplodia seriata

{ *Trichoderma caerulescens*
Hormonema macrosporum

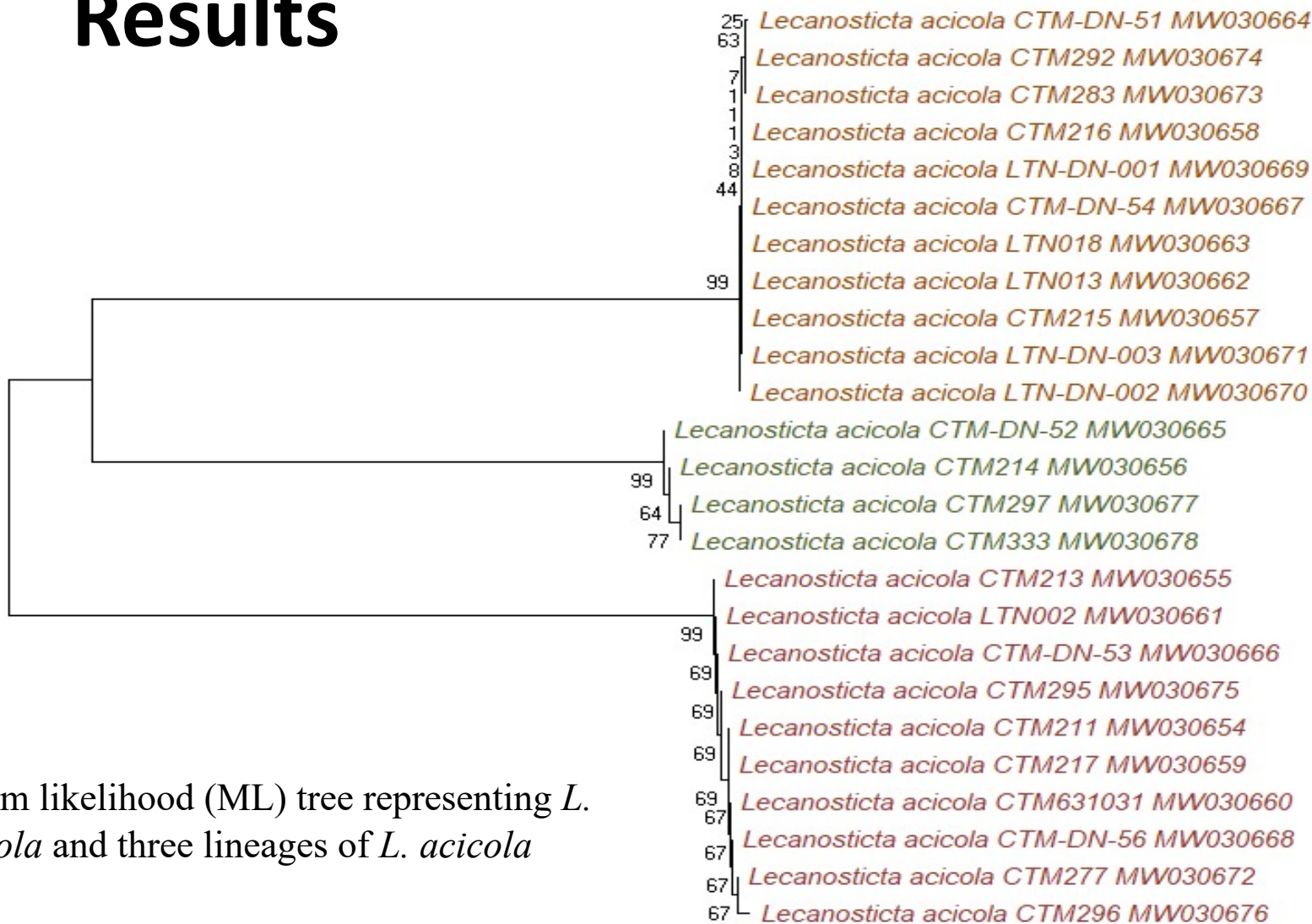
Endophyte

Results



Disease symptoms and reproductive structures of (A) *L. acicola*; (B) *Coleosporium* sp.; (C) *Lophodermium* sp. & (D) *D. sapinea* on loblolly pine.

