PennState Extension

Swiss Needle Cast

Symptoms are present on Douglas fir needles within 3 years of infection. The fruiting bodies can be seen with a hand lens. Damage includes dieback of needle tips resembling drought damage.

ARTICLES | **UPDATED: NOVEMBER 21, 2017**

***Phaeocryptopus gäumannii* (T. Rohde)**

Host

- Douglas-fir

Damage Potential

- Moderate–high

Symptoms and Signs

- May first develop on lower branches

Spring Through Fall

- Two parallel rows of tiny, black fruiting bodies (pseudothecia) on the underside of first- , second- , or third-year needles
- Fruiting bodies may not develop on current-year infected needles until after a frost
- Dieback of needle tips resembling drought damage
- Yellowing or mottling of previously infected needles
- Browning and casting of needles infected at least one year prior; heaviest casting seen on interior of lower branches

Causes of Similar Symptoms

- Rhabdocline needle cast
- Flyspeck
- Cooley spruce gall adelgid
- Environmental stresses
- Nutrient imbalances
- Winter burn

Identification

Symptoms are present on needles within 3 years of infection. The fruiting bodies of Swiss needle cast are easily detected and can be seen with a hand lens anytime throughout the year. Look for two bands of tiny, black structures (1⁄240 inch; 0.1 mm) arising from the stomates on the under-sides of mottled or brown-tipped needles.

Occasionally, a purple band will be visible between the dead tip and green base of the needle. These fruiting structures may occur on all ages of needles—even on needles that appear healthy—so it is important to examine many needles on a tree, not just symptomatic current-year needles. Fruiting bodies found on older needles attached to the tree are still capable of releasing spores. Infected trees may appear thin and, in severe cases, may retain only previous year's growth. Pay particular attention to lower and inner branches when scouting for this disease. Unfortunately, by the time this disease is found, much of the green foliage on the tree is infected. Rhabdocline and Swiss needle casts can both be found on the same tree.

Biology and Life Cycle

Like most other fungal diseases, Swiss needle cast favors rainy, moist, and cool weather. Fruiting bodies develop through the stomata on the underside of the needles by early winter and are visible from late winter into spring, but they only mature about the time of bud break (Figures 1 and 2). Fruiting bodies from 1- to 3-year-old needles are capable of producing spores, which are released from the undersides of needles and carried by splashing water or wind to new growth, where they penetrate and infect the needle (Figure 3). Though primary infection occurs on new growth, occasionally previous years' needles will also become infected at this

time (Figure 4). This significantly increases the infection potential of this disease. Symptoms are much slower to develop and may not be apparent for as long as 2 years after infection. Spore release continues for a longer time than Rhabdocline, the other common needle cast disease of Douglas-fir.

Figure 1. Black fruiting bodies on the undersides of needles pushing up through the stomates.

