Mobile Nature, Cooperative Management, and Institutional Adaptation in Pacific Northwest Blister Rust Control in the 20th Century

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In 1931, during some of the worst days of the Great Depression, a group of foresters gathered in Lakeville, Connecticut, for the Seventeenth Annual Blister Rust Conference. There, amid the hills and agricultural fields of New England, a forester from Idaho crafted a strained analogy. Although his statement now sounds somewhat sexist, the presumably all-male audience some 80 years ago probably did not give it a second thought. Elers Koch remarked,

> There is an old adage that you cannot make an omelet without breaking eggs. I can imagine that the average housewife who is quite accustomed to cracking a dozen eggs for a family omelet would be quite appalled at the number of eggs to be broken into the pan if she were suddenly required to make omelets for a thousand people.
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> The unaccustomed magnitude of the white pine blister rust control job confronting us in Idaho hits a good many foresters in about the same way.[1]

Koch grasped for a way, no matter how contrived, to adequately capture the difficulties he faced as an assistant regional forester for the U.S. Forest Service (USFS) in combating blister rust, a fungus that infected white pine forests in Idaho and elsewhere around the West. No stranger to hardship—Koch had experienced and chronicled the Big Blowup of 1910, the fires that burned approximately three million acres in eastern Washington, northern Idaho, and western Montana—the federal forester could imagine only a housewife's work increased a thousandfold as an apt metaphor. His anxiety was plain.[2]

To extend Koch's analogy, foresters and scientists, timber companies and the public cracked a lot of eggs and tried several recipes during a half century of efforts to confront, contain, and combat white pine blister rust. This forest pest devastated vast stands of white pine across the continent, wreaking its greatest havoc in the Pacific Northwest, especially Idaho. The history of blister rust control reveals more than a problem in forest pathology: it illuminates multiple historical forces and trends.

The simplified story of blister rust is one of arrival, spread, and decline, though not disappearance. The simplified story of blister rust *control* is quarantine, eradication, and technological experimentation. The fungus arrived in North America in 1906 and reached Canada's West Coast by 1910, although it remained isolated and no one detected it until 1921; then, it soon crossed into Washington, after which it spread to Idaho and Oregon. In the meantime, state and national governments passed laws, funded efforts, and sent forth agents to educate silviculturists and to work with the timber industry to stop the increasingly damaging pest. During the Depression, the federal government expanded its funding and control programs, sending in Civilian Conservation Corps (CCC) laborers, while it continued cooperating with local governments and businesses and developed new laws that allowed its agents to cross property boundaries while following the pest's ecological pathways. Despite accomplishing much, those strategies failed to contain blister rust. After World War II, those seeking to control the rust concentrated their efforts on technological approaches, including tree breeding programs, chemical pesticides, and antibiotics. By the 1950s, eliminating blister rust no longer seemed possible, but managing it as part of an integrated pest control program did. In other words, the acute problem of the 1920s and 1930s had become a chronic problem by the 1950s and 1960s. When the federal blister rust control program ended in 1967, the combined efforts of half a century had not eliminated blister rust, but had reduced it to manageable levels.[3]

At the core of their work, environmental historians examine how nature prompts humans to respond to ecological imperatives in ways that will benefit them. White pine blister rust furnishes a terrific case study of this interaction, illustrating how humans continually adjusted their responses to an ecological pest that kept moving. The history of white pine blister rust control also demonstrates the independence of mobile nature: the pest did not recognize or respect international or state borders, or public-private property lines, or foresters' or politicians' strategies. The pest's mobility demanded that local and national governments and public and private forest holders work together. As other scholars have also noted, mobile nature—be it wa-

The detail at the left shows the effects of infection on a young tree. The photo at the right depicts trees dying from blister rust infection. (Special Collections and Archives, University of Idaho Library, PG13-1396 [left], PG13-3207 [right])

ter or weeds or waterfowl—requires institutional innovation and cooperation. Whether creating committees for allocating irrigation water or boards to tackle weed control, people have found it necessary to collaborate to manage myriad environmental issues. To combat blister rust, government and business have had to cooperate, and these efforts illuminate the dynamics of the history of mobile nature.[4]

Cooperation prompted by mobile nature also fit with a trend in governance important at the time of the outbreak and spread of the pest. Progressive Era resource management—conservation—applied scientific principles to environmental quandaries to bring about efficient management for human needs. Conservation, with its proliferating laws and government bureaus, increased state power, typically in ways that helped stabilize business, including the timber industry.[5] When blister rust arrived in the Northwest after World War I, many leaders in government and industry sought ways to cooperate and develop a mutually beneficial agenda, a common approach in the business-friendly 1920s, the decade in which the secretary of commerce, Herbert Hoover, helped build what has become known as the associative state. This partnership between government experts and industry representatives extended the ethos of the Progressive Era.[6] Blister rust control entailed deploying local and national government experts to work with private interests. Indicative of this broader trend toward public-private partnerships was legislation such as the Clarke-McNary Act (1924), which formalized cooperative arrangements between federal and state and public and private forestry programs.[7] During the Depression, however, two things shifted the fight in the forests, extending it beyond simple cooperation among various interested parties. First, the rust kept spreading, jeopardizing millions of acres of timber. Second, a surplus labor supply (that is, the unemployed) and federal work programs (for example, the CCC) made personnel available to directly attack the pest. Although these young men's labor was essential, it did not stop the spread, and then World War II transferred these workers from western forests to the front lines of Europe and the Pacific. After the war, efforts to control blister rust shifted. Now those fight-

ing the rust ramped up breeding programs to genetically improve the trees at the same time that they began using chemicals such as antibiotics and pesticides. These technological approaches represented the final stage in blister rust control and symbolized the postwar emphasis on replacing people with technology.

Viewed through the lens of blister rust control, this era was one of sustained government action. Ties between state, federal, and private parties strengthened as the groups worked together to solve environmental and economic problems caused by an autonomous and sometimes pesky natural world. Institutions deployed expertise, funds, legislation, and technology, the scale of which frequently shifted in response to the outbreak, the effectiveness of previous strategies, and the availability of labor or tools. In the end, local and national, public and private groups worked cooperatively, identifying their common interests and marshaling resources and innovations to control nature and thus sustain a vital economic resource.