Results



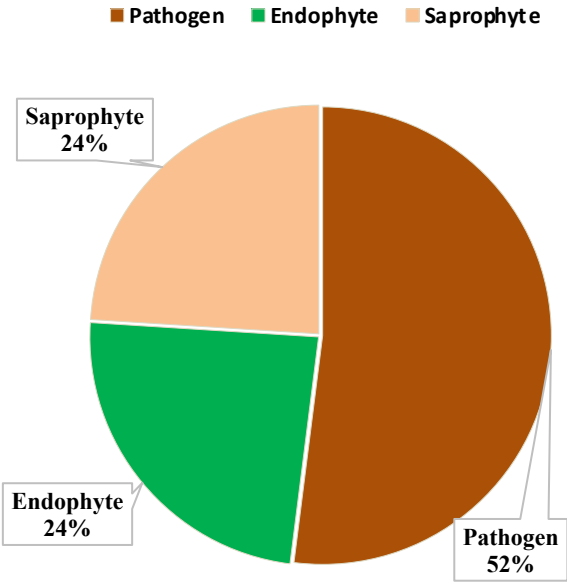
Maximum likelihood (ML) tree representing *L. acicola* and three lineages of *L. acicola*

0.20

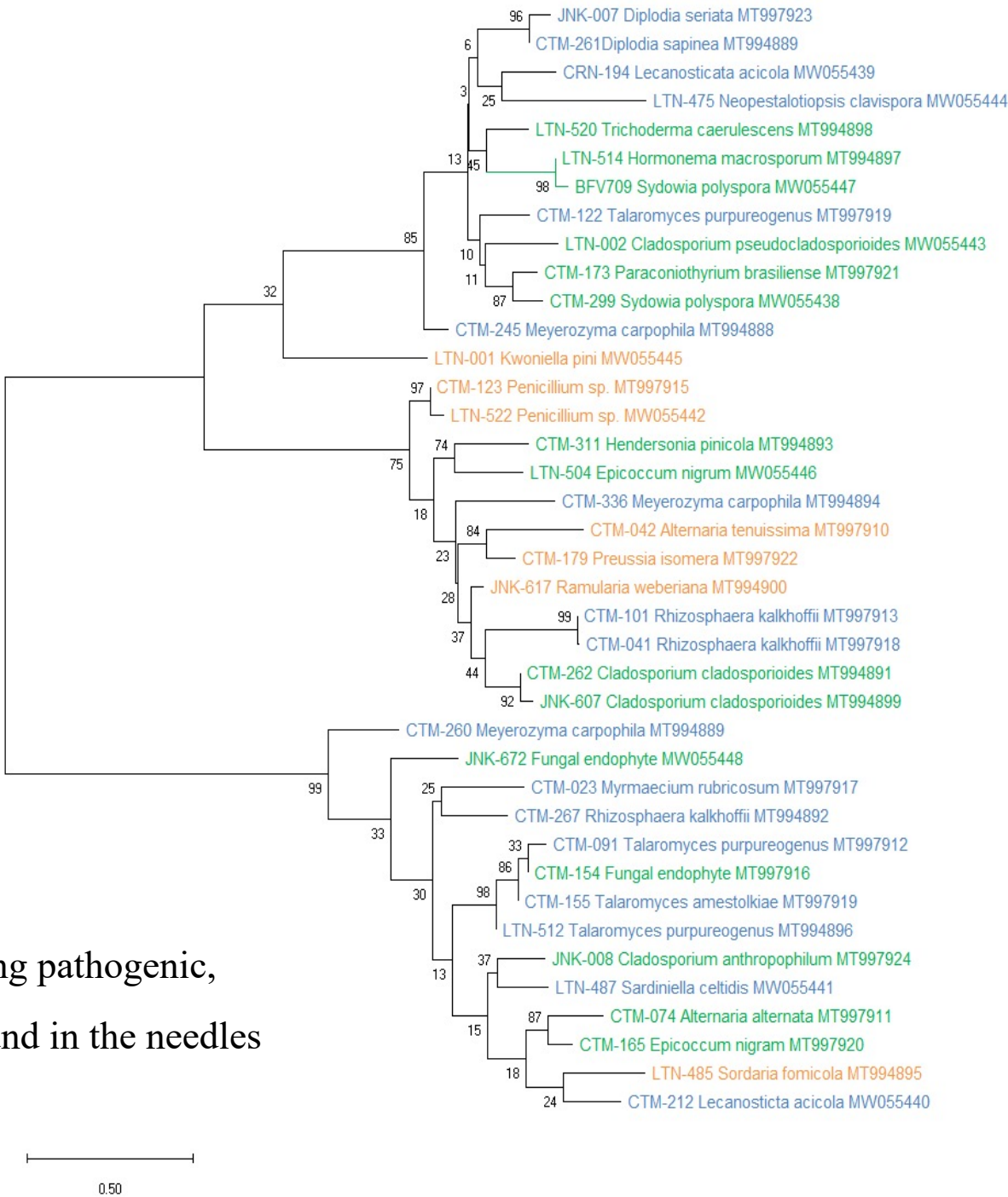
Results

- Total 701 fungal cultures were recovered from unhealthy loblolly pine needles
- They are divided into 58 major groups based on their colony morphology
- To date, 28 species of fungi representing 17 families were identified followed by morphological and molecular data
- Among them, 12 species of fungi represent either pathogens or weak parasites
- Conversely, 8 species of fungi represent endophytes, and 8 species represents saprophytes

