MANUAL FOR FIELD MEN

BLISTER RUST CONTROL - CONNECTICUT

CONNECTICUT AGRICULTURAL EXPERIMENT STATION
In cooperation with
UNITED STATES DEPARTMENT OF AGRICULTURE

FACTS THAT CONNECTICUT BLISTER RUST FIELD MEN SHOULD KNOW

A revision of C. C. Perry's Manual For Field Men,
Adapted to Connecticut by J. E. Riley, Jr., State Leader.
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FOREWORD

The purpose of this manual is to present essential facts to the blister rust control worker.

All field men in positions of responsibility should be prepared to answer intelligently questions concerning the nature and control of the rust. They should know why various operations are performed in order that they may effectively carry them out. It is expected therefore that all such workers will familiarize themselves with the contents of this manual. More detailed information may be obtained from the State Leader, Box 1106, New Haven, or by reference to literature cited at the end of this manual.

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VALUE AND DISTRIBUTION OF THE WHITE PINES

IN THE UNITED STATES

The merchantable white pines of the United States have been estimated by the U. S. Forest Service to be worth approximately $400,000,000. In addition, there are thousands of acres of young growth which constitute the white pine stands of the future. Wherever they grow, their value far surpasses that of associated species. Their rapid growth, high yield and adaptability to forest management makes them highly desirable for reforestation purposes.

There are eight species of white pines native to the United States, only three of which are of great commercial importance. These are the northern white pine (Pinus strobus) native to the East, and two western species, the western white pine (Pinus monticola) and the sugar pine (Pinus lambertiana).

IN CONNECTICUT

The natural white pine region of Connecticut comprises roughly the northern third of the state. According to the 1927 survey, there are 216,154 acres of mature and immature white pine in pure and mixed stands in Connecticut. This growth is estimated to be worth $10,240,416 based on a normal stumpage value of $7 per thousand board feet and a conservative arbitrary value for immature stands.

PREVALENCE, DISTRIBUTION AND DESCRIPTION OF RIBES FOUND IN CONNECTICUT

Ribes are abundant and generally distributed throughout the northern half of Litchfield County. They are less plentiful and more localized throughout the balance of the northern third of the state and are relatively rare in central and southern Connecticut. All species of Ribes are subject to the rust but the European black currant is the most susceptible and is primarily responsible for the long distant spread and local establishment of the disease.

A brief description of the Connecticut Ribes follows:

CULTIVATED RIBES

European Black Currant - Ribes nigrum (pronounced Ry-bees ny-grum). Leaves quite pointed, broader than long, having resin dots (golden or amber colored dots) on under surface only. New stems smooth and round. Stems and leaves give off a strong odor when crushed. Fruit black, smooth, pungent to taste. Rarely escapes from cultivation.

Red or White Currant - Ribes sativum (R. sat-ee-vum) also known as R. vulgare and R. rubrum. Leaves thick, dark green, shaped somewhat like a maple leaf. Fruit red or white, smooth, shiny, tart to taste. Commonly escapes from cultivation.

Flowering Currants - Ribes aureum (R. aw-ree-um). Leaf small and entirely different from leaves of other Ribes, usually distinctly three-lobed, thick, leathery and wedge-shaped at base. Flowers yellow, bell-shaped, fragrant. Fruit is black.

Ribes odoratum (R. o-door-ah-tum). Same as aureum but

leaves are somewhat larger and square-shaped at base. Fruit is black, yellow or red.

Flowering currants are ornamental shrubs often known as clove-bush or spice-bush and it is often difficult to convince people that they are true currants. They vary greatly in susceptibility but often found heavily infected.

Gooseberry - Ribes grossularia (R. graus-u-lay-rea). Stems may be either smooth or prickly. Fruit greenish-yellow or purplish red.

WILD RIBES

Black Currant - Ribes americanum (R. a-merry-cane-um). Leaves thin, slightly heart-shaped, doubly toothed on margin, with small golden or amber dots (resin dots) on both sides (a magnifying glass is sometimes necessary to see them on upper surface). Bushes are often tall; stems ridged. Fruit smooth, black. Often cultivated. Found throughout Connecticut.

Red Currant - Ribes sativum. This is the same species described under Cultivated Ribes but escaped from cultivation. Found throughout the State.

Swamp Red Currant - Ribes triste (R. tris-tee). Straggling or reclining, the branches often rooting freely. Leaves large and thick, hairy beneath, dark green, three-lobed, resembling red maple leaf. Fruit smooth, red, small. Very rare in Connecticut but has been reported in northern Norfolk.