To understand blister rust control efforts, one must understand the biology of the fungus that causes it, *Cronartium ribicola.* This fungus relies on two host plants to complete its life cycle. A pine tree serves as one host, and the other is either a wild or a domesticated gooseberry or currant bush from the genus *Ribes.* To propagate, blister rust spores must travel on the wind from *Ribes* to pine and back again; spores cannot move directly from *Ribes* to *Ribes* or pine to pine. The fungus moves from the needles of the pine into the tree's tissues and can remain in the tree for years, whereas the fungus infects only the leaves of the *Ribes* and so lasts seasonally. Weather, wind, topography, and plant distribution all shape how the fungus spreads naturally through forests.[8] Of course, humans were the greatest factor in the spread of the fungus, moving plants and their pathogens around the globe.[9]

Although its biology is basic enough, blister rust ecology has unique geographic, historical, and economic contexts. Originating in northern Asia, blister rust crossed the Ural Mountains into northern Europe, where, in 1854, H. A. Dietrich discovered it on trees in the Baltic region, naming it in an 1856 publication. Only a single pine species was commercially valuable in Europe, but people widely cultivated *Ribes.* Blister rust did not seriously affect the timber industry because, as one blister rust control official explained, "In Europe the white pine was sacrificed to retain the *Ribes.*"[10] In North America, the situation was reversed: the abundant and valuable white pine trees, the so-called king of softwoods, were economically important, and the primarily wild *Ribes* mattered hardly at all. Americans' appetite for wood was insatiable, and they cut their white pine forests far faster than nature could replenish them. By the mid-19th century, East Coast white pine forests had seriously declined; by the late 19th century, midwestern forests were following the same path.[11] To restock these stump-covered hillsides, during what the plant pathologist Perley Spaulding called the reforestation movement, Americans turned to nurseries, but American nurseries found the economic incentives poor and could not keep up with the demand anyway. European nurseries then stepped in. Millions of pine seedlings were shipped west across the Atlantic between 1907 and 1909 to more than 226 different North American locations, and after 1900 the white pine was the most widely distributed of all American trees. Unfortunately, the fungus incubates for two to three years, so infected seedlings showed no signs of the disease at the time of shipping.[12]

White pine blister rust first appeared in the United States in 1906, in New York, and local, state, and national governments acted quickly to keep pace with its rapid spread. Even from a distance, Pacific northwesterners paid close attention as foresters and governments fashioned responses, technical and institutional. Cooperation between landowners, businesses, and government officials was essential to stopping the fungus's spread and preventing economic catastrophe in the white pine timber industry. Those fighting the disease drew on the conservation movement with its stable of strategies and governmental experts. The efforts to contain blister rust revealed a creative and active group of people engaging seriously with the natural world's whims.

Recognizing the environmental and economic threat the fungus posed, foresters turned to the government for help. The forester F. C. Stewart found blister rust on cultivated currants in Geneva, New York, and three years later, in 1909, Perley Spaulding discovered the rust on pine seedlings. Officials traced 90 percent of the infected nursery stock in this initial outbreak to a single source in Germany, J. Heins Söhne's nursery. Almost immediately, the U.S. Department of Agriculture (USDA) created the Office of Blister Rust Control (OBRC) within the Bureau of Plant Industry, appointing Samuel B. Detwiler its director. The OBRC received funding from 1915 until 1967, making it "the most extensive forest disease control effort in time, money, men, and materiel in the history of US forestry," according to the plant pathologist Otis C. Maloy.[13] While administrative agencies established bureaucracies, Congress also acted.

In the early 20th century, the United States remained the only industrialized nation without protective legislation against plant pests.[14] This changed in 1912 when Congress passed the Plant Quarantine Act. The law was relatively simple, authorizing the secretary of agriculture to require inspections of imported nursery stock to certify that it bore no signs of disease and to ensure that containers were prop-

erly labeled. The legislation also created the Federal Horticultural Board to carry out the act's provisions, initially providing the board $25,000 in funding. Most important, the act allowed the secretary to forbid plant imports from places known to be infected by disease or infested with insect pests. Although it was not the only disease highlighted, white pine blister rust led the list of diseases to be identified, and any infected seedlings were to be quarantined.[15] Northwesterners first learned that the USDA planned to quarantine pine seedlings imported from Europe late in the summer of 1912. As the law required, the secretary of agriculture offered to hold public hearings, which would allow affected parties to ask questions and air concerns and thus provide some democratic feedback to bureaucrats and scientists.[16]

The Plant Quarantine Act attempted to address environmental, social, and economic realities with a political mechanism. In effect, Congress drew a boundary that nature was not supposed to cross. This first effort to stop blister rust portended future strategies: enhance state regulatory power to stop environmental forces. Put another way, mobile nature required legal innovation, much as mobile people prompted the growth of a federal bureaucracy. The dawn of the 20th century found the Atlantic Ocean crowded with commerce and immigrants, along with natural products and pests that fairly mocked human efforts to draw impermeable lines such as national borders. The Plant Quarantine Act grew out of the same impulse as immigration restriction. That is, foresters (or nativists) identified unwanted diseases (or people) and put the power of Congress behind restricting movement across the ocean.[17] Whether considering the Atlantic basin or the North American continent, mobility—of people and nature—characterized the era. But the quarantine act failed to stop the inexorable forces of biology and economy, although not before the USDA extended this logic across the continent.

Efforts to halt the rust's spread—to control mobile nature—intensified when in 1916 the Federal Horticultural Board ordered nursery stock of pines and *Ribes* grown in the eastern United States not to cross the Great Plains—a domestic plant quarantine.[18] In addition, that same year a $300,000 federal appropriation funded at least one official per state to help eradicate the rust, even though no infection had been found west of Minnesota. The appropriation seemed a wise investment given that the North American white pine industry was worth a half-billion dollars, with 20 percent of that value accorded to Idaho's timber industry.[19] Accordingly, the *Idaho Daily Statesman* urged Idahoans to eliminate all "gooseberries and currants rather than run the remotest risk" of infecting the state's valuable white pine forests.[20] Meanwhile, federal agents went West to educate the public about the dangers of the spreading rust and about government plans to contain the fungus in the Northeast. A forest pathologist from the federal Bureau of Plant Industry visited Boise, Idaho, in June 1917 to report on a forthcoming survey to ensure that the rust had not already gained a foothold. The agent assured Idahoans that if rust was found, "no effort will be spared until the scourge is stamped out."[21] Another federal official visited neighboring Washington the same month to investigate the "menace" of blister rust and determine whether infected nursery stock had already arrived.[22] Such visits became routine in these years. And not only federal officials were involved. A Stanford University professor with the ponderous name of Lancelot Burlingame traveled north to investigate whether currant and gooseberry nursery stock was infected. In casual, even flippant, language, the *Morning Oregonian* reported, "Owners of currant and gooseberry bushes in Oregon may have the pleasure of seeing their pet fruit rooted up and burned to a cinder by authority of state and Government officials."[23] People across the country and throughout the Northwest were quickly mobilizing, despite no blister rust yet being found outside the northeastern United States.