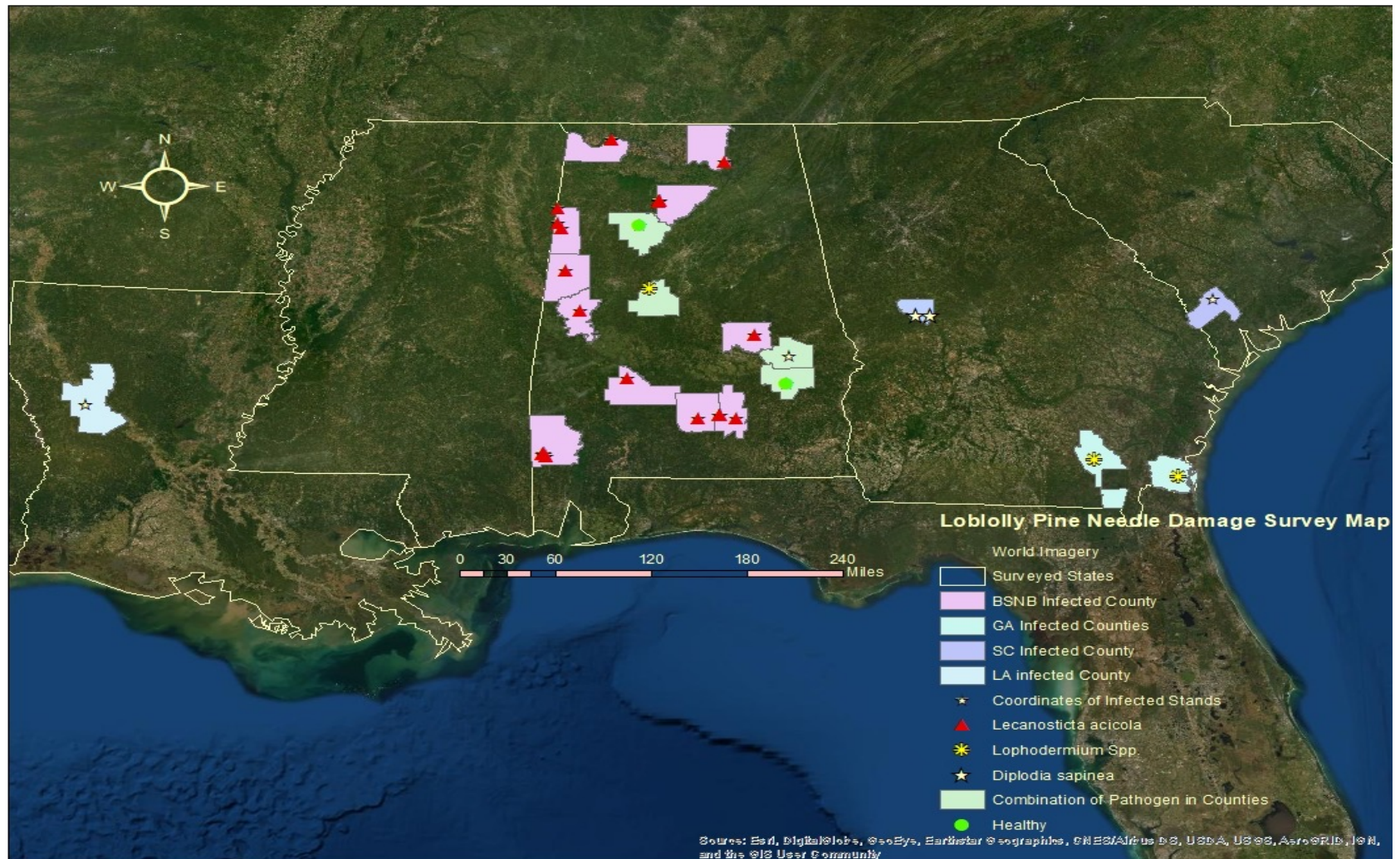
Results



Neighbor-joining tree representing pathogenic, endophytic & saprophytic fungi found in the needles



Results