Skunk Currant - Ribes glandulosum (R. gland-u-low-sum) also called prostratum. Trailing species, rooting at nodes and developing upright shoots. Leaves thick, hairy below, broader than long. Fruit bristly, red, disagreeable to taste. The species gets its common name from the odor given off by the stems when broken. Uncommon in Connecticut but found in swamps in northern Norfolk and Colebrook, and on the rocky ledges and top of Canaan Mountain.

Prickly Gooseberry - Ribes cynosbati (R. si-noss-bat-ee). Bushes often tall and large. Stems supplied with stout thorns and bristles. Leaves usually square-shaped at base, rather thin, soft and downy. Fruit with coarse, almost spiny bristles. Common in stone walls, pastures and rocky ledges. Generally distributed throughout northwestern Connecticut, less common in northeastern Connecticut and comparatively rare in central and southern part of state.

Smooth Gooseberry - Ribes hirtellum (R.hir-tell-um). Usually small-sized bush. Leaves smooth, rather thick, wedge-shaped at base. Fruit smooth, purplish. New stems with soft spines. Common in swamps of northeastern Connecticut, less prevalent in northwestern Connecticut and comparatively rare in central and southern parts of the state.

CHARACTER OF THE WHITE PINE BLISTER RUST

Blister rust is a plant disease which is caused by the growth of a parasitic fungus within the inner bark of the white pine tree and in the leaf tissues of Ribes (currant and gooseberry bushes), pronounced Rye-bees. The fungus is called CRONARTIUM RIBICOLA, pronounced Crow-nar-shum rye-bick-o-la.

The blister rust fungus attacks only those pines which have their leaves-"needles"-in clusters of five. All species of Ribes are susceptible to the blister rust, but the European black currant is the most susceptible species and is chiefly responsible for the long distance spread and local establishment of the disease.

FACTS ABOUT THE BLISTER RUST

ORIGIN OF THE DISEASE

The disease probably originated in Asia and spread over Europe. It was first reported in Europe in 1857. The introduction of the rust into the U. S. resulted largely from the importation of white pine planting stock, principally from German and French nurseries where it had been exposed to infection. It was first found in North America at Philadelphia on nursery white pine in 1905 and and at Geneva, New York, on Ribes in 1906. There is ample evidence to indicate that it existed at Kittery Point, Maine, since 1897,

and it is supposed to have been introduced at Pomfret, Connecticut, on imported white pine in 1902.

PRESENT DISTRIBUTION IN THE UNITED STATES

The rust is now generally established throughout New England and New York. It is also becoming widely distributed in Pennsylvania, Michigan, Wisconsin and Minnesota. In addition, infections have been found in New Jersey, Virginia, West Virginia, Maryland, Iowa and Ohio. In the west, it has been located in British Columbia, and in the States of Washington, Oregon, Idaho and Montana.

HOW THE DISEASE SPREADS

Blister rust is transmitted by means of minute seed-like structures called spores, which are blown about by the wind or carried by currents of air.

Types of Spores: There are five distinct types of these spores, all but one of which function in the spread of the disease.

The first type (aeciospores) are produced on diseased pines early in the spring, April 15 - June 15. These spores transmit the disease to currant and gooseberry leaves upon the under side of which a second type of spore is produced.

Spores of this second type (urediniospores) are liberated about May 15 and as many as seven generations of these may be produced during the season. These spores spread the rust from bush to bush, thus intensifying the disease locally on Ribes.

In mid-summer a third type (teliospores) appear on the diseased Ribes leaves. These spores germinate and produce a fourth type known as sporidia and these transmit the disease to white pine trees.

A fifth type (pycnospores) appear on the diseased pine bark from June 7 to the winter. These spores are contained in small drops of a very clear, sweet-tasting liquid. This stage is an indication of the presence of the disease. The function of these spores is unknown.

CHARACTERISTIC APPEARANCE OF THE DISEASE ON WHITE PINE

Infection takes place through the breathing pores of the

needles during the season of sporidia production. There follows then a period of incubation of from 1½ to 3½ years before the blisters (aecia) burst through the bark of the diseased tree. During this incubation or dormant period the symptoms of the disease are as follows:

(1st season) Small orange-yellow spot usually produced from 6 to 8 weeks after the sporidium falls on the needle. This stage is not readily identified in the field.

(2nd season) Filaments of the fungus grow down the needle into the bark of the branch and spread out to a distance of from ¼ to 2 inches. The bark becomes pale yellow or slightly orange.