International quarantine, domestic containment, and local control constituted the first responses to blister rust in North America. Governments cooperated with private organizations (such as the Committee on the Suppression of Pine Blister Rust in America) to destroy diseased or suspicious trees, including entire stands of imports.[24] Because young pines were more vulnerable to the blister rust, officials targeted nurseries first. The Office of Blister Rust Control called for the cultivated European black currant (*Ribes nigrum*) to be labeled a public nuisance and ordered its immediate destruction, because it was the most susceptible species and produced an especially pernicious spore. In the meantime, researchers learned more about how the rust functioned. Initially, studies suggested that 100 to 300 yards was a safe distance between *Ribes* and pine trees, but over time, new studies and field experience revealed that spores traveled as far as a mile.[25] The need for research and experimentation continued, and in 1916 the federal government began funding blister rust research and experimental control work to improve the efficiency of *Ribes* eradication; chemical testing soon followed.[26]

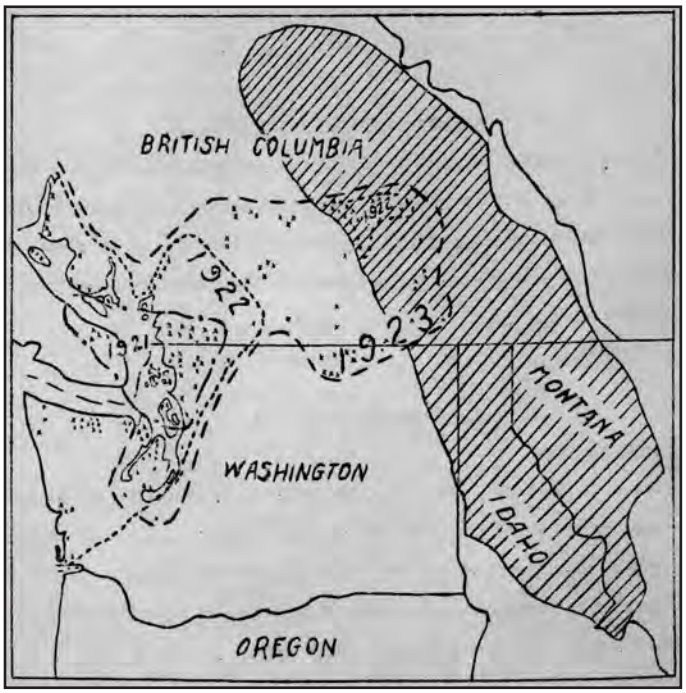
At this time, most control activity focused on East Coast forests, but westerners remained prepared to combat the blister rust should it appear. Perhaps Idaho, of all the northwestern states, was most concerned, given the significant economic stake timber companies had in the white pine industry. According to one 1920 report, Idaho held 20 billion board feet of white pine, of which 5 billion board feet was in national forests, 3 billion on state land, and 12 billion on private land, a mingling of jurisdictions that could confound control efforts.[27] In this context of vast vulnerability, W. H. Wicks, who directed Idaho's Bureau of Plant Industry,

described the rust as "a forest devastator said to be worse than fire."[28] His use of such language in a state still reeling from the 1910 fires suggests how seriously he and other land managers took the threat. Realizing the great damage the disease could cause, the *Idaho Daily Statesman* editorialized that states and the federal government ought to begin working "energetically" to eliminate the rust.[29] Not everyone agreed that state governments should be involved, however. When a Boston-based group invited Idaho's state land commissioner, George A. Day, to join a committee dedicated to helping stanch the spread of the rust and asking Congress for appropriations, Day declined, citing the high percentage of Idaho timber in national forests and stating in effect that saving it was "up to Uncle Sam."[30] Day's sentiment reflected some Idahoans' antipathy to the dominance of the federal government in conservation efforts but ignored the fact that most of Idaho's white pine forest was on private, not federal, holdings.[31] And, of course, Day failed to recognize that blister rust would not respect any property boundary.

While some abdicated responsibility and refused to cooperate, most interested parties agreed to work together to combat the threat. A group of western states created a plant quarantine board in 1919 to help make practices uniform, ensuring that the states understood and enforced new quarantine laws consistently. Idaho joined this group.[32] In addition, in 1919, 50 people, including representatives of seven western states and British Columbia, forestry officials from both Canada and the United States, timber interests, and university researchers, met for the "first gathering of this kind" to discuss blister rust. Among other concerns, they noted the logistical challenges of inspecting all nursery stock.[33] Despite being "under the watchful eye of organized forces of inspectors," the task seemed a monumental one.[34] A Portland meeting of the Board of the American Phytopathological Society pledged continued support for the inspection work and vowed "to stiffen up state quarantines" to keep western white pines free of blister rust.[35] The following year, a federal scientist, H. Metcalf, toured the West and proclaimed it free from rust, citing as the reason inspectors' vigilance in ports. Still, he worried that the fungus might show up in trees shipped in previous years.[36]

And he was right to worry. On November 22, 1921, the *Morning Oregonian* reported the first discovery of blister rust in the West, on British Columbia's Vancouver Island.[37] Governments had responded and citizens had cooperated to combat mobile nature, but they had failed to keep blister rust out. Ecological forces wedded to economic dynamics proved stronger than laws. It would not be the last time humans would fail to control nature's disordering power.

With blister rust detected in the Northwest, action ramped up. Not even a month passed before a meeting was called in



Hash marks show where blister rust had been found in 1921-23; shading marks dense western white pine forests. (*Blister Rust News,* March 15, 1924, p. 30)

Portland to focus on the best methods of containment and curtailment.[38] Indicating the seriousness with which the region's officials took the threat, Washington's governor summoned university and college presidents, along with the state forester, to the conference.[39] Attendees, who also included researchers, members of the quarantine board, and Canadian officials, resolved to employ "every method known to plant pathologists, foresters and nursery men and private owners" to block the pest's further spread.[40] In spite of this vow, the rust was soon detected in Mount Vernon, Washington, as well. National officials contemplated extending the federal quarantine of both white pine and *Ribes* to Washington, preventing the state from exporting those species, a move state officials approved.[41] Meanwhile, Washington issued its own quarantine early in 1922, and Idaho followed suit a month later.[42] Inspection and quarantine remained the orders of the day.