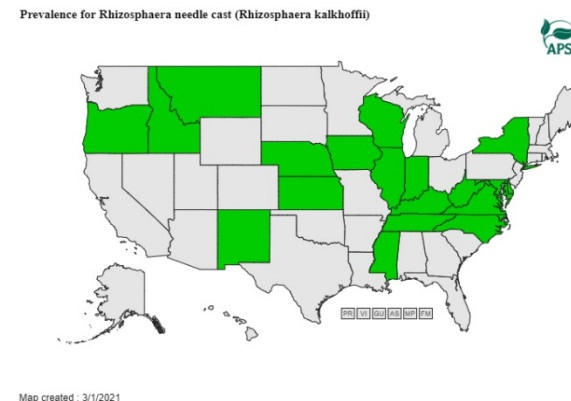
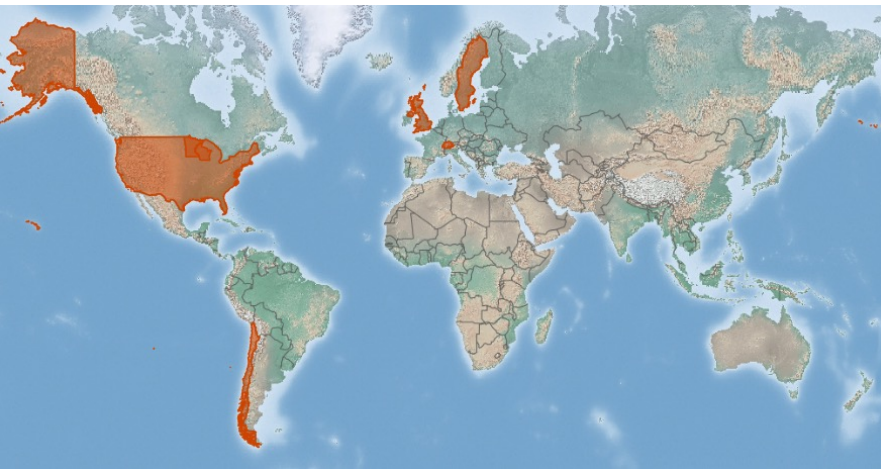


Map of loblolly pine foliar damage observed in stands across the southeastern US

New species reports in AL...

