A History of White Pine Blister Rust In North America and Wisconsin

by George Lehrer

This year marks a milestone in Wisconsin forestry as it has been 100 years since the discovery of white pine blister rust in the state.

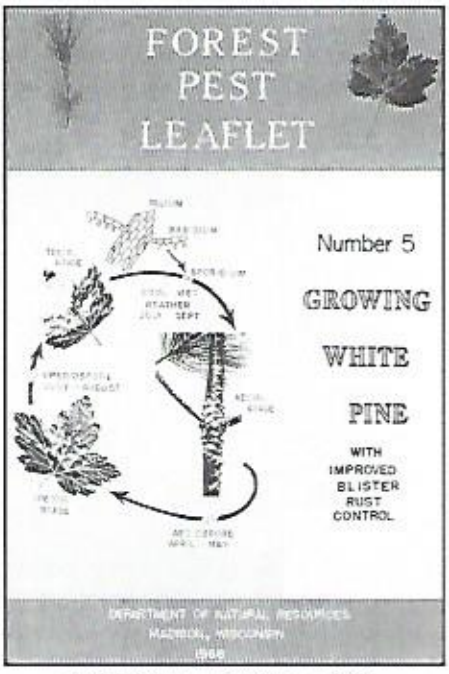
The Impact of Logging, Settlement And Imported Growing Stock

The exploitation of the vast white pine resource played a significant part in the permanent settlement and development of much of Wisconsin. A large volume of highly useful wood, easily transportable via flooded streams, was needed to facilitate the rapid westward expansion of a rapidly growing nation in the late 19th and early 20th centuries. Northern and central Wisconsin provided raw material, offering vast stands of valuable white pines which soon fell to the axes and saws of hard-working, mostly immigrant, workers, many of whom stayed to settle on the newly-cleared lands. Initial efforts to farm many of the newly-homesteaded farms were doomed to fail because of a short growing season and poor soils, and many thousands of acres of newly deforested acres were left with little or no tree growth and few seed trees.

Wildfires and repeated fires set to clear slash, exacerbated the situation, and in the early 1900s much of northern Wisconsin was indeed a bleak landscape. It became clear that agriculture was not the total answer and that reforestation was the best alterative for much of the landscape. This fueled a need for large quantities of inexpensive planting stock, which, because of a lack of local tree nurseries, was not available except from European nurseries.

An example of extreme white pine blister rust damage.

Across the Atlantic, the potential value of white pine was recognized and the species was extensively propagated. However, within a few years in Europe, our eastern white pine was heavily infected with white pine blister rust, a minor pest in the native Swiss stone pine *(Pinus cembra)* which is resistant, but not immune, to the disease.



WI DNR pamphlet from 1968.

Due to a two- to three-year or longer development period for the disease to become obviously visible, and lack of effective plant quarantine measures, infected nursery stock was the primary method by which blister rust was transported to North America. It was present as early as 1898 in Maine, but not identified as the extreme hazard it presented until 1909, when it was found on white pines near Geneva, New York. This discovery, along with the knowledge of the potential for damage shown by European experience, generated concern among plant pathologists with the USDA and the few foresters in this new profession.

Early Control Efforts

The first efforts at control were aimed at inspection of imported planting stock, with destruction of infected trees, and a ban on the importation of five-needled pine nursery stock. For various reasons, these measures proved inadequate and the spread of blister rust via infected imported seedlings continued for several years. At the USDA, the

