

RHABDOCLINE NEEDLE CAST

Rhabdocline weirii

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*Rhabdocline
pseudotsugae* Syd.



Foliage with Rhabdocline
needle cast infection.
Courtesy of Tracey Olson,
PDA

Host

- Douglas-fir

Damage Potential

- Moderate–high

Symptoms and Signs

- May first develop in needles on lower branches

Late Summer

- Yellow spots or flecks on current-year needles that enlarge with time

Late Winter Through Early Spring (Before Bud Break)

- Reddish-brown spots on upper surface of current-year needles; distinct border between diseased area and healthy, green tissue
- Swollen, light tan fruiting bodies on the underside of symptomatic needles

Bud Break

- Fruiting bodies rupture underside of needle epidermis, releasing mass of orange spores

Late Spring (After Bud Break)

- Darkened fruiting bodies indicating sporulation has passed

Summer Through Early Fall

- Previous year's infected needles drop or cast; severely diseased trees might only retain current-year needles

Causes of Similar Symptoms

- Cooley spruce gall adelgid
- Swiss needle cast
- Douglas-fir needle midge

Identification

Douglas-fir is the only known host of *Rhabdocline*. Laboratory analysis provides the most accurate identification, but growers can generally identify this fungus in their fields by observing symptoms prior to bud break. In late winter or very early spring, look for reddish-brown splotches on the upper needle surface (Fig. 1). There is a distinct division between diseased tissue and the surrounding healthy, green tissue. As bud break approaches, remove shoots containing suspect needles and place them in a glass of warm water for a few minutes. Mature fruiting bodies of *Rhabdocline* will rupture the epidermis longitudinally on the underside of the needles and release a mass of orange spores.

Biology and Life Cycle

Rhabdocline needle cast infection occurs around bud break, when buds are opening to expose susceptible immature needles (Fig. 2). During periods of high humidity (rain shower or heavy morning dew), the mature fruiting bodies open (Fig. 3). Fruiting bodies are only found on the previous year's needles and open on the underside of the needle. During spore release, the needle epidermis splits lengthwise, revealing a light tan to orange spore mass. Individual spores are dispersed by water and wind to the susceptible new growth. Spores germinate on the wet needle and penetrate the cuticle before the fungus begins to grow inside the needle.



Figure 1. Distinct symptomatic reddish-brown splotches of Rhabdocline needle cast (March).
Courtesy of Tracey Olson, PDA



Figure 2. Early bud break of Douglas-fir buds signaling the start of Rhabdocline sporulation.
Courtesy of Brian Schildt, PDA



Figure 3. Fruiting bodies rupture on the undersides of Rhabdocline-infected needles during bud break.
Courtesy of Tracey Olson, PDA

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

	May	J	J	A	S	O	N	D	Jan.	F	M	A	M	J	J	A	S	O	N	D	Jan.	F	M	A	M	J	J	A	S	O	N	D
Infection																																
Symptoms																																
Casting																																
	First Year								Second Year								Third Year															

↑ Bud Break

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

The infection period may last several weeks, but only the newly emerging spring growth can become infected. When the fruiting body turns dark brown or black, spore production is complete for the year (Fig. 4.) Needles containing spent fruiting bodies will be cast from the tree through late spring and summer. Trees that have severe infection over consecutive years may hold only the most current year's needles during the winter (Fig. 5).



Figure 4. Brown to black fruiting bodies signaling that spore production is complete for the year. Courtesy of Tracey Olson, PDA



Figure 5. Severely infected tree with only current-year needles remaining. Courtesy of Brian Schildt, PDA

Monitoring and Management Strategies

Plantation Establishment

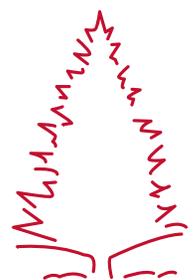
- Choose a site with slope, good air circulation, and water drainage to promote drying of trees.
- Properly space trees to encourage adequate drying of needles, especially in spring.
- Plant resistant or tolerant tree varieties; avoid Douglas-firs from Rocky Mountain seed sources.
- Remove and destroy unmanaged Douglas-fir that may act as a source of inoculum.

Preseason

- Maintain proper weed control year-round.
- Concentrate scouting on trees planted in areas that are more conducive for disease development (low-lying or shaded areas). Look at all sides of the tree.
- Scout the block in late winter or early spring (before bud break) for reddish-brown blotches on upper needle surface of most current-year needles. Overcast days afford the best opportunity to see needle discoloration. Pay particular attention to needles on the lower third of the tree and trees that look thin and only have last year's needles. If symptomatic trees are located, tag several to observe for maturation of fruiting bodies.
- Soak suspect needles in warm water to check for the maturity level of the fruiting bodies. When fruiting bodies open, spores are mature and ready to be released.

Growing Season

- Threshold level: Ask a state/regional plant inspector about any regulatory thresholds.
- In late April/early May, begin regular scouting for bud break in each target block. Make the first fungicide application when the first buds begin to open.
- At the end of the season, evaluate results and update records.



Control Options

Biological

- No recommendations are available at this time.

Mechanical

- Remove and destroy severely infected trees prior to bud break.
- Prune and remove dead/dying branches when they are dry.
- Butt-prune large trees to encourage drying of lower branches.

Biorational

- No recommendations are available at this time.

Chemical

- Apply an appropriate fungicide when buds begin to break on the trees in the block. Do not wait for new growth to elongate. Successful prevention of infection depends on preventing spores from infecting new needles—keep a protective coating of fungicide on the new growth for this to happen.
- Follow through with two to three additional applications until needles are fully elongated and mature or fruiting bodies have darkened. See the schedule below:
 - First application: when first trees in plantation break bud
 - Second application: 1 week after first application
 - Third application: 2 weeks after second application
 - Fourth application: 3 weeks after third application only if spring is prolonged by cool, wet weather and sporulation remains active or Swiss needle cast is detected

Next Crop/Prevention

- Purchase and plant disease-free nursery stock from a reputable company.

