HOW TO

Identify White Pine Blister Rust and Remove Cankers

USDA United States Department of Agriculture

Prepared by Forest Service North Central Research Station

Introduction

White pine blister rust (caused by the fungus *Cronartium ribicola* J. C. Fisch. ex Rabenh.) was introduced into the United States about 1900 and has since spread throughout the range of

white pine. The disease intensity varies throughout the range but is normally most severe where late summers (July-September) are cool (below 67º F) and damp, conditions necessary for blister rust infection. Thus, the farther north, the more blister rust.

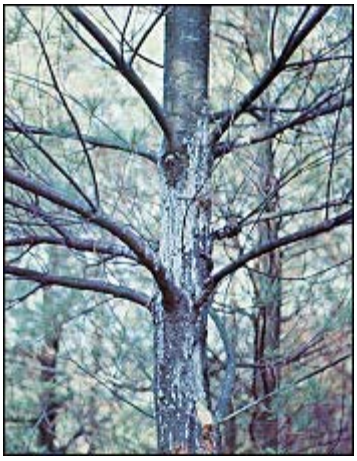
The fear of blister rust has greatly limited the amount of white pine planted in the Lake States even though there are many suitable areas in the southern parts of the region where white pine can be grown with no significant mortality from blister rust. Red pine has often been substituted for white pine in the Lake States, but red pine is now experiencing many new and serious disease and insect problems of its own. Thus, there is renewed interest in white pine with the hope of achieving a better balance of conifer species in the Lake States that will help minimize disease and insect losses. The development of blister-rust-resistant white pine, the possible increase in natural resistance to the disease, the planting of white pine in low blister rust hazard zones, and the pruning of blister rust cankers in certain high quality white pine stands can help achieve this balance.

Toward this end, helps for identifying white pine blister rust and suggestions for controlling it by canker pruning are presented here.

Identification

Symptoms vary with different stages of spore and canker development. The fungus has five spore forms in its life cycle: two (pycniospores and aeciospores) occur on pine, and the others (urediospores, teliospores, and basidiospores) occur on the alternate hosts, currant and gooseberry *(gibes)* bushes. The fungus cannot spread from pine to pine.

For initial infection look for: Patches of browning bark bordered by a yellowish discoloration of the bark the first year and a typical spindle-shaped swelling by the second year after infection. Fungus spores (basidiospores) produced on the *Ribes* host during cool, wet weather in late summer and fall infect the white pine through stomata on needles or young stems.



Breaks in the bark cankers and a resulting resin flow down the stem that hardens, providing a distinctive symptom.

Do not confuse with damage done by the pine bark aphid which appear as scattered patches of white flecks on the bark of the tree.

Year round look for: Mature cankers bordered by a yellowish discoloration of bark at the canker margin and rodent-feeding on cankers.

In early spring look for: Sporulating cankers in the form of orange-yellow blisters that push through the bark and produce aeciospores. These spores are wind disseminated and infect Ribes.

In late spring and early summer look for: Pycnia that appear as yellow-brown blisters on the canker face and produce a sticky yellow-orange fluid containing pycniospores. After a short time these blisters and fluid turn hard and black and can persist in this form for several weeks.

In summer look for: Uredia on Ribes. Orange spores, called urediospores, develop on the undersides of leaves as a result of infection by aeciospores released from pine, or from previously produced urediospores that can re-infect the same host, but cannot infect pine. These spores are wind disseminated.

In late summer and early fall look for: Brown hair-like projections (telia) on the underside of Ribes leaves. Telia commonly start forming while uredia are present on the same leaves. In cool, wet weather of late summer and early fall, the telia produce delicate round, hyaline spores called basidiospores that are carried by wind to pine needles where they cause infection thus completing the life cycle.

Control

Cankers on the main stem will usually kill the tree above the canker. No control is possible. Cankers on the branches at least 4 inches from the main stem (trunk) should be removed from the tree. This will prevent the canker from reaching the main stem and killing the tree. Most blister rust cankers in the Lake States occur within 9 feet of the ground so pruning has the added advantage of removing the needle-bearing surface of the tree that is most vulnerable to infection. Where infection occurs in the upper crowns of large trees, pruning for control is impractical.