(3rd season) Canker enlarges, pycnial drops may begin to form by June 7 and continue up to the winter. When these drops dry up there remain scars - pycnial scars - which are very characteristic and make identification of the disease certain.

(4th season) In late spring or early summer, blisters appear usually in the zone of the pycnial drops of the previous season.

ON RIBES

The first evidence of the disease on the leaves of Ribes is the development of small patches of a yellowish appearance on the under side of the leaves. As the intensity of the infection increases, these spotted areas increase until they may completely cover the surface of the leaf. In mid-summer, brown hair-like or horn-like projections develop from these patches. These are called telial columns and are composed of the teliospores from which sporidia develop. These columns often become so abundant that they may completely cover the under surface of the leaf, giving to it a decidedly rusty appearance.

HOW THE DISEASE CAN BE CONTROLLED

The critical point in the so-called life history of the fungus is that it cannot propagate itself on one host plant, but requires two distinct hosts. It is apparent, therefore, that if the two sets of host plants are separated widely enough so that the spores produced upon one cannot reach the other in a viable condition, the disease cannot spread. Control, therefore, simply involves the elimination of the less valuable host, which is the currant or gooseberry bush.

FACTS ABOUT THE OCCURRENCE OF BLISTER RUST IN CONNECTICUT

The disease on white pine was first found in Connecticut in a plantation of imported stock at Wilton in the spring of 1909. For several years thereafter, infected pine were located and destroyed throughout the state in the hope of eradicating the disease. However, by 1915, it was found that the rust was present on wild Ribes; and in 1916, a state-wide inspection showed that it was permanently established in Connecticut and that protection to pine through the elimination of Ribes was the only practical means of control. The disease has since been found in nearly every town in the state, and a thorough search would probably disclose infected pine in all of these towns.

Blister rust attacks and kills trees of all sizes; however, its damage is particularly severe to the younger growth. Recent township surveys, confined to white pine 20 feet and under in height, show that approximately 12 to 24 per cent of such trees are infected in several towns in Litchfield County. Pine infection is less severe throughout the remainder of the northern third of the state and relatively rare in the southern two-thirds of Connecticut.

ORGANIZATION OF CONTROL WORK

Blister rust control in Connecticut is carried on under a cooperative agreement between the United States Bureau of Plant Industry, the Connecticut Agricultural Experiment Station and the Extension Division of the Connecticut State College.

The U. S. Bureau of Plant Industry coordinates control activities of the several cooperating states under regional leadership and supervision. It furnishes technical information and subject matter, conducts experiments and demonstrations for improving control practices, and supplies trained men for state and district leadership in the conduct of the control work.

The Connecticut Agricultural Experiment Station assumes the administrative direction of the federal employees within the state. It cooperates with individuals, associations and townships in local eradication of Ribes and enforces state regulatory measures.

The Extension Division of the Connecticut State College makes available, in so far as is practical, its facilities for the promotion of the control program.

BLISTER RUST CONTROL PLAN FOR CONNECTICUT

The Connecticut plan for control embraces three major activities: (1) the systematic eradication of Ribes within infecting distance of white pine worth protecting, (2) elimination of Ribes nigrum throughout the state, and (3) the production of healthy white pine nursery stock by the application of sanitation measures around white pine growing nurseries.

The state accomplishes these objectives through informational, service and supervisory activities. The informational efforts consist of creating general and favorable attention, interest and desire through such facilities as news items, exhibits, meetings, publications, etc. The service work is limited to personal interviews and instruction in the disease and its control with the intention of securing effective cooperation in the application of control measures by individuals, associations and towns.

In order to insure effective protection, adequate supervision is essential. The state and Government cooperatively provide a leader to give general supervision of control activities. In addition, the state furnishes trained scouts to determine Ribes conditions and foremen to direct the application of control measures.

STATUS OF CONTROL AND REQUIREMENTS FOR MAINTAINING CONTROL

The initial eradication of Ribes has been completed in the commercial white pine sections of the state. There now remains the task of finishing the state-wide eradication of the European black currants and maintenance of control by the re-eradication of Ribes where necessary.

