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Emerging Brown Spot Needle Blight Disease on Loblolly Pine

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Brown spot needle blight (BSNB) is an emerging problem in loblolly pine (*Pinus taeda*) plantations with varying levels of severity (Fig. 1) across the southern region of the U.S. On loblolly pine, BSNB has been involved in outbreaks of disease with significant and continuing damage since 2016 and Arkansas specifically since 2020 (Fig. 2). The infection with BSNB on loblolly pine is characterized by needles forming brown spots with a yellow halo, crown discoloration and progressive needle damage/loss that can lead to tree mortality (Fig. 1). Historically, in the South, the disease has been mainly problematic on longleaf pine (*Pinus palustris*) at the grass stage; however, it is hypothesized that wind and rainfall events facilitated the spread of the pathogen into new regions, including Arkansas.

The disease BSNB has now been confirmed in all size classes of loblolly pine and is known to infect at least 28 other conifer species worldwide. The current emergence is a serious concern because of the economic and ecological importance of loblolly pine across the southern region of the United States. Currently, the emerging problem on loblolly pine has been found in Arkansas (AR), Texas (TX), Louisiana (LA), Mississippi (MS), Alabama (AL), Florida (FL), Georgia (GA), South Carolina (SC), North Carolina (NC), and Tennessee (TN), (Fig. 2) with more widespread damage including some mortality in MS, AL, AR, and LA.

Dispersal and Identification

The fungal pathogen that causes BSNB is *Lecanosticta acicola* (taxon synonyms: *Mycosphaerella dearnessii*, *Scirrhia acicola*, *Eruptio acicola*). It spreads when the weather conditions are right for reproduction and dispersal. Most of the infection takes place during the rainy season, especially in late spring to early summer. Rainy fall and early winter spore production has also occurred in some sites in AR, LA, MS, and AL

Figure 1. (Left image) Drone image showing two adjacent loblolly pine stands with different levels of needle damage (minor and severe respectively, photo credit John Riggins).. (Center) Four-year-old loblolly tree branch infected with *Lecanosticta acicola* which is the pathogen that causes (BSNB) Brown Spot Needle Blight. (Right) A BSNB infected needle showing typical discoloration pattern of the lesions on needles showing brown spots and yellow halos.

potentially doubling the dispersal period per year. Infected needles have brown spots, usually with a yellow halo (Fig. 1). Lesions develop in the spots and elongate causing further chlorosis and browning sometimes causing banding and the needles to brown from the tip back toward the fascicle. The fruiting bodies of the pathogen, found in the lesions, develop below the epidermis of the needles, then erupt through the surface of dead needle tissue, lifting a strip of needle epidermis over the center of the fruiting body (Fig. 3). Mature fruiting bodies bear numerous conidia and they are released to initiate new infections (Fig. 3). The conidia are spores dispersing mainly by rain splashing to adjacent trees or branches with windy rain events facilitating the spread. A microscope is required to identify BSNB conidia, which are elongated spores typically 15-35 µm x 3-4 µm in size, observed in Arkansas to be pale or brown dark brown. They range in shape from straight to curved, are delimited by 1-3 walls, and the outer wall is thick and granular. They have a flat base on one end and are rounded to a soft, sloping point on the other (Fig. 3).

Affected trees may shed and regrow needles as a reaction to the infection and invasion. The energy required to recover and to defend against the pathogen places additional strain on existing resources such as water and nutrients, leading to reduced growth and in some cases mortality. Trees in poor health that expend energy on needle defense are then more vulnerable to secondary diseases, damage and insects such as needlecast, needle feeding midges, herbicide drift, drought stress, pitch canker, bark beetles, weevils, wood borers, and root rot.