Idaho's Department of Agriculture had tried for years to establish inspection stations, and officials now believed they could set up at least one in Sandpoint, a major point of entry into the state in the northern panhandle. The department called a meeting in February 1922, hoping to convince the city of Sandpoint to donate land for the station and local lumber companies to furnish lumber for the building, indicating both the state's desire to cooperate with municipalities and timber interests and its limited financial resources.[43] A conference the next month continued the con-

versation about inspections but yielded protests from some representatives of Spokane and Tacoma nurseries who feared that inspections would damage plants and interfere with their business. The parties postponed making a decision, showing that commercial inertia was hard to overcome.[44] Nevertheless, the meeting prompted calls from the railroad, nursery, and agricultural industries as well as government bureaus for the Idaho legislature to act to establish state inspection stations. The director of the Idaho Bureau of Plant Industry, W. H. Wicks, lobbied forcefully for the inspection station plan and downplayed any objections from Washington businessmen. His was a prudent message:

> It is of interest to all Idahoans that these stations be put into operation, because the state can boast of the largest standing forest of white pine in the world. Estimates place the amount of this timber at 20,000,000,000 feet, and it is now free from rust or other pests.[45]

Wicks saw an enormous resource needing vigorous state protection. Also clear from his claim that "all Idahoans" would benefit from the work was that he recognized that public and private forests both were at risk. When Detwiler, director of the Office of Blister Rust Control, visited Boise in May 1922, Wicks used the occasion to again press for the inspection stations that still awaited the legislature's approval.[46]

Idaho's halting experience with approving inspection stations symbolized the larger funding challenges and economic uncertainties that blister rust control presented. From 1916 to 1921, the federal government matched state and private funds dollar for dollar, an important marker of cooperation.[47] When the fungus arrived in the West, Congress quickly appropriated funds to fight it there.[48] The secretary of agriculture, Henry C. Wallace, asked Congress for $150,000 for these efforts, because the rust constituted a "grave menace" to the standing pine forest, which was worth nearly a quarter of a billion dollars.[49] Eventually, more funds were added to support extension field agents.[50] Costs always were a great concern, and officials continually reexamined them. As the rust infiltrated more forests, state, private, and federal representatives discussed the economic viability of western eradication of blister rust. For example, one proponent of eradication, J. V. Hoffman, who directed the Forest Service's Wind River Experimental Forest in south-central Washington State, argued at the Second International White Pine Blister Rust Conference for Western North America in 1921 that eradication in Washington and Oregon would be cost effective but suggested white pines be replanted simultaneously to help prepare for future forest harvests to ensure future payoffs. Paying for eradication concerned officials throughout the campaign.[51]

Long and widespread campaigns of any type always faced questions of mounting costs. But the intermingled public and private forests of the West presented special challenges. Blister rust did not respect borders, including property lines. Preventing the spread across jurisdictions thus was critical, and the public recognized this. In 1922 the *Morning Oregonian* reported that for every thousand board feet manufactured, between $13 and $16 in payroll or other economic inputs came to communities; many understandably feared "economic dislocation," though they questioned who most benefited from protecting these forests. "This represents a community of interest far greater than the original ownership," the paper proclaimed. "It is, therefore, apparent that the protection of the white pine forests is a matter of individual, state and national concern."[52] This theme of working toward the greater good, of looking beyond ownership questions and focusing on a broad "community of interest," became increasingly prominent as the blister rust spread.

In the fall of 1922, bad news came on two fronts. First, the rust had been found in the far southwestern corner of Washington, indicating that the fungus had spread south more rapidly than anticipated. Second, it had crossed the Cascade Range eastward and reached the area near Revelstoke and Beaton, British Columbia, creeping closer to the heavy white pine forests in the northern Rockies. According to the pathologist C. R. Stillinger, unless the rust was "hurriedly checked" it would "in a short time be established in the Inland Empire white pine stands."[53] Oregon's pines were still safe at this point.[54] But officials now acknowledged that spreading was inevitable. Detwiler expected the rust to move throughout the West's white pine forests but hoped it could at least be "materially slowed down."[55] That became the OBRC's priority.

In Washington State, efforts to fight the rust started with the quarantine instituted on March 1, 1922. Besides stopping the sale and import of *Ribes* and white pines, the state also ordered all black currants destroyed.[56] Two weeks later the U.S. Department of Agriculture extended a quarantine to prevent interstate shipments of the host plants.[57] Within a couple months, local papers reported success: federal and state agents had destroyed all currants in four counties—Jefferson, Skagit, Snohomish, and Whatcom.[58] Oregon added its own *Ribes* quarantine a month later.[59] Meanwhile, the Idaho Bureau of Plant Industry director, W. H. Wicks, asked the state legislature for $5,000 to help enforce quarantines and to declare currants a "nuisance," which would give the state agriculture department the power to destroy the plants.[60] Along with the University of Idaho forestry professor Henry Schmitz, Wicks also drafted a bill that would compensate owners of gooseberry or currant bushes that had to be destroyed.[61] These were important interfaces: the combined federal and state efforts represented significant cooperation, and the proposed compensation plan signaled a new level of involvement of government officials with pri-

vate citizens affected by blister rust control.

Thus, blister rust control was a multipronged attack, consisting of quarantine, inspection, and *Ribes* eradication, the last a practice underway in five western states by the mid-1920s. Federal agents destroyed 53,364 black currant plants before January 1923 throughout Washington. Compensating owners of cultivated currants could prove expensive, and in 1924, neither the Washington state legislature nor Congress would continue to fund a compensation program, showing that sacrifice for the greater good had its limits.[62] That same year, however, Idaho passed an eradication and compensation program, and 1,292 bushes were removed from 269 sites.[63] Eradicating *Ribes* proceeded efficiently: the prestigious journal *Science* reported that black currants were nearly gone from Idaho and Oregon by 1925.[64]

Although *Ribes* eradication was seemingly a success, it was not without controversy. At the Third International Western White Pine Blister Rust Conference in 1922, Washington's director of agriculture, E. L. French, explained why some opposed *Ribes* eradication.[65] The most colorful objection came from a resident of Sumas, Washington, whose letter to the blister rust official G. B. Posey was shared by French at the conference:

> Since the government can afford to pay two big husky men with soft hands and white pants to come to my place in a fine car and go in my garden to grub my currants. Then it dont seem more than fair that I should have to pay for the same. I think five dollars will about compensate for the damage done. There is lots of wild currant and gooseberries in the woods but the gentlemen seem to prefer to dig something that some poor man has pruned, sprayed, and has free from disease.
>
> Now I dont mind donating my share (high taxes) to keep a few gentlemen in white collars who think little and do less. *But* I do object to paying taxes on land and having some suckers come digging up my currants without my authority.
>
> Therefore be it resolved that if Lenne and Trosky is running this country I have no more to say more than if I don't get my five spot you will in a few years need to send a crew in overalls to dig black currants out of the woods if God will make seed sprout and limbs to take root.[66]

The letter writer signed off, "Yours for fair play."[67] French presented several other letters from Washington residents who wished for compensation for the removal of their carefully tended *Ribes.* He also argued that Washington did not need to participate in control efforts, because compared with other states, Washington relied much less on the white pine for economic survival.[68] Even though all northwest states faced a common threat, they were not aligned on a common policy.

