

NEEDLE DISEASES OF CONIFERS



Introduction

Needle or foliar diseases affect most of the conifers that are important forest trees in Idaho. Outbreaks are uncommon, but for Douglas-fir and larch will usually coincide with periods of wet, cool spring weather. Needle disease outbreaks in the pines often occur in the years following cool moist summers. Foliar disease often look dramatic and can cause defoliation (loss of needles) and growth loss. Outright death of trees solely due to needle diseases is rare, but trees that are repeatedly defoliated will have less vigor and may be more susceptible to other agents such as insects or other diseases. Needle diseases of western larch, Douglas-fir, and pines (especially ponderosa and lodgepole pines) are of most interest to land managers in Idaho. Needle diseases are rarely managed in forest situations, though control may be practical in high value trees such as ornamentals, nursery stock or trees in seed orchards.

WESTERN LARCH

The two needle diseases that most commonly affect western larch are larch needle blight caused by *Hypodermella laricis* and larch needle cast caused by *Meria laricis*. Both diseases are caused by fungi that infect the developing needles in the spring. They often occur together.

Disease Recognition - Identification

Larch needle blight is usually more noticeable early in the spring because it infects all the needles on the short shoot



Figure 1. Severe infection of larch needle blight. Photo by Dan Miller.

(Figure 1). The infected needles turn red, then brown, wilt and remain hanging on the tree for one to two years. This process of needle death can occur in as little as three days, giving the impression that the trees are dying. As spring progresses, the long shoots begin growth with normal green needles and many of the infected short shoots will produce a second flush of green, healthy needles. The brown needles will develop



Figure 2. Larch needle blight—all needles on short shoot have been killed. Note black spots on dead needles. Photo by Dan Miller

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Figure 3. Severe infection of larch needle cast. Photo by Dan Miller

small black spots as summer progresses (Figure 2).

Larch needle cast also appears as the young needles begin to grow in the spring (Figure 3).

This disease produces yellow and brown spots or bands on the needles (Figure 4). Often needle tips and entire needles are killed but usually not all needles on the short shoot are infected or die. Heavily infected and dead needles are cast and most do not remain on the tree.

Biology - Disease Cycle

The spores that cause needle blight



Figure 4. Yellow and red spots and bands on needles infected by larch needle cast. Photo by Dan Miller.

(*Hypodermella*) infection are produced within the small black dots (hysterothecia) on the dead needles and spread to newly emerging needles during early spring rains. Similarly, the spores of the needle cast fungus (*Meria*) are produced on needles cast the previous year. Following the infection of new needles, more spores are produced on these needles that continue the infection cycle as long as favorable conditions exist. The occurrence and spread of both diseases is favored by rainfall in the spring during larch needle development.

Damage

Epidemics of larch needle diseases seem to occur about every ten years. Severe infections by these diseases can cause reduced diameter growth proportional to the amount of defoliation. If the outbreaks persist for several years, they can cause seedling mortality and top or branch kill in larger trees.

Disease Management

Cultural

- Needle diseases are often a problem when the host species is growing at or near the edge of its environmental range.
- Match the species to the site by using locally-adapted seed sources. Moving seed sources

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significantly south or down in elevation increases the risk of *Meria* needle cast disease.

- Thin to favor resistant individuals and to maintain open canopies that increase air movement.
- Ornamentals and windbreaks - removing and burning needle litter may reduce the severity of larch needle cast (*Meria*).

Chemical

- Spraying fungicides to control the diseases is not practical in forests but may be beneficial for ornamentals, windbreaks and Christmas tree plantings.
- Chlorothalonil is commonly used to control needle diseases on ornamentals although no fungicide treatments are currently (2010) recommended in the [PNW Plant Disease Management Handbook](#) available from Extension and Experiment Station Communications, Oregon State University or on the Oregon State University Extension web site.

Always read and follow pesticide label directions.

DOUGLAS-FIR

Introduction

The two most common needle diseases of Douglas-fir are Rhabdocline needle cast caused by *Rhabdocline pseudotsugae* and *R. weirii* and Swiss needle cast caused by *Phaeocryptopus gaeumannii*. Both diseases are native to Idaho. Rhabdocline needle cast occurs sporadically. Some years it is quite evident and in others, it is hard to find. Swiss needle cast has been observed to occur more frequently and severely since the 1990's. This may be due to higher than historic

amounts of Douglas-fir regenerated on the moister forest habitats.