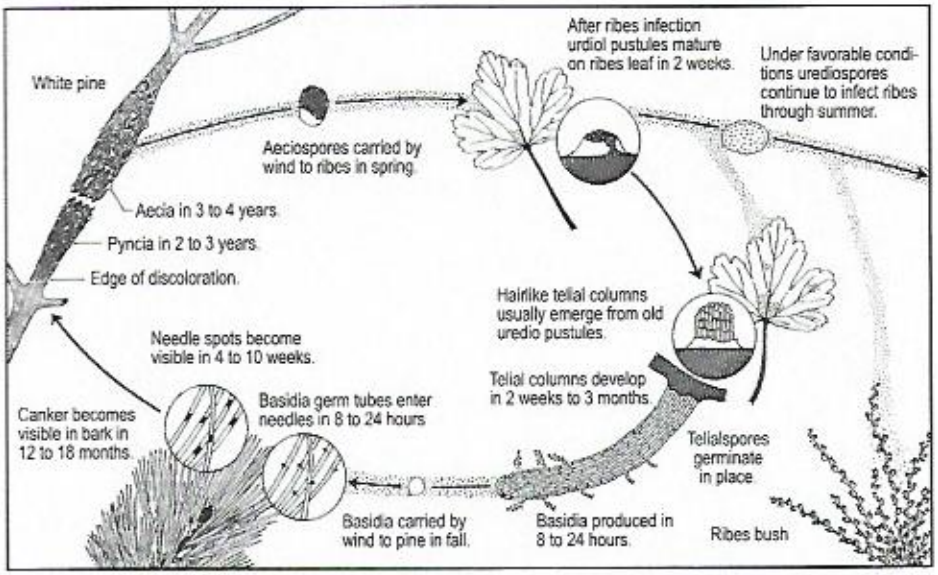
Office of Forest Pathology was initially the focal point in the effort to curtail the disease through cooperative efforts with the various states' Departments of Agriculture or Conservation. Eventually, responsibility within USDA for blister rust research and control efforts was delegated to the U.S. Forest Service where it still lies.

In Wisconsin, the responsibility for survey and control of blister rust was delegated to the Plant Industry Division of the State Department of Agriculture. Currently, the WI DNR has this responsibility. Limited by the constraints of a shortage of qualified personnel and the travel limitations of the time, a comprehensive survey was understandably difficult, but in 1915 blister rust was found in Polk County on white pine and the alternate host ribes (collectively currant and gooseberry plants).

First efforts at control were aimed at finding and eliminating all imported nursery stock which could be infected, along with the five-needled pine planting stock import ban. These measures soon proved both impossible and ineffective. Within a few short years it became obvious that blister rust had become established across North America through infected planting stock. The hope of eradicating the disease by means of eliminating all infected trees was abandoned, but the quarantine prohibiting the importation of five-needled pine planting stock (and European black currant, *Ribes nigrum)* continued.

European black currant, which had been shown to be extremely susceptible to the rust, was widely planted by early immigrants and may even have been responsible for some early introductions of the disease. So in addition to quarantine measures, the plant was declared a public nuisance and efforts were made to completely eradicate it in all pine growing areas.

Early research showed that blister rust is a nonsystemic, obligate parasite, needing living material to survive. In other words, removing infected trees or branches eliminates that infection, and removing one of the alternate hosts from within infecting distance breaks the cycle and prevents new infections from occurring. Research indicated the aeciospores produced on pine are quite



Life cycle of white pine blister rust published by the U.S. Forest Service in 1959.

long-lived, and thus can be responsible for long-range dissemination of the disease, (up to hundreds of miles), and that spread from ribes to pine was a relatively short distance ranging from a few feet to perhaps several hundred yards in most instances, and was dependent upon cool temperatures and moisture. As is the case in many instances of introduction of a new disease to an area, epidemic conditions threatened to eliminate white pine from many areas.

This threat of blister rust, along with the hazards of white pine weevil and severe browse damage from rapidly expanding deer and hare populations, led to intense discrimination by many foresters against planting of white pine or measures to protect natural reproduction. Through the 1920s, control efforts continued, mainly by federal workers scouting for rust locations, attempts to eliminate infected trees, the mostly successful effort to eliminate European black currents, and intensive publicity attempts to get landowners to protect white pine by eradicating ribes.

The Role of Plentiful Labor

In the 1930s, availability of plentiful inexpensive labor via the various federal relief programs such as CCC, (Civilian Conservation Corps) NRA (National Recovery Act) WPA (Works Progress Administration) and others gave rise to the greatest effort ever seen to control a plant disease epidemic. Thousands of man-days of labor were expended in finding and mapping stands of white pine throughout its range, and removing ribes from a surrounding control zone of about 900 feet, or 1,500 feet around tree nurseries.

In Wisconsin, more than 460,000 acres of white pines were worked by removing nearly 100 million ribes. The cost of this work has been questioned, as have instances of perceived ineffectiveness. Overall, several valid studies and surveys have shown that ribes eradication is generally (but not always) effective in reducing infection rates and allowing white pine regeneration to thrive.