Species #1: *Rhizosphaera kalkhoffii*

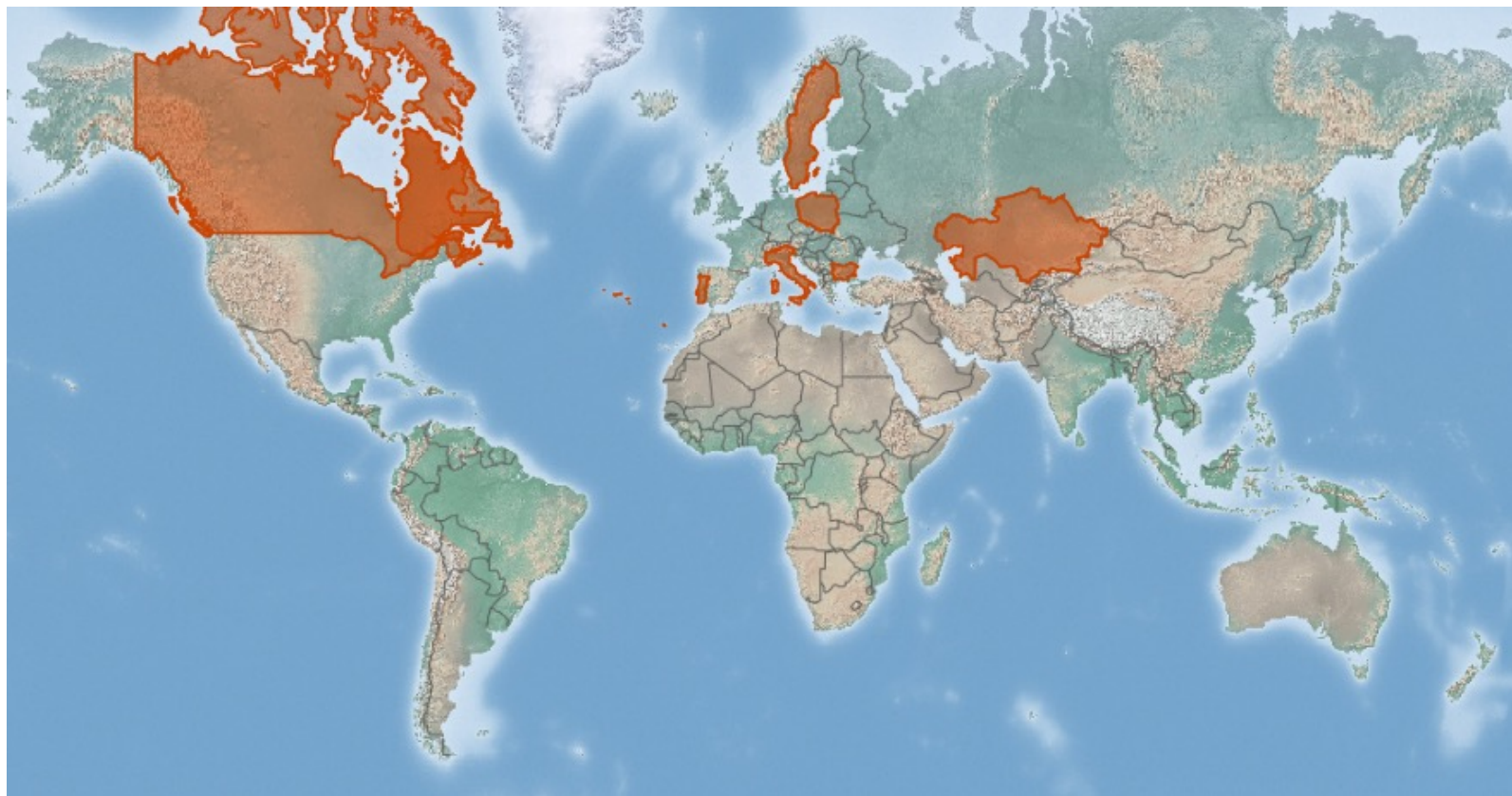
- Pathogen
- The fungus survives winter on living / recently killed needles. In spring through early autumn, spores spread to new needles within the tree or in neighboring trees via splashing water (rain).
- Pathogenic to *Picea*, *Abies*, *Tsuga*, *Pseudotsuga*, *Cedrus*, *Larix*, *Pinus*
 - Needle blight disease
 - Caused pitch canker disease on *Pinus sylvestris* in China



