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Western Gall Rust Management

***Endocronartium harknessii* (J.P.Moore)Y. Hiratsuka**

Hosts:
Lodgepole pine
Ponderosa pine
Ornamental pines
(Austrian, Mugo, Scots)

Western gall rust is the most common stem rust found on "hard pines" (2-3 needled pines) in the Northern and Intermountain Regions.

Topics

<i>Damage</i>	1
<i>Life History</i>	2
<i>Impact</i>	2
<i>Management</i>	2
<i>Other Reading</i>	3

Damage

Lodgepole and ponderosa pines are the principal hosts in the western United States; however, ornamental plantings of Austrian, Mugo, and Scots pines in proximity to forested areas can become infected. Unlike other stem rusts, western gall rust doesn't require an alternate host to complete its life cycle.

Perennial infections of the cambial tissues in branches and twigs cause globose swellings called galls. Galls that develop on the main stems can cause somewhat concentric ridges in the stem sapwood called "hip" cankers which affect form, lumber content, and growth rate.

Stem cankers on pole or larger trees rarely kill the trees directly but often contribute to stem breakage.

The rust infects pines of all ages, causing the most severe damage to seedlings/saplings in tree nurseries, Christmas tree plantations, and/or progeny test areas. Infected trees are more commonly found in drainage bottoms or near bodies of water.

Key Points

- Trees of all ages are affected.
- Infections in young trees are most damaging.
- Cankers on stems of seedlings and saplings are usually lethal.
- Branch infections do not move into stem and die when the branch dies.
- Stem cankers on larger trees contribute to stem breakage.

WHERE GALL RUST IS SEVERE:

Promote tree species diversity and control tree density

OVERVIEW OF WESTERN GALL RUST MANAGEMENT

1. **Sanitize ornamental trees.** Prune infected branches to improve appearance and limit local inoculum.
2. **Seed sources.** Select apparently resistant trees as seed sources.
3. **Remove infected trees.** Cull infected seedlings in nurseries. Select against infected trees in stand thinning operations after 10 years of age.
4. **Limit local inoculum.** Sanitize stands surrounding nurseries by removing infected trees.



Figure 1. Trees with stem galls should be cut during precommercial thinning and stand improvement harvests.



Figure 2. An infection on just one side of the stem probably will not kill the tree directly but will lead to a hip canker as the tree matures.



Figure 3. A hip canker (arrow) caused deformation of the lower stem which predisposed the tree to wind breakage.

Life History

Spores produced on infected pines in the spring are windborne and infect emerging shoots and/or cone-flowers on pines. Infections are most common in the lower third of the crown, likely owing to better moisture retention close to the ground. The fungus grows within the cambial tissues. Round swellings (galls) are produced on branches, twigs, and stems and eventually girdle and kill the branch or stem. The canker does not spread beyond the gall. Alternatively, galls on main stems enlarge and cause "hip"

Impact

Branch galls commonly result in branch death, especially when infested by insects or infected by secondary canker fungi. High rates of branch infection may reduce growth and predispose trees to attack by pine engraver beetles (*Ips pin*). Stem infections are far more serious. Galls restrict water conductivity (Wolken and others 2010) which often results in tree death, especially in dense stands where trees are competing for water. Young trees are commonly killed outright by

Management

On sites with a history of severe gall rust, promote tree species diversity and control stand density for optimum growth.

In nurseries, seedlings with galls should be destroyed. Detection of seedling galls is difficult; often there is only a slight swelling on the main stem. Infected pines within 300 yards of nursery beds should be removed to prevent seedling infection.

Genetically controlled resistance to infection is evident; infected trees generally occur in groups of the same age-class and seed source. When thinning infected stands, remove trees with stem galls or more than six branch galls. Aggressive, early thinning for gall

cankers, which may exist for decades.

One or two years after infection, blisters containing spore pustules appear under the bark scales, completing the disease cycle. The orange-colored spores form in paper-thin blister-like pustules on the galls during the spring or early summer.

Unlike other stem rusts of pines, the fungus causing western gall rust does not require an alternate host to complete its life cycle.

the restriction of water and nutrients caused by stem galls (Figure 1) or by subsequent infestation of the gall by insects or secondary canker-causing fungi. Deformation from hip galls predispose trees to stem breakage (Figures 2 and 3).

The tissue around the edges of a stem canker are common sites for sequoia pitch moth (*Synanthedon sequoia*) infestation which increases the extent of dead cambium.

rust that will leave stands understocked is not recommended. Infection rates decrease dramatically over the first 10 years as trees rapidly gain resistance (Blenis and others 2005). Incidence of infection decreases further as the trees reach maturity (van der Kamp and Spence 1987).

Branch infections generally die within ten years after thinning. This is likely due to increased vigor and growth of the host and the consequential shading-out of the lower branches, where most of the infections occur.

The pathogen requires live host tissue to survive so it is not necessary to dispose of infected trees or branches after cutting.

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Publication Citation

Hoffman, J. and S. K. Hagle. 2011. Western gall rust management. Chapter 14.1 Forest insect and disease management guide for the northern and central Rocky Mountains. USDA Forest Service, Northern Region, State and Private Forestry. 3 pp.

Available from USDA Forest Service, Montana Department of Natural Resources, and Idaho Department of Lands.

Online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5188580.pdf

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