



# Christmas Tree Needle Cast and Needle Blight Field Guide

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## 1. Introduction: Needle Cast and Needle Blight Diseases in Christmas Trees

Needle disease management is important for many reasons: to maintain optimal photosynthetic needle properties for tree growth, achieve desirable aesthetic characteristics such as color and density, and to reduce premature defoliation, all which affect the overall marketability of Christmas trees.

Conifers exhibit needle cast diseases when a fungi is present. Such diseases can cause significant loss in Christmas tree stock when tagged trees in the summer are targeted and lose their needles by the fall.

Genetic susceptibility among trees can vary greatly. Needle cast diseases primarily target the needles and not the shoots or stems. Typical symptoms of needle cast diseases include yellow or brown spots, bands on needles, needle tip discoloration or dieback, needle death, and premature shedding of needles. Discoloration of needles can differ, sometimes exhibiting shades of red or purple tinge.

Needle cast disease symptoms can resemble other common problems within tree lots and therefore are often quite difficult to identify in the field alone. Proper disease diagnosis requires microscopic examination of both size and shape of spores. Spores produced by needle fungi will eventually erupt through the needle, these spores are then spread via air, water, wind, or physical disturbances to the area. Spores can erupt both while on the tree and once fallen. High moisture levels and poor air circulation are favorable conditions for disease spread. For control of needle cast diseases it is imperative that they be identified correctly and proper steps to prevent and control the infection are made as soon as possible.

### Preventative measures:

- Avoid overcrowding
- Maintain good air circulation
- Space trees properly
- Improve/ maintain high tree vigor
- Prevent tree stress



## 2. Common Needle Cast Diseases

### A. <sup>ii</sup>Isthemiella Needle cast: *Isthemiella faullii* darker

- i. Host: Balsam Fir
- ii. Effect: *Isthemiella faullii* is one of the most common and most destructive needle cast diseases on Balsam fir. Its effects result in reduced growth or death to the tree. This disease however does not pose serious problems on older trees.
- iii. Identification:
  - a) change in color of infected needles (spring of second growth, fully brown by midsummer).
  - b) Fruiting bodies raised running the full length of the needle in a sinuous or labyrinthine pattern (only observable under a hard lens).
  - c) Fruiting bodies usually aligned in a double row (sometimes in a single row).
  - d) Second type of fruiting structure (developed by midsummer of their third growing season) on the underside of needles: appears as single blank line running the length of needle.
- iv. Method of Control
  - 1) Promote good air movement by controlling weeds and pruning lower branches.
  - 2) Avoid sheering in wet weather.
  - 3) Disinfect sheering tools regularly.
  - 4) Space tree adequately.
  - 5) Do not interplant rotations.
  - 6) Plant clean nursery stock.



Fig. 1. Linear Fruiting bodies on underside of of balsam fir needles at the end of their second growth year.



Fig. 2. Infected balsam fir needles with *Isthemiella faullii* needle cast.





## B. <sup>iii</sup>Lirula Needle cast: *Lirula nervata*

- i. Host: Balsam, Fraser and white fir
- ii. Effect: Damage to 1-year old infected needles resulting in the loss of needles and growth reduction.
- iii. Identification:
  - a) Infected needles become yellow then turn brown and even gray in color.
  - b) Fruiting bodies (developed in late summer of the first year after infection) appear as a black line (early summer).
  - c) Asexual fruiting bodies appear as small dots on upper surface of needles.
- iv. Method of Control
  - 1) Promote good air circulation through proper weed control and pruning of lower branches.
  - 2) Avoid sheering in wet weather.
  - 3) Disinfect sheering tools regularly.
  - 4) Do not interplant rotations.
  - 5) Plant clean nursery stock.



Fig. 3. Short black line on needles of infected fir.



Fig. 4. Browened needles, killed by Lirula, attached firmly onto stem.



### C. <sup>iv</sup>Lophodermium Needle Cast: *Lophodermium seditiosum*

- i. Host: Balsam Fir, Grand Fir, and White Pine
- ii. Effect: Red, yellow or brown discolored needles which later can turn grey. Discoloration usually restricted to 2-year-old foliage. Severe infection can result in significant growth reduction.
- iii. Identification:
  - a) Discolored needles.
  - b) Asexual fruiting bodies appear as small dots on upper surface of the needles by mid-summer.
  - c) Sexual fruiting bodies appear as a black line on the lower needle surface.
- iv. Method of Control:
  - 1) Choose disease resistant/ less susceptible nursery stock.
  - 2) Promote good air circulation by controlling weeds and pruning lower branches.
  - 3) Do not shear during wet weather.
  - 4) Disinfect sheering tools regularly.
  - 5) Remove live branches on cut stumps within plantations.



Fig. 5. Early stages of Lophodermium Needle Cast. Large black, oval fruiting bodies can be easily seen on underside of needle.