Despite French's reticence and the correspondent's hostility toward government men "with soft hands," cooperation among parties—federal and state, public and private, academic and industry—remained critical to success and a hallmark of blister rust control. In the summer of 1922, for example, federal agents had planned a reconnaissance of Idaho forests to ensure the rust had not arrived, citing the "vital importance" of saving the state's huge white pine stands from the rust's ravages. The University of Idaho forestry professor Henry Schmitz led six federal agents on the timber cruise, a cooperative endeavor between locals, who understood Idaho's woods best, and federal officials, who possessed wider experience combating the rust.[69] In the meantime, Idaho's governor, D. W. Davis, asked the public to send specimens to a plant pathology lab in Moscow and the schools to instruct students about "the habits and appearance" of the rust, something also done in Oregon on the orders of the state superintendent of schools.[70] In Washington, Boy Scouts also joined the fight in searching out sites of infection.[71]

Two years later, attendees of the December 1924 Western White Pine Blister Rust Conference in Seattle reaffirmed their desire to cooperate in the "vigorous prosecution of [control] work."[72] As the executive secretary of the conference put it,

> It is only through the best kind of cooperation that there is hope of being successful in this fight. So far such cooperation has been forthcoming and it is one of the principal aims of the Western White Pine Blister Rust Conference to insure continuance of this feeling of mutual confidence which has so far marked the activities of all agencies engaged in control work.[73]

Conference attendees included public guardians, private landowners, and industry representatives. A 10-year blister rust control program would be developed at subsequent conferences. The pathologist H. P. Barss described the program as "not final and inflexible. It is a plan to work toward, subject to such changes and modifications as developing knowledge and changing situations may require."[74] Such approaches—both cooperative and flexible—characterized blister rust control and were shaped by contemporary political trends and the rust's ecological characteristics.

Even as control work called on many interested parties, it also drew on several experimental methods. Quite early in the outbreak, news reports emphasized the importance of applied science to ward off economic catastrophe, an approach fully consistent with the prevailing conservation ethos. Researchers were performing laboratory work to understand the pathology.[75] Beyond the lab, workers attempted various field tests, concentrating on both chemicals and costs. In the 1920s, the OBRC created the Methods Development and Improvement Project, which included three types of research: mechanical (for example, equipment development), ecological (such as the study of the morphology of

Ribes), and chemical (for example, fungicide and antibiotic tests).[76] Researchers at the headwaters of Placer Creek near Wallace, Idaho, tested the ability of various chemicals to eradicate *Ribes* through soil injection, soil surface application, and spraying.[77] In Latah County, home of the University of Idaho, workers found they could clear *Ribes* on a 10-square-mile tract near Elk River for approximately a dollar per acre, results that the USDA considered feasible.[78] Meanwhile, at the USFS Experiment Station near Priest River, Idaho, another trial found the cost nearly doubled ($1.93 per acre).[79] In 1927, a Spokane-based inventor shared with state officials in Olympia a portable gas-powered sprayer that could "exterminate" currants.[80] In 1931, a plant physiologist reported promising experiments with ethylene oxide, a water-soluble substance that was pumped into the ground with a so-called gopher stick, quickly killing off plants without harming the soil.[81] Although such experimentation continued, so did the white pine blister rust problem. When the Great Depression descended in the 1930s, a new era emerged as control efforts intensified to match the spreading rust.

By that time, Idaho's valuable white pine forests had become infected. After successfully preventing the rust's spread into Idaho through quarantine and *Ribes* eradication for years, efforts had finally failed to "keep it from one of the greatest stands of white pine timber in the world." A federal pathologist, Stephen N. Wyckoff, assured the public that 50 "government men" were working the affected area to protect valuable timber stands.[82] But ecological and economic problems outpaced solutions. In November 1930, Idaho's governor, H. C. Baldridge, asked President Herbert Hoover to encourage Congress to appropriate $600,000 for a two-year campaign. Baldridge sent Hoover reports predicting that within 10 to 15 years the rust, if left unchecked, would "nearly totally" despoil the state's white pine forest. He also claimed that 60 percent of the state's industrial work force would be affected and that by 1940 the region would have lost $14 million annually in wages. Despite Idaho's traditional antipathy toward federal involvement, Baldridge recognized that Idaho acting alone could not resolve the issue. "This or some other plan must be devised and adopted which will enable us to solve the problem presented," Baldridge explained. "We cannot solve it alone, and only by substantial support on the part of the federal government can we ever hope to remedy the serious situation with which we are confronted."[83] Conditions clearly were dire. The predictions spoke to the great fear in the region, heightened by the emerging international economic crisis. Idaho required federal help.

And so, once again, cooperation had become critical, and the parties involved were becoming well practiced at it. In 1924, Congress had passed the Clarke-McNary Act, which allowed state and private monies to be matched by federal funds in reforestation and firefighting efforts.[84] This landmark bill represented a significant policy statement, suggesting that private, state, and national forests formed an interconnected unit to be managed cooperatively whenever possible. Now, blister rust control required similar recognition and action. In late 1931, Idaho's state land board announced a contract that brought together state and private funds, matched by the U.S. Forest Service, resulting in $60,000 to eradicate blister rust.[85] Such cooperative agreements were not unheard of, of course. In fact, the Northwest helped pioneer similar arrangements with firefighting. In this era, the associations between private industry and government grew stronger.[86]

As the Depression continued, the scale of blister rust problems grew: more forests became vulnerable as the pest spread, the cost of containing and combating infection became prohibitive, and government funds shrank because of declining revenues. In the Northwest, blister rust threatened three million acres of white pine forest, half of which was on federal land.[87] *Science* reported that in the national forests alone more than five billion board feet of mature white pine worth $25 million and another million acres in young white pine were threatened.[88] Blister rust proved not the only danger: pine beetles also appeared at this time in western forests. To combat these threats, the Western Forestry and Conservation Association, a trade association for the western timber industry, responded in a standard way: by asking the federal government for financial assistance, through "a national fund for use in emergency control of insects and disease epidemics."[89] The association believed such a fund was necessary because existing efforts were disorganized and delayed. This was a call from business for government support. Despite work being done, a senior USDA pathologist forthrightly assessed the challenge: "The scale of operation is too small to meet the situation."[90] The multiplying problems in the forests overwhelmed all parties.

