

RECENT DEVELOPMENTS IN WHITE-PINE BLISTER RUST CONTROL IN THE NORTHWEST

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It was over 35 years ago, in 1906, at Geneva, N. Y., that a strange and unfamiliar disease was found on the leaves of a ribes † bush. As is often the case, this discovery might well have been only the extension of the known range of a common, native disease, or even the first finding of a previously undescribed, mild-mannered, indigenous fungus. This was not true of the Geneva collection, however, for laboratory examination revealed that once more a serious and destructive Old-World fungus had become resident in North America. The pest was white-pine blister rust (*Cronartium ribicola* Fisch.), a disease that had been discovered, observed, investigated, and written about in Europe for over half a century, but against the introduction of which this country did not put up quarantine barriers until 1912.

Skipping over the succeeding 15 years, which marked the organization and development of the program to control blister rust in the eastern white pine forests and the intensive searching for evidence of its introduction into the West, we come to the fall of 1921. Then, just 20 years ago, it was revealed that the West also had this disease to combat, for it was discovered to be firmly established in the forests of southwestern British Columbia and northwestern Washington. This focused attention immediately on the extensive forests of commercial white pine in the West, particularly the stands in the Northwest, and resulted in the first western control efforts. The initial task was the development of working methods in a new country with host plants, topography, forest cover, weather, and many other factors different in the extreme from those in the East. This particular phase of the work, although relatively uninteresting to most people, actually provides the material for the behind-the-scenes or inside story of blister rust control in the Northwest.

A review of the 18 years of control efforts in this region shows that there have been three distinct periods, which

were marked by varying degrees of successful accomplishment. The first period was the 10 years from 1923 to 1932, a period of preparation and slow advancement. The second period, which includes the 4 years from 1933 to 1936, was one of outstanding progress and achievement. The third and last period, which runs from 1937 to the present, is one identified with the difficult problem of holding gains already made, with a greatly reduced supply of available labor.

Quarantine enforcement, white-pine-resource surveys, experimental control work, and initiation of the Federal-State-private cooperative control program were the major activities of the first decade. Unfortunately an adequate program was not started then, even though it was well outlined and strongly urged by men who had studied the problem thoroughly to the conclusion that the disease would be generally established in this region by 1936. This prediction came true, as did another they made, namely, that unless large-scale operations were started in that earliest period and continued aggressively until all valuable stands of white pine were protected, the cost of control would increase because of the greater difficulty of controlling the disease after its invasion.

The results of this first period of 10 years, from 1923 to 1932, were initial control work on only 215,169 acres, or about 8 per cent of the 2,670,000 acres of western white pine, and rework on 6,570 acres, which is only a fraction of 1 per cent of the area.

A very abrupt change in circumstances occurred in 1933, which marked the beginning of the second period in the history of blister rust control in the Northwest, for almost overnight the Federal emergency work projects to relieve unemployment became the source of thousands of workers for this

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† Ribes is the generic name for currants and gooseberries.

program. Although the extensive operations of 1933 and 1934 did not continue on such a large scale in 1935 and 1936, the total work accomplished in these 4 years suggested the possibility of completion of the major part of the task by 1940. During this 4-year period initial control work was accomplished on 1,405,867 acres, or 52 per cent of the total, and rework covered 70,426 acres, or 5 per cent of the estimated job. Combined with progress during the preceding decade, the cumulative totals were 60 per cent of the initial work and 6 per cent of the rework.

The hopes of carrying on in these proportions to completion of the task, were, however, short-lived, because decreasing relief loads and the demand for emergency workers on other projects of every description have, since 1937, drastically reduced the number available for this project. It is notable that the ensuing regression came at a time when two highly important developments were taking place, namely, the rapid build-up of the rust spreading from the many spearheads of infection started during the years from 1923 to 1936, and the urgent need for extensive rework on part of the large acreage covered during the second period. As a result, the efforts since 1937 have largely been centered around rework or holding the line. This has prevented that much-needed large-scale and rapid extension of control to untouched areas, although some of this has been possible. In total, about 252,100 acres of initial work and 323,100 acres of rework are the record from 1937 through 1941. In addition, further work on 170,000 acres of mature timber has been deferred until after logging because of the present low hazard to this loggable timber.