Also during these early years important research was undertaken, including at UW-Madison where A. J. Riker began critical research later continued and expanded upon by Bob Patton, Gene Van Arsdel and others. Results of research done largely in Wisconsin showed the precise moisture and temperature conditions needed for successful development and spread of the rust from ribes to pine and the environmental conditions favoring them. This led to modification of control efforts in southern areas where environmental conditions allow white pine to grow with minimal hazard from blister rust. It also showed why conditions in some northern areas made control efforts either ineffective or economically impractical.

Other important research in Wisconsin concerned genetic resistance of some individual white pine trees and that not all resistant trees may have the ability to transmit this resistance to their progeny.

Pruning young white pine can provide effective—and cost effective—blister rust protection.

Research done in Wisconsin and elsewhere showed the ineffectiveness of fungicidal chemicals, which were being promoted as practical controls of blister rust in the forest. Chemical fungicides can provide preventative control in tree nurseries.

The Importance of Pruning

Studies in Wisconsin also confirmed the effectiveness of timely pruning as a preventative as well as a curative measure in established young white pines.

The intensive direct control efforts through ribes eradication was interrupted by World War II, and postwar control efforts had to be more measured because of demand for labor in an economy with several past years of suppressed civilian economic activity. In Wisconsin there were U.S. Forest Service area supervisors in Antigo, with one state-employed seasonal assistant, and Hayward, with two seasonal assistants, and one state employed area supervisor in Madison. A U.S. Forest Service state leader and one clerical assistant in Madison completed the permanent staff monitoring blister rust in the state.

Direct control fieldwork was confined to summertime as growing season conditions were needed for reliable identification of ribes plants for the hand (and sometimes chemical) eradication methods used. Labor consisted largely of college and high school students during summer vacation, although prison inmate labor was sometimes used and in at least one county, able-bodied welfare recipients were employed. Work was done on public and Indian lands and on private lands where the landowner contributed 50 percent of the cost, and the Forest Service provided the rest, plus leadership.

Winter activities mostly consisted of survey, planning and reporting by the permanent staff. In the 1960s, the Forest Service discontinued staffing of blister rust control activities but continued to cooperatively fund activities on non-federal public and private lands through the Wisconsin Department of Agriculture's Plant Industry Division. It was staffed by personnel from the previous field offices.

Ribes eradication was still the primary control effort, but the practice of pruning all juvenile white pines in selected stands was being increasingly used as a control measure. In addition to being fairly effective in controlling the rust, pruning offered some advantages.

First, it is easier to train temporary workers to properly prune a tree than to locate, identify and properly eradicate any of the nine native and three cultivated species of ribes found in Wisconsin. Second, pruning can be performed at any time of year, allowing better utilization of labor which might be available during the period when ribes are not in leaf and the ground is snow covered. Third, control efforts in pruning operations are confined only to the trees, whereas ribes often need to be removed from different ownerships and varying distances from the pine to be protected. Fourth, pruning may only need to be done once, but the normal ribes eradication program called for one or more reworkings of an area at about five-year intervals to remove missed and/or newly-grown ribes. Finally, environmental changes such as a logging operation, fire or windthrow in or adjacent to a worked area can encourage ribes regeneration.

In some cases force account (hourly paid) labor was used, but much of the work was performed by a wide variety of program workers. As mentioned earlier, welfare and inmate labor was used where available, as were Youth Conservation Camp (state), Comprehensive Employment Training Act and Green Thumb laborers available near where work was scheduled. A vast majority of the control efforts were expended on public lands but there were some activities cooperatively done on private woodlands.

Staff Reductions Have Affected Control Efforts

Supervisory staff retirements and resignations without replacement led to staff reductions so that from 1977 until 1982 there was only one area supervisor in Antigo and a program manager in Madison as permanent staff. At that time, federal financial support was drastically curtailed and the control program as previously constituted was discontinued.

Since then there have been no organized control efforts and only limited serious appraisal of the blister rust situation in Wisconsin. These surveys were limited in scope, some apparently concentrated on younger age classes, and one on pole- and small sawlog-sized trees. I am aware of no current attempts to monitor the continuing effects of blister rust on the white pine resource in Wisconsin.

George Lehrer is a WWOA Charter Member, active in the North Central Chapter who owns woodland in Langlade County. He was employed by the Wisconsin Department of Agriculture from 1960-1997.