The 71st Congress, ending in March 1931, allotted more than $700,000 in various bills to fight the rust, but the following year, as the Depression deepened, budget cuts became necessary.[91] The Tennessee senator Kenneth McKellar, a Democrat, set out to reduce funding for science, including pest control work, in congressional agricultural appropriations.[92] Business groups in the inland Northwest called on Congress to limit cuts to blister rust appropriations and fire-fighting budgets. Although he and his fellow businessmen understood the desire for "economies in government," Ellsworth Thorpe, secretary of the Timber Products Bureau, told policymakers that "economies to curtail forest fire and blister rust operations too severely might mean loss of millions already spent in this work."[93] In spite of their objections, the cuts were severe: funding for blister rust control

went from the proposed $469,997 to $69,997—an 85 percent reduction.[94]

The industry continued to strategize. At the end of 1932, timber interests called for the federal government to employ two thousand men each summer until 1940 to fight blister rust in Idaho's white pine forests.[95] Private timber companies enlisted chambers of commerce to press their congressional delegates to fund the program, arguing that "sufficient state and private money is not available to fight the pest."[96] A year later, industry representatives renewed the call, asking for a $1.75 million appropriation.[97] Insufficient resources plagued most efforts during the Great Depression regardless of the segment of society or economy, and the private claims on public dollars, too, represented a common theme of the era. The scale and nature of the economic and ecological problems required all the parties to pool their efforts and resources.

The timber companies called for help just after Franklin D. Roosevelt defeated Hoover in the 1932 presidential election, so perhaps they saw greater potential for the release of national funds. Historians have long interpreted President Roosevelt's New Deal as experimental.[98] One of his immediate experiments after taking office was the Civilian Conservation Corps, which put young men to work on conservation projects, including forest work in the Northwest.[99] *Science* favored such work, reasoning that because the federal government owned about a third of western white pine forests, "a large responsibility obviously rests with it." The CCC would address imminent forest destruction on these lands.[100] Investing in the CCC would change blister rust control and northwestern forests.

The CCC accomplished a significant amount of work in northern Idaho in its first year. Almost immediately after taking the oath of office, Roosevelt ordered the Forest Service to begin finding campsites to use as bases for emergency work. While USFS officials searched, they also explored possible partnerships with state governments and local landowners to address the issue of the forests' "intermingled" ownership—the most persistent theme in this history.[101] Civilian Conservation Corps men soon numbering seven thousand worked in 35 camps in the Coeur d'Alene, St. Joe, and Clearwater National Forests and on interspersed private and state lands. They pulled *Ribes* bushes by hand and experimented with chemicals, using 225 tons of weed killer in northern Idaho alone.[102] One oral history described the work in simple terms: "You pulled 'em and pile 'em and they die."[103] To ensure they covered the ground systematically, workers strung out cotton twine to create sections, using 40 tons and a whopping 56,000 miles of line. This was "hard and monotonous work" and involved "struggling through thick brush and down timber on steep slopes in the hot sun." Fortunately, workers became "seasoned" quickly.[104]

The CCC proved to be a popular program with the public, and private forestry interests also found it worthwhile, emphasizing the cooperative aspect of blister rust control work. A private organization, the Charles Lathrop Pack Forestry Foundation, expressed its relief in a published bulletin, explaining that the rust had been a "menace" to half a billion dollars' worth of timber but that now, "for the first time since a defensive battle against this insidious forest disease was declared in 1918[,] there are men and money available in a degree commensurate with the value of the standing timber at stake."[105] The timber industry recognized that the fight had shifted from defense to offense because of new vigor in the federal government's efforts. The young CCC men, now numbering 12,000, could save the region's sizable timber economy and thus showed "How the Forest Army Pays," as the *Daily Olympian* put it.[106]

And it paid in several ways, for CCC men did not focus only on the blister rust campaign; they also provided an effective standing army to fight forest fires when fire season hit during the summer. Observers commonly connected or compared forest fires and forest diseases. The workers fighting both were often one and the same, and each threat made foresters nervous.[107] "Uncle Sam is waging a desperate battle in the forests of the west to save timber from a scourge even worse and more persistent than fires," proclaimed one northwest newspaper.[108] *Blister Rust News* described a fire chief receiving the following response to his request for more firefighters: "I'll have more men in the morning, but we can't call any more blister rust men off their job except as a last resort. Blister rust is moving fast and it's worse than

Civilian Conservation Corps workers from Camp F-42 pull *Ribes* in St. Joe National Forest in September 1933. (K. D. Swan, National Archives and Records Administration, College Park, Md., 282343)

Civilian Conservation Corps laborers take a break from blister rust work. (John Platt, Special Collections and Archives, University of Idaho Library, Idaho160-a 001)

fire."[109] Anyone familiar with the history of American forestry and fire control will recognize how desperate the situation must have seemed to warrant such a comparison. In an issue of the *Idaho Forester,* Henry Schmitz claimed, "Three factors militate against perpetuating the forests, namely, destructive logging, fire and disease." He concluded that fire and disease caused the greatest drain on profits.[110] Blister rust workers attacked both of these issues, but the progress of *Ribes* eradication was slowed when workers left to fight fires.

Acting as both *Ribes* pullers and firefighters, these woods workers also served an economic role. First, the men working on blister rust control stopped the spread of the rust and safeguarded the timber industry's current and future revenue. Second, more immediately, as the *Bellingham Herald* noted, the workers received nearly a million dollars a month "in hard cash" that would "be circulated through the Pacific Northwest in wages and food purchases."[111] Although some criticized these measures—"He's sittin' in a hotel in St. Maries drawing rocking chair money," said one lumberjack lambasting the government workers—blister rust control did boost local economies.[112] The program required CCC laborers to come from the county where the work occurred, keeping a local preference in effect. The CCC employed many northwesterners: Washington employed 754 men in 18 camps; Oregon, 133 men in 5 camps; and Idaho, 10,604 men in 155 camps. Of course, this was the goal of work-relief programs—to accomplish useful work and boost the economy. In 1935, the president directed more than $6 million to blister rust eradication.[113] In addition, just five months after Roosevelt took office, the Public Works Administration, which funded the CCC, among other projects, passed the billion-dollar mark in expenditures.[114] Clearly, New Deal programs put men to work and infused money into the region.

Yet the need continued, and thus in 1936, a federal pathologist, S. E. McLaughlin, recruited additional laborers from western Washington to work in the inland Northwest, where the need was greatest. Regional camps needed two thousand more men who were certified as eligible for welfare relief. They would work "six hours a day, five days a week, a total of 130 hours a month, at the security wage rate of $44 a month, less 20 per cent for subsistence—assuring workers a net of $35 a month." To sell the work, McLaughlin informed potential laborers that their transportation from the urban centers of Everett, Seattle, and Tacoma to the work sites would be provided, and if they finished the season, they would receive return transportation. Even more, there would be "good food and comfortable camps." Moreover, "Having Saturdays and Sundays free, and being in the national forests area where lakes and streams are plentiful, they are assured the sport of fishing while at the camps."[115] It almost sounded like a vacation for men who faced significant economic hardship, if you disregarded the backbreaking work of pulling *Ribes* in the hot summer sun. That such recruiting efforts were necessary hinted at how laborious the tasks were that awaited men in the mountains.