Factors Influencing Brown Spot Needle Blight Severity

Host tree genetics, environmental conditions, and the pathogen's virulence are all important factors involved in disease development and severity. While not much is known about the role of loblolly pine genetics in disease development, current studies at the University of Georgia, Athens are using seedlings to support a potential difference. The University

Figure 2. Map indicating counties and parishes first year positive for brown spot needle blight (BSNB) disease in loblolly pine, confirmed through the Forest Service SRS (Dr. Rabiu Olatinwo), in collaboration with Auburn University (Dr. Lori Eckhardt), University of Florida, Mississippi State University/Oregon State University (Dr. John Riggins), University of Georgia (Dr. Caterina Villari), Louisiana Tech University (Dr. Shawn Yang) and the University of Arkansas at Monticello (Dr. Laura Sims). The map was produced by Dalton Weatherly and includes the sample testing conducted at the new University of Arkansas Forest Health Research Center (FHRC) in Monticello, Arkansas, currently housed in the Forest Resource Center (Dr. Michael Blazier) and the Forest Business Center (Dr. Matthew Pelkki) on the Monticello campus.

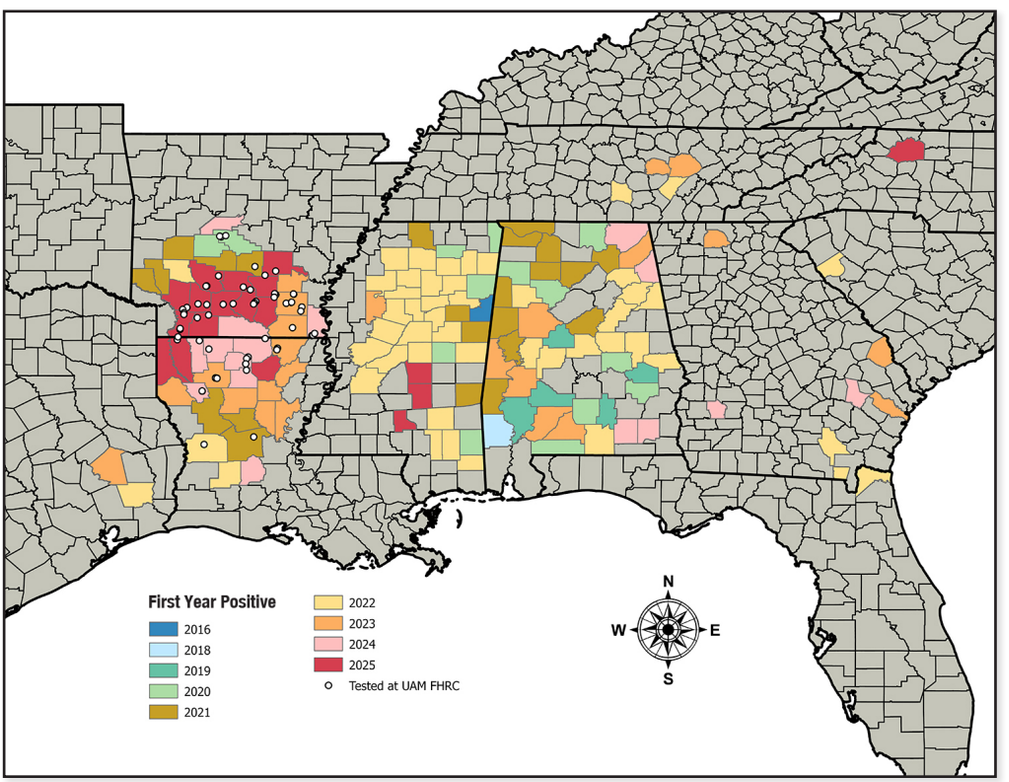
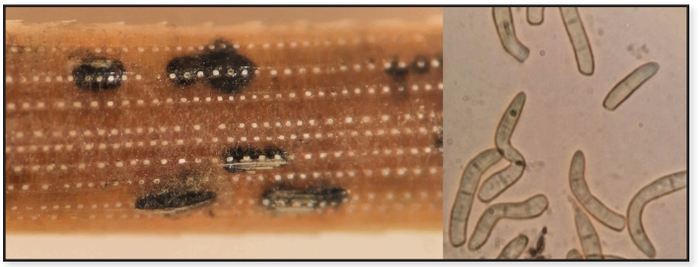


Figure 3. Dark colored fruiting bodies of the BSNB pathogen *Lecanosticta acicola* are signs of infection. The fruiting bodies erupt through the pine epidermis and produce the conidia spores when mature (right). The conidia, found inside the fruiting bodies, are the dispersal structures of the pathogen (right).