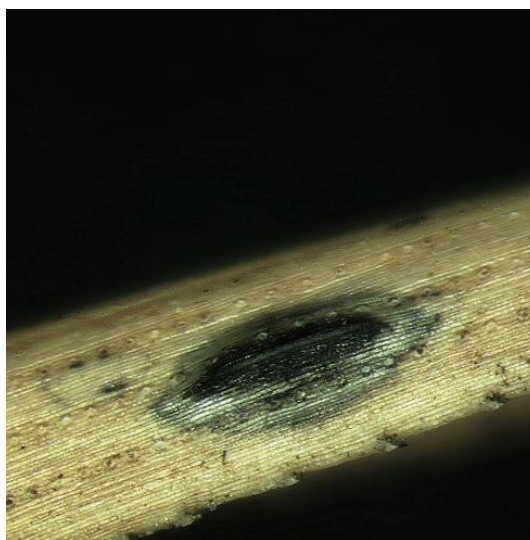


Fig. 6. Characteristic football-shaped Lophodermium fruiting body.



## D. "Swiss Needle Cast: *Phaeocryptopus gaumanni*

- i. Host: Douglas-fir
- ii. Effect: Browning and early needle loss resulting in thin-foliage trees.
- iii. Identification:
  - a) Targets 2–3-year-old needles, especially on lower branches.
  - b) Browning occurs during July and August, where needles fall off in late August.
  - c) Parallel rows of round fuzzy, black, fruiting bodies in tiny, pore-like openings identifiable on the underside of needles (green and browning).
- iv. Method of Control
  - 1) Remove and destroy severely affected trees as soon as possible.
  - 2) Promote good air circulation by spacing tree adequately, controlling weeds and pruning lower branches.
  - 3) Do not shear in wet weather.
  - 4) Disinfect sheering tools regularly.
  - 5) Remove live branches on cut stumps within plantations.

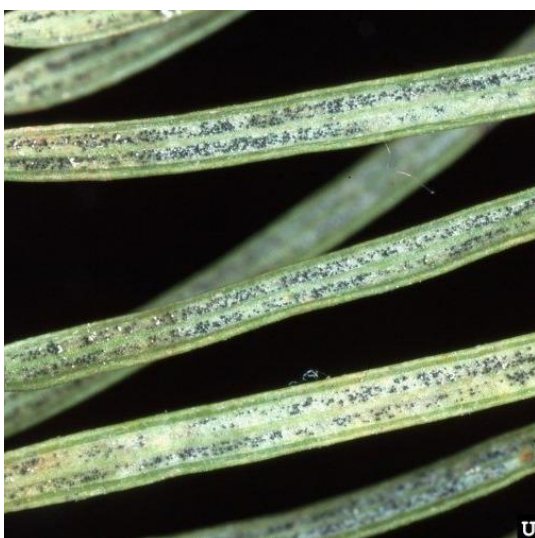


Fig. 7. Fruiting bodies of Swiss Needle Cast arranged in two rows on undersides of needles.



Fig. 8. Infected needles with Swiss Needle Cast brown from tip down.





## E. Rhabdocline Needle Cast: *Rhabdocline pseudotsugae*

- i. Host: Douglas-fir.
- ii. Effect: Browning and early needle loss resulting in thin-foliage trees. Heavily diseased trees will only keep their current-year needles.
- iii. Identification:
  - a) Yellow spots
  - b) Spots eventually enlarge causing a reddish-brown mottling evident by early spring
  - c) Distinct border between diseased area and healthy, green tissue.
  - d) Oblong tan fruiting bodies develop on underside of needles; spores released during wet weather (May-July).
  - e) Orange spores released from fruiting bodies on underside of needle after bud break.
- iv. Method of Control
  - 1) Plant disease resistant species.
  - 2) Remove and destroy severely affected tree as early as a possible.
  - 3) Promote good air circulation by spacing trees, controlling weeds and pruning lower branches.
  - 4) Do not sheer during wet weather.
  - 5) Disinfect sheering tools regularly.
  - 6) Remove live branches on cut stumps within plantations.



Fig. 9. Distinct reddish-brown patches of Rhabdocline needle cast.



Fig. 10. Fruiting bodies ruptured on the undersides of infected needles during bud break.



## F. <sup>vi</sup> *Rhizosphaera* Needle Cast

- i. Host: True Fir, Douglas Fir, Pine
- ii. Effect: Extensive defoliation leading to lower tree grade and potentially tree death.
- iii. Identification:
  - a) Browning or purple discoloration on older needles.
  - b) Needles fall off in late summer-fall
  - c) Younger needles remain non-symptomatic
  - d) Fruiting bodies appear as tiny black bumps in rows on infected needles
  - e) Damage begins on lower branches and moves up the tree
- iv. Method of Control
  - 1) Planting resistant species.
  - 2) Promote good air circulation by planting with adequate spacing, and removing bottom branches.
  - 3) Fungicide application