Despite the efforts, costs, and time expended, blister rust still spread. H. E. Swanson, the pathologist in charge of efforts in the Pacific Northwest, stated in 1937, "Annihilation of our white pine stands no longer is a threat, it actually is at hand." The disease moved faster than control efforts, and Swanson predicted that unless workers completely eradicated *Ribes* in two years, "the loss of vast fields of the white pine is inevitable." The statistics accompanying Swanson's statement showed the challenge. Although more than 1.75 million acres in the Northwest had been controlled by the

end of 1936, 1.2 million acres still needed attention. In 1937, only 140,000 of those 1.2 million acres received treatment, with only 2,500 workers on the job, down from 6,000 workers the previous year.[116] Some areas in Idaho had reached infection rates of 15 percent; a decade later they would be 95 percent.[117]

The eradication efforts proved successful, so far as they went, but by the late 1930s some worried that the control program would not continue. "The extent to which relief labor will continue to be available for conservation work of this kind and the possibility of continuing operations to cover remaining unprotected pine stands can not [*sic*], of course, be determined at this time," mused S. B. Fracker of the Bureau of Entomology and Plant Quarantine, which since 1932 had been responsible for blister rust control efforts, "but in any event the protection already given to millions of acres of valuable white pine helps to conserve a forest resource of great value to the public for timber, recreational and water-supply purposes."[118] Fracker's comment reflected the uncertainty of politics—concerning congressional appropriations in particular—when vast and ongoing ecological problems loomed.

Amid this uncertainty, officials once again innovated, trying new control methods, expanding experiments, and even developing new legislation. In 1940, Congress passed the White Pine Blister Rust Control Act, also known as the Lea Act after its main sponsor, Representative Clarence F. Lea, a Democrat from California. Hardly a controversial law—barely any discussion exists in the *Congressional Record*—the legislation sought to maintain cooperation between the government, industry, and local communities in the fight against blister rust.[119] It authorized federal agencies to work to eliminate blister rust from all forest lands, "irrespective of the ownership"; however, it also stipulated that no federal funds would be expended upon nonfederal land unless the proposed federal expenditure was matched or surpassed by the owner of that land or the state.[120] The law recognized that the government could not protect federal forests unless it also protected the private lands interspersed with them. As Senator Lewis Schwellenbach, a Washington Democrat, emphasized on the Senate floor: "It is simply impossible to protect Government land if adjoining lands are not in any way taken care of."[121] As the scale of the outbreak increased, the federal-local coordination authorized by the Lea Act became essential. The secretary of agriculture, Henry A. Wallace, son of the agriculture secretary who implemented federal actions when the rust first appeared in the Pacific Northwest in 1922, explained that the law would allow and encourage the federal government to coordinate blister rust control efforts and budgets in "the public interest."[122] The law easily passed and became a useful tool to land managers and a strong illustration of the intermingled nature of both property and control strategies. Moreover, the Lea Act represented another example of how a mobile, independent natural world forced human institutions to respond in novel ways.

More important and extensive than this legislation was the expansion of programs that deployed mechanical, chemical, and even biological technologies as means of control. Although federal officials had long experimented with chemicals, simple human labor had been the mainstay method. A report by the government pathologist Stephen N. Wyckoff reported the eradication of 91,139,701 *Ribes* bushes by 1934, "yanked from the earth by leathery hands of workers."[123] But even in the 1930s, those involved in control efforts used mechanical means. In the Kaniksu and Coeur d'Alene National Forests, for instance, blister rust control workers deployed bulldozers to creek bottoms where there was little timber but many *Ribes*.[124] It is difficult to imagine that this eradication method was ecologically benign, reminding us that at the root, blister rust and control strategies both altered ecological relationships in the region's landscapes.

Shifts in labor supply and infrastructure helped propel changes in blister rust control methods too. Spurred by the United States' entry into World War II, the CCC ended in 1942. Its accomplishments were impressive. *Scientific Monthly* reported that CCC laborers had treated just shy of eight million acres for forest fungi.[125] During the New Deal, relief workers had built massive road systems and generally improved fire control operations. But now those men were needed elsewhere. Accordingly, those fighting the rust began to concentrate on technological means of control.[126]

Chemical eradication eventually became an important means of removing *Ribes* from western forests. Although Americans had used chemicals in agriculture and forestry for decades, the use of chemicals, especially those developed during the war, became far more widespread for domestic purposes after WWII. Trials in the mid-1940s tested 2,4-D and 2,4,5-T in both lab and field settings. Both herbicides—which when combined created the notorious Agent Orange, the defoliant that U.S. forces later used in Vietnam—were fairly effective at killing *Ribes* and relatively cheap, with the cost of 2,4-D about a dollar per acre and the cost of 2,4,5-T double that. Workers tested the herbicides with backpack sprayers called Hi-Fog guns, with high-powered sprayers mounted on trucks, and even with helicopters, a technological trend that became more common in the forestry industry after World War II.[127] In fact, foresters used aircraft in several ways, including in fire control and in surveys of the impact of pests in unroaded areas. Once again, fire and disease were tightly interwoven in forestry practices.[128]

Biological efforts constituted an even more interesting chapter, for here scientists used nature to battle nature. A scientist reported in 1933 that another fungus, *Tuberculina maxima,* seemed to attack and destroy the blister rust, "a good illustration of the complicated relationships existing in nature," where all living things are "subject to attack by other living things."[129] German foresters apparently used this fungus successfully in blister rust control efforts, but Ernest E. Hubert, a University of Idaho forester, researched its utility in western forests and found it insufficient. "Under optimum conditions," stated Hubert, "it might be possible to enlist the purple mold as an aid in the control of the blister rust fungus, but it could never take the place of the mechanical, chemical, and other control methods already tested and now in use over vast areas of white pine timber." Hubert examined several natural agents for control and found them "slow and erratic," given the rapid pace of the disaster unfolding in white pine forests.[130] Scientists in 1932 in Oregon and 1933 in Idaho experimented with inoculating pines with another fungus, *Fusarium bactridioides,* which attacked the cankers caused by the rust. Researchers initially reported high confidence in this method.[131] Thus, one result from the outbreak of blister rust seems to have been greater awareness of the movement of pests around the world and the complexities of the natural world.[132] Yet none of these experiments yielded the magic bullet.