Disease Recognition - Identification

Rhabdocline needle cast

Symptoms first appear during the fall or winter as small yellow spots on current season needles. In the spring, the spots enlarge, sometimes merge, and turn dark red-brown (Figure 5). Infected needles are cast during the summer leaving bare areas on the twig (Figure 6). Absence of a



Figure 5. Needle spots caused by *Rhabdocline* needle cast (prior to bud break). Photo by Dan Miller.



Figure 6. Consecutive years of high infection with *Rhabdocline* needle cast causes severe defoliation. Photo by Dan Miller.

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season's needles is evidence of Rhabdocline or Swiss needle cast.

Swiss needle cast

Symptoms appear as a yellowing of previous year's needles in the spring. Lightly infected needles may remain green for several years. Heavily infected older needles turn brown and drop during the summer (Figure 7). This disease



Figure 7. Healthy needles (L) and needles infected with Swiss needle cast (R). Photo by US Forest Service Archive www.forestryimages.org.

can be identified by the pinpoint-sized black dots on the underside of the needle (Figure 8). A hand lens is helpful in detecting the presence of these dots.



Figure 8. Close up of fruiting bodies (pseudothecia) on the underside of needle. Photo by Sue Hagle Service Archive www.forestryimages.org.

Unlike Rhabdocline, Swiss needle cast does not produce readily visible needle spotting. Severely infected trees have yellow needles and thin crowns, symptoms that can easily be mistaken for those of advanced root disease.

Biology - Disease Cycle

Rhabdocline needle cast

The spores that spread the disease are produced on previous year's needles in the spring. These spores infect young needles during the period of shoot elongation. Moisture is required for the spores to germinate and infect the needles. Because of this moisture requirement, the disease is most evident in springs following wet years. Symptoms of infection are not visible until the fall



Figure 9. Douglas-fir infected with Rhabdocline needle cast. Note healthy tree in background. Photo by Dan Miller.

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or winter when small yellow spots appear on the infected needles. Infected needles remain on the tree until the following summer.

Swiss needle cast

Spores are produced in the small black dots (pseudothecia) in the spring and are spread by wind to the newly emerging needles. Symptoms of infection do not appear until the following spring. Infected needles may remain on the tree for several years, providing a continuing source of infection (Figure 8)..

Damage

Rhabdocline needle cast severity varies by year.

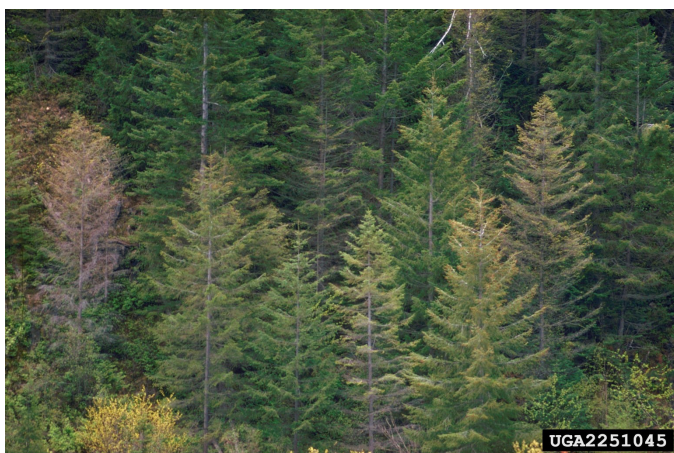


Figure 10. *Douglas-fir trees infected with Swiss needle cast. Note healthy trees nearby. photo by Robert James, www.forestryimages.org.*

Some years have a high incidence of the disease and in other years it is hard to find. A single attack usually results in only partial defoliation (Figure 9). Defoliation for several consecutive years can result in decreased radial and height growth. Trees can take years to recover from deep depressions in radial growth. Douglas-fir show varying degrees of resistance to Rhabdocline needle cast. Even in years when infection rates are high, some trees show little or no damage. Damage is greatest in smaller trees because they have fewer total needles. Larger

trees usually undergo only light defoliation and sustain less damage.

Swiss needle cast rarely causes mortality but severe infections can result in low needle retention and reduced height and diameter growth (Figure 10).

Disease Management

Cultural

- Avoid regenerating Douglas-fir in low lying areas with poor air drainage where cool moist conditions that favor infection persist in the spring.
- Avoid off-site planting by matching species and seed sources to the site.
- Avoid collecting seed from symptomatic trees.
- Thin to remove highly susceptible individuals and to maintain open canopies that increase air movement.