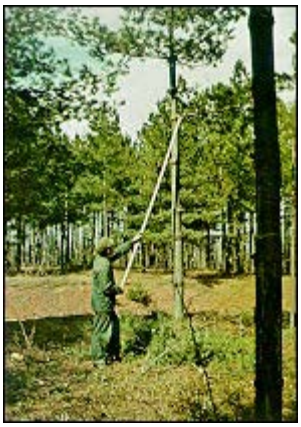
Caution! Check your area for white pine weevil infestation. An investment in blister rust canker control may not be practical where weevil damage is severe unless the weevil can also be controlled.

In Forest Stands

Pruning to control white pine blister rust is normally warranted only in the northern parts of the Lake States where the disease is most severe. For best blister rust control begin pruning when trees are about 4 years old and 2 feet in height. Of course pruning also provides the additional benefits of better wood quality. Here is how to decide if pruning is needed, regardless of hazard zone.

1. Consider stands of white pine more than 3 years old that have more than 200 crop trees per acre and living needles within 18 inches of the main stem in the lower 9 feet of the tree.
2. Determine the number of white pine crop trees per acre that have no cankers on or within 4 inches of the trunk.
3. Determine the number of crop trees per acre with at least one canker 4 to 18 inches from the main stem. Do not count cankers above lower seven living whorls.
4. Divide the infected crop trees (3) by total crop trees (2 + 3) to determine the percent of infection during the last 5 years.
5. Divide total infection percent (4) by 5 (years) or the total number of whorls on a tree minus 2, whichever is less, to determine annual infection rate.
6. Prune only those stands that have an annual infection rate greater than that shown to be acceptable in the tabulation below:

White Pine Per Acre (Number)	Acceptable Annual Lethal Infection (Percent)
200-299	1
300-399	2
400-499	3
500-599	4
600-649	5
650-699	6
700-749	7
750-799	8
800-849	9
850+	10



7. Re-examine stands every 10 years until the lower 9 feet of the bole are free of living limbs.
    - Prune a maximum of 200 crop trees per acre for natural stands and 350 trees per acre for plantations.
    - Prune all limbs flush to the trunk from the lower half of the tree or to 9 feet, whichever is less.
    - Prune all accessible branches above 9 feet that have a canker 4 to 18 inches from the stem.

Example

1. 10-year-old white pine stand.
2. 320 crop trees per acre.
3. 65 crop trees with cankers 4 to 18 inches from the main stem in the lower seven whorls.
4. 65/320 = 20 percent for 5 years
5. 20 percent/5 years = 4 percent per year
6. 320 crop trees per acre at 4 percent annual infection. Hence, pruning is appropriate.

Protecting Ornamental and Christmas Tree Plantings

The principles of controlling blister rust on trees grown for ornamental purposes (landscaping, Christmas trees, etc.) are the same as for forest trees, but the practice is somewhat different. By definition such trees should maintain the maximum amount of foliage. So, home and cabin owners and Christmas tree growers who want to protect their white pines from blister rust should remove only those branches that contain cankers 4 or more inches from the trunk. Repeat the process whenever new infections are detected. Trees with cankers on or within 4 inches of the trunk are doomed to die anyway, so any effort to preserve them is futile.

For Additional Help

Contact your State Department of Natural Resources, Forestry or Plant Pathology Extension Services, or your State Department of Agriculture, Plant Industry Division.

Technical References

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Weber, R. 1964. Early pruning reduces blister rust mortality in White Pine Plantations. USDA For. Serv. Res. Note LS-38, 2 p. Lake States For. Exp. Stn., St. Paul, Minnesota.

Photographs of *Ribes* uredia and telia and pycniospore droplets on white pine, courtesy of Robert Patton, Department of Plant Pathology, University of Wisconsin, Madison, Wisconsin.

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