Employed when water was scarce, the Hi-Fog gun used high pressure to break concentrated chemical solutions into a fine spray. (Special Collections and Archives, University of Idaho Library, PG13-3206)

Besides deploying more sophisticated technology in control work, scientists and managers aimed their efforts at genetically improving trees to make them resistant to parasites, a process that promised savings but also required deeper ecological knowledge. Genetic experimentation began in the 1920s in the eastern United States and continued into the postwar era. Scientists searched for existing resistant trees for parent genetic material, while foresters tried to combat the rust by inoculating and hybridizing the trees. In 1952, Russell B. Clapper, a pathologist with the federal Bureau of Plant Industry, Soils, and Agricultural Engineering (the name had changed from Bureau of Plant Industry in 1943), emphasized how costly in time and money tree epidemics were, noting that from 1915 to 1950 the federal government had spent more than $58 million on blister rust control. Furthermore, trees, considered a crop by the U.S. government, grew relatively slowly, particularly compared with other crops. Foresters could not just replace a diseased crop the following year. Clapper argued that developing trees genetically resistant to the rust could solve the problem and save great costs. This would require, he pointed out, greater attention to ecological context. Merely finding land available for planting was not enough if the climatic, biological, or altitudinal characteristics of the land were mismatched.[133] Such work, then, took advantage of the more thorough ecological perspectives being developed in the mid-20th century.[134] In 1957, researchers, confident that they had finally produced rust-resistant stock, planned to mass-produce it.[135]

In addition to improving trees themselves, foresters applied antibiotics to some effect by the late 1950s, a time when such drugs became widely available. The drug Acti-dione reportedly killed about 80 percent of the blister rust cankers to which it was applied.[136] The Forest Service also used another antibiotic, Phytoactin, which, like Acti-dione as well as the genetic modifications, treated the trees rather than the *Ribes,* the main focus for decades. By the mid-1960s, however, foresters found other methods, including the use of parasites, more effective than the use of antibiotics.[137] Thus, new technologies made new tools available to foresters, though no method completely solved the problem. This was the story of blister rust control over and over.

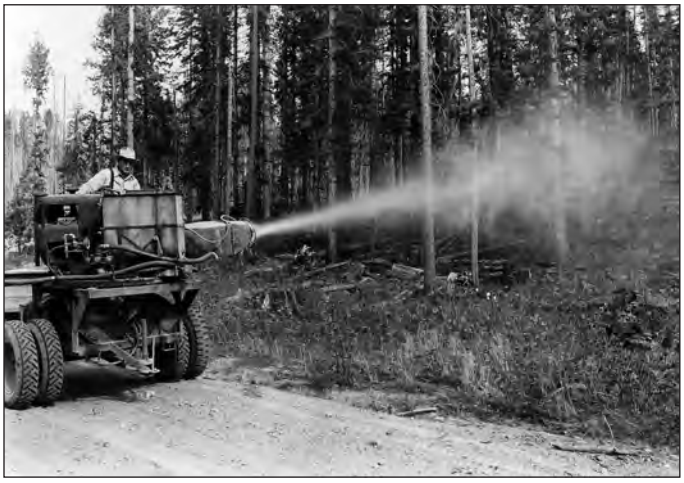
In the 1950s, responsibility for blister rust control moved

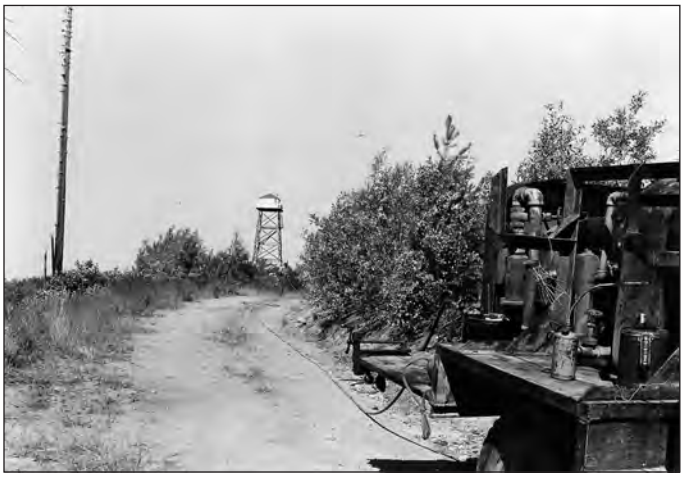
from the Bureau of Entomology and Plant Quarantine to the Forest Service. The director of the USFS's Division of Forest Pest Control, Warren V. Benedict, offered an assessment: "By 1954 blister rust had spread to most white pine forest types in America. . . . The problem was now one of integrating blister rust work into forestry."[138] Benedict was basically acknowledging defeat: he recognized that both quarantine and eradication had failed to eliminate the rust. Moving forward, foresters would have to integrate blister rust control into their larger management strategies, treating the pest much as one might a chronic disease as opposed to an acute outbreak. By 1967, the blister rust control program as something distinct came to an end.[139]

When blister rust first arrived in the United States, its scale quickly impressed and dismayed interested parties. Federal and state governments partnered with private landowners—large and small—to stop the fungus. When international quarantines failed, state governments led the charge to contain the rust and eradicate *Ribes.* As the problem expanded, local, private, and state entities pooled their funds and labor but failed to keep pace. The federal government also offered its assistance, its involvement reaching a zenith in the 1930s. Massive financial, technical, and personnel resources were mobilized in the largest forest disease control effort in American history.[140]

State, local, federal, and private entities made often herculean efforts to stop nature in its tracks. The Plant Quarantine Act of 1912 and numerous domestic regulations failed to keep plants and their pests in Europe, or on the East Coast, or in Canada, and so the disease spread. Nor could the Lea Act and the numerous conferences calling for and implementing cooperative agreements among federal, state, and private parties stop the fungus from crossing property lines, illustrating humans' inadequacy in the face of mobile nature. As long as plants were shipped and as long as wind carried spores from pines to *Ribes* and back, blister rust would spread.

How political institutions responded to the rust reflected not only nature's mobility but also underlying institutional values. For a state like Idaho with millions of dollars at stake in its timber industry, investing in blister rust control made economic sense. Despite occasional and minor dissent, the state willingly relied on federal investment to protect white pine forests, public and private. Conservation in this era focused on maintaining an economically viable industry more than maintaining ecological functioning, resulting in labor and research dedicated to forest production and protection. As with fire control, timber interests pursued blister rust control with great enthusiasm, using any means available, and without deep ecological understanding, although the pursuit yielded greater environmental knowledge. Ultimately, blister rust transformed from an acute to a chronic condition, and the program was scaled down. Yet the disease left its imprint on the forests and institutions that managed it. And therein lies the critical lesson of this history: nature changes the very institutions that seek to shape it, and the dynamic process continues.





New chemicals and machinery, such as the turbine blower (top), allowed for easier coverage, especially along roads and skid trails, where *Ribes* were common. Mile-long hoses could tap into the main hoses on the 400-gallon-capacity sprayer (bottom) to cover large areas. (Special Collections and Archives, University of Idaho Library, PG 13-3203 [top], PG 13-3204 [bottom])

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