Chemical

- Spraying fungicides to control the diseases is not practical in forests but may be beneficial for ornamentals, windbreaks and Christmas tree plantings.
- The following fungicide treatments are recommended in the 2010 edition of the [PNW Plant Disease Management Handbook](#) available from Extension and Experiment Station Communications, Oregon State University or on the Oregon State University Extension web site.
- In general, the first application is made in the spring when new growth is 1 to 2 inches long. **Refer to product labels for recommended application rates and timing**
- Products containing chlorothalonil such as Bravo, Daconil, Echo 720 and Spectro 90

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WDG are recommended for control of both Rhabdocline and Swiss needle casts.

- In addition, copper-based products including Copper-count-N, Kocide 3000 and Nu-Cop 50 are recommended for Rhabdocline needle cast control.

Always read and follow pesticide label directions.



Figure 11. *Diplodia tip blight* on ponderosa pine. Photo by Dan Miller.

THE PINES

The pines are attacked by several major and minor needle diseases. One of the most common, **Elytroderma needle cast** is described separately in Forester Forum No. 22. This disease also infects the branch wood and causes the formation of witch's brooms similar to those caused by dwarf mistletoes. Another, **Diplodia tip blight**, caused by *Sphaeropsis sapinea*, affects older ponderosa pine and causes a dieback of the shoots (Figure 11).

Other needle diseases are collectively referred to as needle casts since the infected needles are cast or dropped from the shoots. The most common needle casts on pines are caused by



Figure 12. Needle cast on lodgepole pine. Photo by Dan Miller.

several species of *Lophodermium* and *Lophodermella*. Ponderosa, lodgepole and white pine are all affected by these diseases (Figures 12 and 13).

Red band needle blight caused by *Mycosphaerella pini* primarily affects ponderosa and lodgepole pine but occasionally can be found on white pine. The most serious outbreaks of red band occur on sites that favor long periods of high humidity such as low-lying areas with poor air drainage. Needle casts are usually more severe in springs following cool moist summers.

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Figure 13. Close up of western white pine needles damaged by *Lophodermium nitens*. Photo by Sue Hagle www.forestryimages.org.



Figure 14. Red band needle blight on ponderosa pine needles. Photo by Dan Miller.

Disease Recognition – Identification

Pine needle casts occur most commonly and most severely on needles in the lower to mid crown. Needle casts usually affect only one age class of needles and not the entire shoot. Needle casts are most visible in early spring when needle tips or entire needles produced the previous year turn yellow or red in early spring. They later turn brown and usually are shed during the growing season. Occasionally on ponderosa pine, dead

needles turn grey and remain on the tree for several years producing a symptom known as grey beard.

Red band needle blight produces red spots or bands on the needles that remain visible after needle tips die (Figure 14). Tan or black round to oval shaped spots usually appear on the dead or dying needles.

Diplodia tip blight produces stunted, discolored needles on new spring growth. The disease then progresses back on the branch, killing the needles as it goes (Schnef 1992).

Biology – Disease Cycle

Spores of most needle cast diseases are produced on previously infected year-old needles. They are released in summer during periods of high humidity and infect only young elongating needles. In May or June of the following year, infected needles turn red-brown and by July they change to light brown. Spores are produced in shallow tan or black spots or depressions on brown needles and are disseminated by wind. The dead needles are usually cast after spore production. These diseases are more severe following wet years that favor infection.

Red band needle blight infection occurs on year-old needles in the spring during periods of high humidity. Weather conditions may also permit the infection of current-year needles during the summer. Spores that spread the disease are produced in small black spots (stroma) on infected needles during the second season following infection.

Damage

Mortality is rare; however severe defoliation can result in growth reduction. Outbreaks in successive years can result in the loss of older needles causing branches to resemble lion's tails with only the current year's needles present on the tip of the branches. Black pineleaf scale produces similar symptoms.

Diplodia tip blight can kill entire branches and may kill the tops of heavily infected trees.

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Hagle, S.K. 2004. Larch needle blight ecology and management. Chapter 15.3. Forest insect and disease management guide for the northern and central Rocky Mountains. USDA Forest Service, Northern Region, State and Private Forestry. 5pp.

Hagle, S.K. 2004. Larch needle cast ecology and management. Chapter 15.2. Forest insect and disease management guide for the northern and central Rocky Mountains. USDA Forest Service, Northern Region, State and Private Forestry. 5pp.