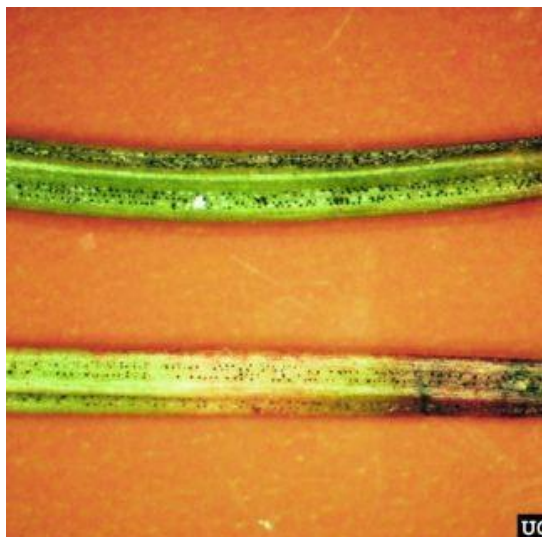


Fig. 11. Tiny black fruiting bodies of the *Rhizosphaera* fungus visible in lines on underside of needles

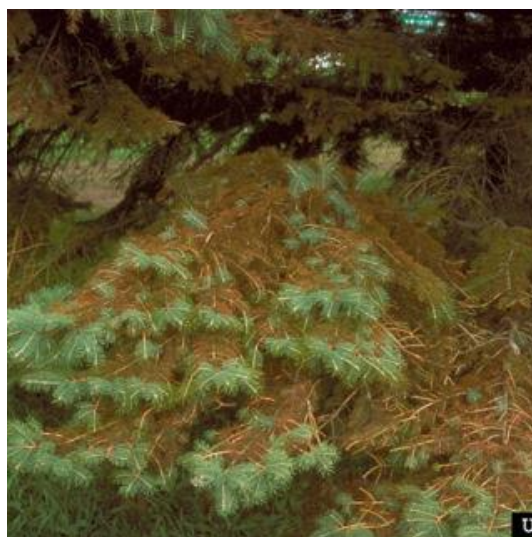


Fig. 12. New needles infected with disease remain green, while old needles turn brown on a spruce tree infected with *Rhizosphaera* needle cast.





### 3. Common Needle Blight Diseases

#### A. <sup>ivv</sup>Diplodia Shoot Bight: *Diplodia pinea*

- i. Host: Pines and occasionally Douglas-fir
- ii. Effect: Trees greater than 25 years old are more susceptible to the disease. However poor site growing conditions located close to effected tree may become infected.
- iii. Identification:
  - a) Newly developed shoots infected turn brown and stunted.
  - b) Brown needles
  - c) Fruiting bodies appear as black dots at the base of the needles
  - d) Secondary buds form at the base of dead shoots. Growth the following spring produces bunched growth.
  - e) Disease usually first observed on lower branches.
- iv. Method of Control
  - 1) Maintain tree vigor
  - 2) Improve soil environment and condition through contains weeds and aeration
  - 3) Remove infected branches on trees exhibiting few symptoms (unlikely to control disease spread)
  - 4) Disinfect tool regularly
  - 5) Improve air circulation
  - 6) Fungicide application



Fig. 13. Stunted tips of Diplodia tip blight kills end of shoots, stunting tree growth



Fig. 14. Diplodia infection stunts and curls tips of shoots.



## B. <sup>viii</sup>Interior Needle Blight; *Rhizosphaera*, *spp.*

- i. Host: True Firs including Grand and Noble fir
- ii. Effect: Random browning of older needles mostly on lower branches. Tree affected are often unmarketable.
- iii. Identification:
  - a) Browning of needles on interior on branches most predominantly observed during late summer and fall.
  - b) Infected needles will remain firmly attached in late summer and early fall.
  - c) Small black fruiting bodies on underside of needle.
- iv. Method of Control
  - 1) Increase air circulation through proper weed control
  - 2) Decrease needle wetness
  - 3) Do not interplant before current year has been completely harvested.
  - 4) Fungicide application



Fig. 15. Noble fir with needle cast



Fig. 16. Interior needle blight present on a young noble fir tree



### C. <sup>viiiix</sup>Balsam Fir Tip Blight; *Delphinella balsameae*

- I. Host: True Firs including Balsam Fir
- II. Effect: Young fir shoots wilt, shrivel, and are soon after killed. This blight does not cause significant damage to the tree but can be harmful to the tree grade if disease is severe and present in areas such as the mid-crown.
- III. Identification:
  - a) Needles on current years shoots are killed, shrivel and curl.
  - b) Outer portion of branches become red and die
  - c) Cast needles are cast in the late fall or early spring leaving the shoots bare.
  - d) Tiny black fruiting bodies present on upper surfaces of dead needles
- v. Methods of Control:
  - 1) Plant resistant species
  - 2) Maintain open stand and good airflow
  - 3) Fungicide application



Fig. 17 Delphinella blight on subalpine fir.



Fig. 18. Dead needles and shoots on current years new growth of Concolor fir.





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