of Arkansas at Monticello is conducting studies of existing stands. Temperature, humidity, and rainfall patterns have a large influence on the pathogen's ability to grow, disperse, and infect. Site factors that may affect the incidence and severity of BSNB are the timing and type of silvicultural treatments and the availability of nutrients and water. The pathogen has likely changed over time. For example, now in the southern region the pathogen mainly appears to impact loblolly pine instead of longleaf, and it can be found in all age classes. Reports of mortality that may be attributed to BSNB have occurred very recently in AR, LA, MS, and AL, in areas where the pathogen has likely been affecting trees for nearly a decade, or within shorter timeframes where multiple or sustained infection periods occur.

What to do if you Suspect Brown Spot Needle Blight

In the southern region, BSNB has been mainly problematic on loblolly pine. If you suspect it on other pine species, please report it. In all cases, proper diagnosis and identification of the pathogen are key for disease management. If you suspect a tree on your property is infected with BSNB, contact your local county extension agent or forester immediately. They can help you prepare samples to send in for diagnosis. You can also collect foliage samples yourself and send them to Laura Sims at the address below with some additional information.

Brown Spot Needle Blight Management Recommendations

Site Preparation

A healthy start for your trees can help prevent disease. Current studies are underway to develop science-based management recommendations. Check with your nursery source to ensure they are aware of the problem and that they are taking adequate measures to prevent disease spread or proliferation in nurseries. Check your seedlings for any signs of needle pathogens or other health concerns, and plant only healthy stock. Send plants in for testing if there is a concern or consult with your county extension agent.

Because *Lecanosticta acicola* spreads in moist environments, wider spacing (450 TPA) with vegetation management may help to reduce moisture buildup. Prepare the site properly, with site appropriate seedlings, ensuring proper fertilization based on site needs, and ensure good drainage. Keep abreast of new research on seedling development and choose seedlings with apparent tolerance and resilience when challenged by the pathogen in tests.

Forest Management

Prevention is key to management. Thinning and clearing on schedule will help to prevent negative health issues. Proper fertilization after thinning to retain vigor is important in stands with nutrient deficiencies that will impact a pine crop. Managing competing vegetation in mature and healthy stands will reduce competition pressure, ensure resources reach the intended crop, pine, and allow those plants to expend resources toward host defense, making stands more resilient to disease.

Current studies are underway at the University of Arkansas and Mississippi State University to evaluate the role of prescribed fire in already diseased, mature stands. Many factors may be involved in the success/failure of this type of management, such as stand vigor at the time of treatment, level of disease tolerance, ambient canopy moisture post fire, timing of other management treatments, and fire intensity. Any issues with needle diseases should be monitored and reported.

When Should I Remove the Trees?

Disease should be monitored, and removal will depend on site goals and disease severity. Removal should be conducted on a case-by-case basis.

To learn more about testing in the West Gulf region, please contact Laura Sims, University of Arkansas at Monticello, simsl@uamont.edu; Chandler Barton, Arkansas Department of Agriculture, Chandler.Barton@agriculture.arkansas.gov,; Tyler Cloud, Louisiana Department of Agriculture and Forestry, tcloud@ldaf.state.la.us; Jaesoon Hwang, USDA Forest Service, jaesoon.hwang@usda.gov.

How Do I Send a Sample?

Place samples in a paper lunch-sack sized bag and then put it in a plastic one-gallon bag (Fig. 4). Label the bag with a sample name, date of collection, collector, and location (coordinates). Place the labeled bag in a sealed box. Samples should be shipped overnight to Dr. Laura Sims, University of Arkansas Division of Agriculture, Forestry, 110 University Court #3468, Monticello, AR 71656.

Figure 4. When shipping overnight samples, first place them in a paper bag, then a plastic bag, and in a shipping box. Samples must include a label and contact, and addressed to: Dr. Laura Sims, University of Arkansas System Division of Agriculture, Forestry, 110 University Court #3468, Monticello, AR 71656.

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