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Scharpf, R.F. 1993. Diseases of Pacific Coast conifers. USDA Forest Service. Agriculture Handbook 521. 199pp.

Schnepf, C.C. 1992. Diplodia tip blight on ponderosa pine. Current Information Series Publication 946, University of Idaho Extension Service. Moscow, ID. 2pp.

Useful Links

[Region 1 & 4 Field Guide](#)

[Region 1 & 4 Management Guide](#)

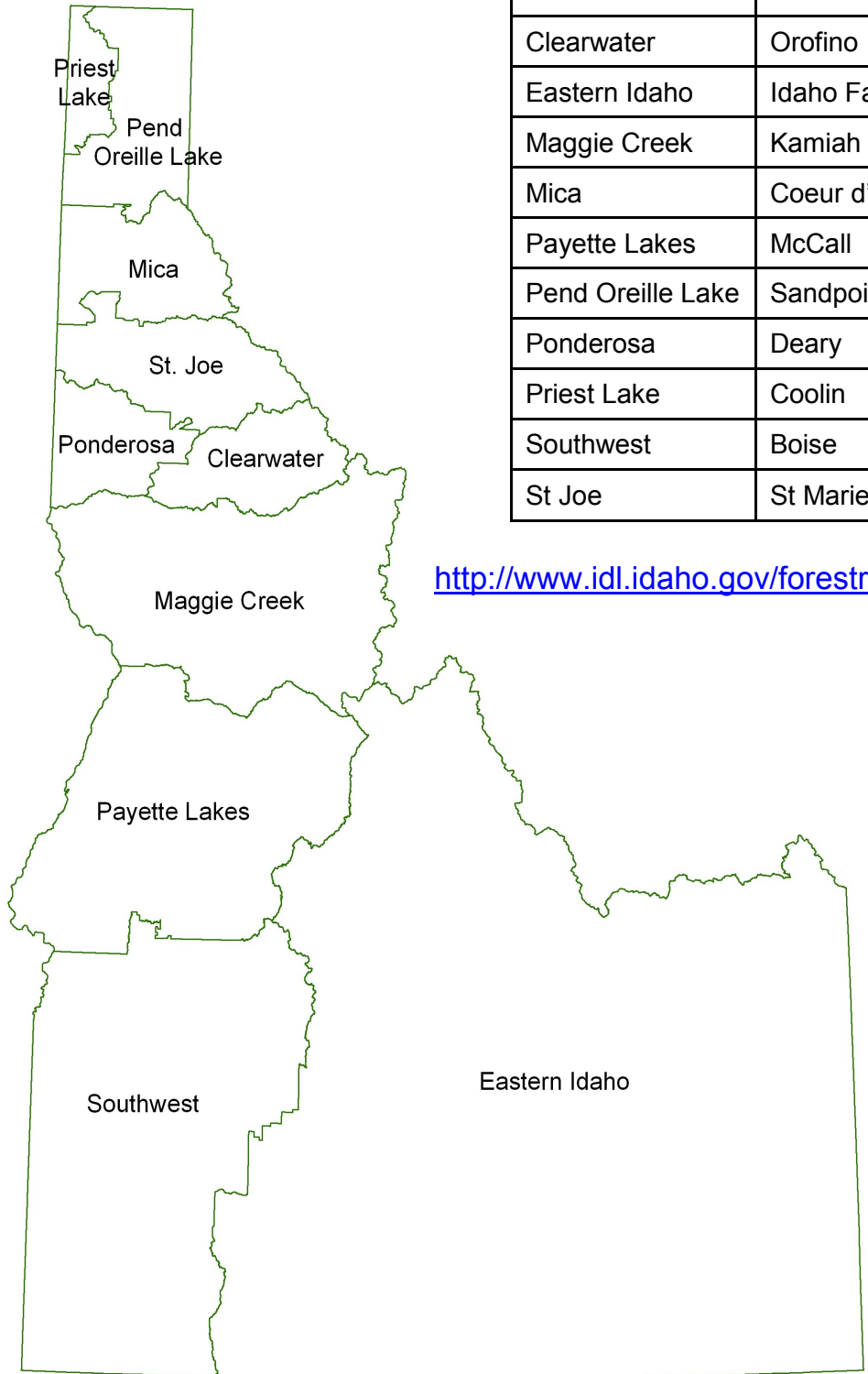
[PNW Plant Disease Management Handbook](#)

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<http://www.idl.idaho.gov/forestry/forest-health/index.html>