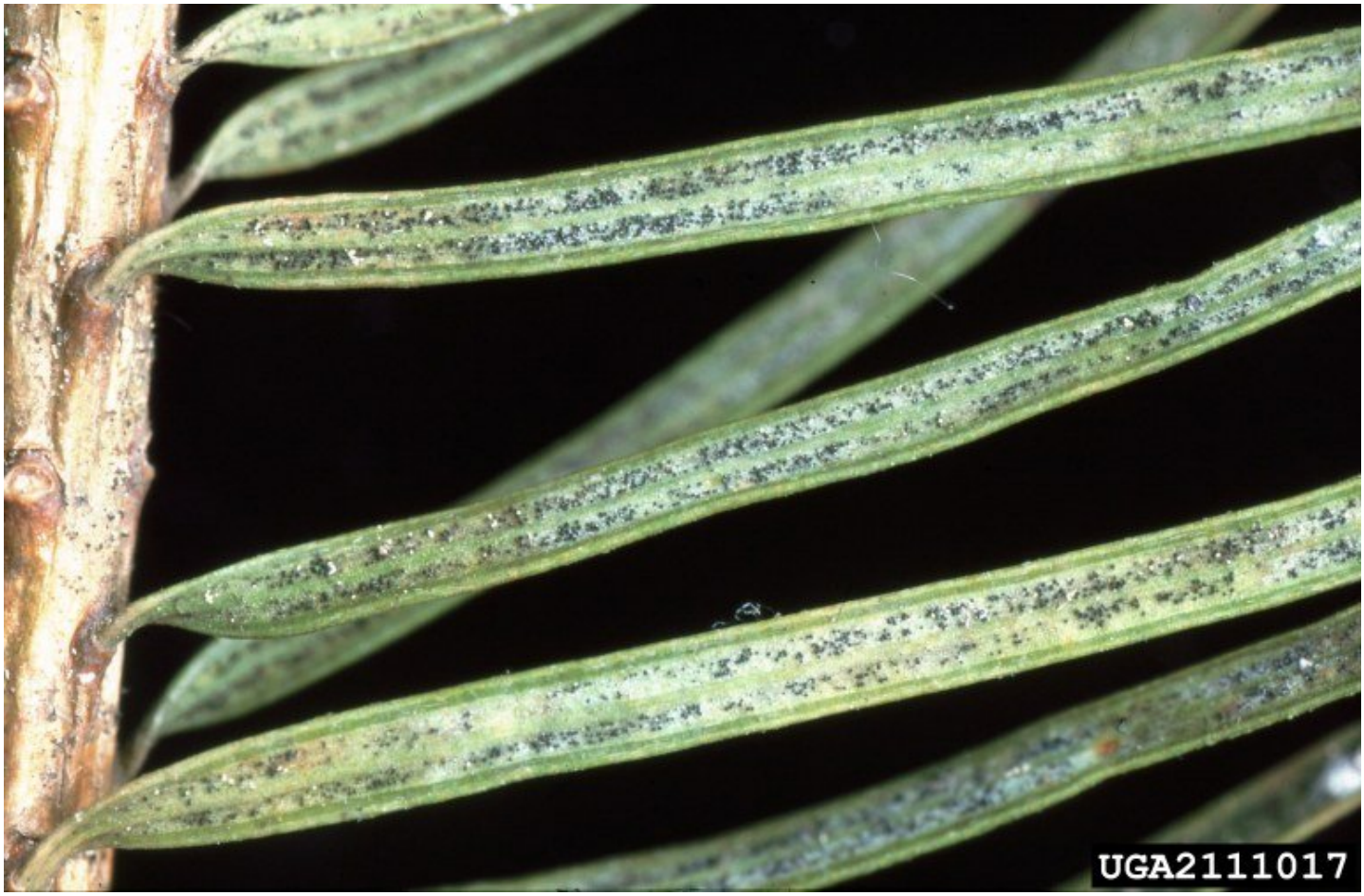
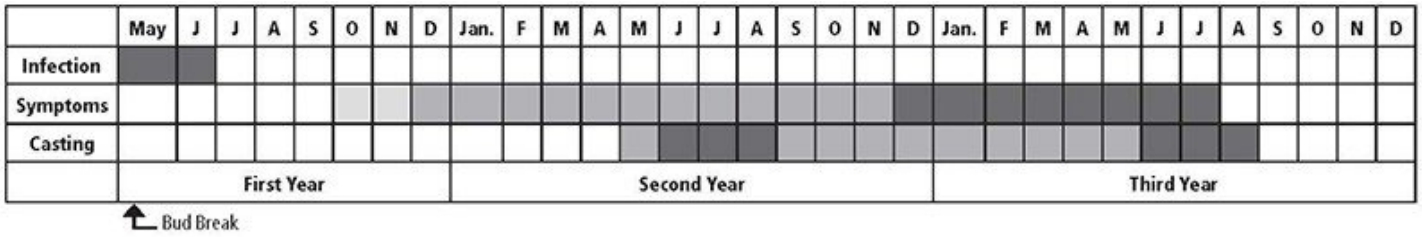


Figure 2. Fruiting bodies arranged in two rows on the undersides of needles.

Figure 3. Infected needles brown from tip down.

Figure 4. Previous seasons' infected needles may be cast or remain on the tree.

Disease Cycle Calendar (Single Year's Growth of Needles)



The heavier the shading, the more intense the infection/symptom/casting.

Monitoring and Management Strategies

Plantation Establishment

- Plant trees with expanded spacing (6 feet by 6 feet, or 1.83 by 1.83 m) to allow for good air circulation. Avoid planting on a north-facing slope, near hardwood

forests, or in a low, damp area. These types of areas generally retain moisture on needles for longer period of time.

- Plant resistant or tolerant tree varieties; avoid Douglas-firs from Rocky Mountain seed sources.
- Remove and destroy unmanaged Douglas-fir that may act as a source of inoculum.

Preseason

- Properly water and fertilize to promote good health of trees.
- Maintain proper weed control year-round.
- Begin scouting for fruiting bodies in 4- to 10-year-old trees in late winter. Select 20 or more trees and examine the undersides of current and older years' needles on three branches per tree. Select branches from the lower third of the tree and look at 1- and 2-year-old needles. Pay particular attention to trees that appear off color or thin. Concentrate scouting on trees planted in areas that are more conducive for disease development.
- Scouting can be more effective on an overcast day when needle mottling is more apparent.

Growing Season

- Threshold level: Ask state/regional plant inspectors about regulatory thresholds.
- In late April/early May, begin regular scouting for bud break in each target block. Make the first fungicide application when the buds are ½–2 inches (1.27–5.08 cm).
- At the end of the season, evaluate results and update records.

Control Options

Biological

- No recommendations are available at this time.

Mechanical

- Minimize disease transmission by shearing only when trees are dry.
- Shear healthy trees/blocks first to minimize transmission of spores on equipment and personnel.

- Sterilize equipment in contact with the disease by soaking in denatured alcohol for 3 minutes.
- Remove and destroy heavily infected trees prior to bud break.

Biorational

- No recommendations are available at this time.

Chemical

- If treatment is necessary, apply fungicide when shoots are ½–2 inches (1.27–5.08 cm). Make a second application 2–3 weeks later. A third application may be necessary if rainfall is high and temperatures remain cool. These treatments coincide with the second and third applications for Rhabdocline needle cast.
- Since infected needles may remain attached to the tree and continue to produce spores for up to 3 years, chemical control for 3 consecutive years may be necessary.
- If Rhabdocline needle cast is also present, make sure to begin fungicide applications at first sign of bud break.

Next Crop/Prevention

- Inspect plants/nursery stock; buy from a reputable company.
- Collect seeds from trees showing resistance for a seed-collection program.

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