Species #2: *Sydowia polyspora*

- Pathogen and endophyte
- Favored by a warm climate, especially if the host is stressed by summer drought or insect or mite attack
- Wide geographical range and is common in Europe
- Shown to be pathogenic to *Thuja*, *Abies*, *Tsuga*, *Larix*, *Picea* and *Pinus*
 - Serbia: *P. nigra* and *P. sylvestris* associated with drought and frost
 - Italy & Spain: *P. halepensis*
 - Poland & Lithuania: *P. sylvestris*
 - North America: *P. ponderosa*
- Vectored by bark beetles associated with...
 - Spain: *P. radiata*, *P. nigra* subsp. *salzmannii* and *P. sylvestris*
 - China: *P. yunnanensis*

Sydowia polyspora Distribution



Project Summary

- Brown-spot pathogen, *Lecanosticta acicola*, is a primary pathogen causing loblolly pine needle defoliation and tree mortality in Alabama
- A total of 28 fungi representing 17 families were found associated with LPND based on their colony morphology and ITS-rDNA sequence data
- *Sydowia polyspora* and *Rhizosphaera kalkhoffii* were recovered with BSNB where stand prevalence was more than 60%
- Pairs of healthy and unhealthy trees were repeatedly found **chlorotic** and **defoliated** in 2019 and 2020
- High infection trees were produced significantly **shorter** needles, shoots and total number of fascicles than low infection trees
- Micronutrients such as **B, Zn, Mn, Na** were significantly varied with infection levels. Similarly, **N/P, P/S, K/Mg, Ca/B** were found statistically significant between low infection versus high infection trees

Further Activities

The study is still investigating the pattern of the disease and nature of spreading across states, locality, and/or region

The study is expected to expand field-based sampling across the southeastern US as well as get more samples from landowners, forest managers, and forest health state cooperators

The study is aiming to construct a more detailed distribution map of needle pathogens across the southeastern US

The research continues to associate the environmental factors which may drive the emergence and spread of LPND

The study is under way analyzing habitat suitability of needle pathogens across the southeastern US

Things We Need to Learn

Understand the pattern of disease and the nature of the spread

Understand the environmental factors which may drive the emergence and spread of the pathogens

Understand disease cycle, habitat sustainability and synergy between pathogens

Develop a screening process for tolerant and resistant families of *Pinus*

Develop management regimes for potential mitigation

Origin of the pathogens – Cooperation with Dr. Irene Barnes, Forest Agriculture and Forestry Biotechnology

Potential New Funding

- State Appropriations
 - AL Senator Richard Shelby
- Federal Appropriations
 - Governor's Budget
 - State Senator Chris Elliott

Annual Meeting Update

Meeting will be held on November 10-11, 2021, in Mobile AL hosted by Kris Bradley and Regions Bank.

More information to follow about meeting and field trip.

Comments, Discussion?