The progress of control work to date stands at about 2,043,150 acres given initial treatment or deferred status and 400,100 acres reworked. This means that the first part of the job is about 70 per cent and the second part about 25 per cent completed.

The development and improvement of control methods and equipment have been going on since the first ribes bush was uprooted in 1923. The intention is not to review the many changes and minor adjustments which have been made in these methods and procedures, but rather to point out some of the more significant developments which have taken place in the blister rust control program. Of interest in this connection is the present status of the three primary methods of ribes eradication, namely, hand grubbing, chemical treatment, and clearing with bulldozers.

On initiation of control work in and around the Clearwater, St. Joe, and Cabinet National Forest areas one of the primary problems was the destruction of the masses of the highly susceptible western black currant, *Ribes petiolare*, which was generally present along most streams. The eradication of this species was not possible by grubbing methods, so the use of chemicals was developed, for which specially designed portable spraying equipment was devised. Through this equipment more than 1¼ million gallons of chemical solution have been pumped in destroying this species on 22,518 acres of stream type, winding through several hundred thousand acres of forest land. The annual output has ranged from a peak of 388,000 gallons in 1934 to a mere 12,700 gallons in 1941. With the exception of a few isolated areas in the back country of the St. Joe and the Clearwater forest areas, the *R. petiolare* problem has been "licked" and chemical eradication has passed from a primary method of ribes eradication to one of minor importance.

A similar situation exists in connection with the special brush-rake-equipped bulldozer, which was introduced in 1933 to eradicate *Ribes inermis* from brush jungles in stream-bottom land. In 1940 work on the last area within the white-pine type which had to be treated by this drastic method was completed. This method accounted

for a total of 2,200 acres cleared of brush and ribes, much of which is now under cultivation growing heavy crops of hay or being used for pasture. Bulldozer work in blister rust control in the Northwest may now be regarded as a thing of the past.

These two accomplishments represent important milestones in the history of blister rust control and are more significant than indicated in the acreage involved. First, the areas treated with chemical and bulldozer were all high-hazard areas from a blister rust standpoint, capable of causing early introduction and heavy intensification of the rust; and second, the areas treated by these methods were all costly units, each acre involving from five to ten times the average cost of working an acre in the upland type.

This leaves hand grubbing as the primary method of ribes eradication over the remaining acreage. A serious problem in connection with this method has confronted control supervisors from the beginning of the work. This problem is to get the workers to remove every bush completely so it will not resprout. Workers have been furnished with various types of tools, depending upon the size of bushes which were prevalent, with which they could remove a bush properly if ordinary care and diligence were employed. This did not prove adequate, especially among the large number of relief workers, because care and diligence were not universal attributes throughout the rank and file. The breaking of bushes at the ground could not be sufficiently eliminated by supervision alone, so resprouts constituted as much of a problem as missed bushes, if not more. Checkers could find the missed bushes, but there was no possibility of their finding the hidden crowns and roots of bushes broken at or below the ground level. Naturally this was one of the principal factors necessitating rework on many areas.

Specific aid toward the mastering of this problem came from the ranks of the relief workers, when one of this group, for his own particular use, fashioned a tool in the shape of a pronged pick with long, beveled claws

resembling those of a claw hammer. From this idea a claw-mattock ribes tool, which is practically foolproof in eliminating the root-crown problem, has been perfected and used during the last 3 years. The value of this tool in the battle against ribes through the great reduction in the amount of area requiring rework is inestimable. One might say that a "found" ribes is an "eradicated" ribes in the present work, which was not always the case in years past.

Less tangible than the above-mentioned developments but highly important in the general line of attack are those matters dealing with planning. This phase of the job is a year-around process requiring thoughtful and detailed attention to the multitude of factors affecting the establishment and development of white pine and ribes and, directly or indirectly, influencing the action of blister rust. The careful coordination of blister rust control work with the other elements in the white pine management program is a forward step in planning. An important contribution in this field is the publication entitled "Blister Rust Control in the Management of Western White Pine," a joint work by Kenneth P. Davis of the Northern Rocky Mountain Forest and Range Experiment Station and Virgil D. Moss of the Bureau of Entomology and Plant Quarantine.

Another element of planning which has always been important, but more so in recent years because progress of control work has not kept pace with the spread and intensification of blister rust, is the matter of "priorities," or, in other words, the question as to which areas should be worked first. This is not merely a question of relative values of the different white pine areas but a complex problem necessitating the consideration of a number of factors, including the occurrence of ribes plants and their possible increase, the amount of blister rust present and its rate of intensification, and the age and density of the white pine stand, as these are important from the standpoint of potential damage in the stand.

It can be readily seen that a great deal of information is necessary for the

establishment of proper "priorities." Many of these data are gathered in the normal course of pre-eradication surveys and eradication and checking activities. The records taken on these activities provide all the essential information relating to ribes and white pine on areas where control work has been performed and to a somewhat lesser extent on unworked areas. It has become necessary in recent years to introduce the disease survey as a method of securing essential information on the amount and rate of intensification of the rust on individual tracts. This survey was inaugurated in 1935 to secure, primarily by a system of sampling, an estimate of the amount of rust present in the region. The extensive use made of the data taken on these sample surveys has shown the importance of their place in the prosecution of any control program where the rust is as widely distributed as it is in the Northwest. In 1941 the disease survey was changed from a special project activity to one integrated with checking and performed as a definite function of each control operation.

Aside from the part which disease survey plays in determining priorities or deferred classification for areas, it will serve to provide the final answer as to when control is established on an area. It was originally expected that when the residual ribes plants, as determined by the check on an area, were fewer in number and smaller than those provided for under certain established working standards, the white pine stand would be protected. While the presence of ribes must now be considered as prima-facie evidence of present or future rust on all sites, there are many other factors influencing the disease, as indicated in the numerous instances where similar ribes populations have resulted in greatly different rust conditions. In the last analysis, the dependable answer as to whether a stand of white pine has been protected from blister rust lies in the examination of the trees for the disease.

An example of the type of maneuvering which is going on in control planning is the deferred working status accorded to all mature timber stands.

Approximately 170,000 acres of this type have been so classified, and at least 100,000 acres additional, including some of pole size, will be added after more thorough inspections or surveys are made. This means that attention to the acreage of loggable timber which will suffer very little, if any, damage before harvest, must be deferred, temporarily at least, in favor of the more urgent job of protecting younger age classes, even though rust intensification in the mature stands will make the post-logging control work more difficult.

This review covers the more important recent developments in blister rust control in the Northwest. In general the objective has been to develop the most practical and efficient methods of ribes eradication and to plan the program so that the greatest possible acreage of the more valuable white pine lands may be maintained in the growing of this tree species. To aid in the fulfillment of this objective we have in the Spokane Blister Rust Control Office a special staff working on "Methods Development" and "Control Investigations." The results of their work are a continual aid to the control supervisors in the improvement of their plans and methods. In this connection several organizations that are as vitally concerned in this problem as the Bureau of Entomology and Plant Quarantine have contributed greatly to the development of these projects. These include the Forest Service of Region One, the Northern Rocky Mountain Forest and Range Experiment Station, the Division of Forest Pathology of the Bureau of Plant Industry, and the University of Idaho School of Forestry.

In conclusion, it can be said that substantial progress has been made in the blister rust control program, as indicated by the review of accomplishments in the first part of this discussion. There still remains a large amount of unfinished work, both in untouched lands and in those requiring further attention, before control is fully established. The final result, measured in terms of acreage maintained in white pine in this region, will depend on the extent of the program that it is possible to carry on during the next few years.