From experience to date, it is apparent that one examination of any pine area will not succeed in accomplishing the complete eradication of Ribes and in establishing permanent control of the disease. Sprouts may develop from Ribes that were poorly uprooted; there will be an occasional bush missed in the first examination; there may be seedlings too small to be seen; and finally, it has been recently demonstrated that Ribes seeds remain dormant in the ground, and when conditions are favorable these seeds germinate and in time may partially restock the control area. Fortunately, not all of these conditions will prevail on any one area, but nevertheless they indicate the necessity for periodic examinations to keep an area effectively Ribes-free. The time period involved between eradications will vary of course, but it seems reasonable

to say that a reexamination should be made at least five years after the initial examination. In many instances, reeradication work will simply involve a reexamination or scouting of the area to determine conditions, while in other cases a new population of Ribes may be found which will require additional work to eliminate.

In many towns, Ribes were originally so few in number that it is quite possible that no further work will be required. In other towns, white pine was found in too limited an amount to justify further efforts to eradicate Ribes. In other words, the plan will be to restrict reeradication work to those towns in which our experience and records show that there is a substantial growth of white pine and where Ribes were initially found in considerable abundance.

Infection studies demonstrate that, when most of the Ribes leaf surface has been removed, little or no new pine infection takes place until Ribes become reestablished. Frequently, one will notice blister rust cankers in control areas; but a close examination will usually disclose the fact that the trees became infected prior to the application of control measures. It takes at least three years for an infection to develop to a point where it is readily recognizable. Young trees may be killed within a few years, but it may take 10-20 years to kill trees of large size. Meanwhile, these trees may appear more or less normal, but dying branches and dead tops usually give increasing evidence that the disease is making stealthy progress.

AUTHORITY FOR SERVICE WORK AND REGULATORY MEASURES

Section 2124 of the Revised Statutes of 1930 authorizes the Director of the Connecticut Agricultural Experiment Station to control insects or diseases which are or may become serious pests to economic plants; he may cooperate with agents of the U. S. Dept. of Agriculture in control of plant pests.

Section 2126 of the Revised Statutes of 1930 specifically authorizes the Director to investigate and control the white pine blister rust; to destroy infected currant and gooseberry plants and to declare districts within which all currant and gooseberry plants may be destroyed.

Section 2127 of the Revised Statutes of 1930 prohibits the growing, planting, propagating, selling, transporting and possession of the European black currant (R. nigrum).

Federal Quarantine: U. S. Dept. of Agriculture Plant Quarantine No. 63 provides that no five-leafed pines or Ribes may be shipped into Connecticut unless accompanied by a permit from the State Entomologist.

(Permits are granted for the unrestricted entry of white pines but permits for Ribes are only granted for shipments of such stock to places not in nursery sanitation zones. No attempt is made to prevent Ribes shipments to those towns that have been declared local control areas because the control area order for towns applies only to those portions within infecting distance of pine. Recipients of such shipments accept them at their own risk and their stock is subject to confiscation if planted within 900 feet of white pine.)

ERADICATION PROCEDURE IN CONNECTICUT

There are two established methods of Ribes eradication, namely chemical eradication and hand pulling. The former has been found effective in the West for stream types where certain Ribes occur in dense concentrations; but under Connecticut conditions, it is not considered practicable.

The eradication procedure will vary somewhat with the kind of cooperation and size of the working unit; but in general, it may be outlined as follows:

1. Pre-eradication survey: An examination is made of the working unit; data on the following points are recorded on suitable maps - amount and distribution of white pine, boundaries of control area and pine infection conditions.
2. Ribes scouting: Inspection of control areas to determine those portions which require crew work; the remaining sections, where Ribes are few and localized, are cleaned of such bushes by the scout.
3. Crew eradication: Systematic crew eradication of Ribes in portions designated by the scout.
4. Checking: In order to secure satisfactory results in control work, frequent checking is essential. Detailed instructions regarding the procedure are given by the supervisor.

CULTIVATED RIBES SURVEY

A systematic survey is being made in all towns within the

natural white pine section to locate all cultivated Ribes. Those within infecting distance of white pine will be removed; and in addition, all European black currants wherever found will be destroyed. This is a special project and the procedure is described in special instructions to Cultivated Ribes Survey workers.

NURSERY SANITATION

The nurseries growing white pines in quantity are urged to cooperate with the Connecticut Agricultural Experiment Station in establishing and maintaining sanitation zones extending 1500 feet from the bounds of the white pine growing blocks, within which all Ribes are destroyed under authority of Section 2124 of the Revised Statutes of 1930. In addition a mile zone is maintained within which a survey is periodically made to locate and destroy R. nigrum. Special instructions are issued for this type of work.

RESPONSIBILITIES AND DUTIES OF FIELD MEN

CREW MEN

Duties: Locate, uproot and properly dispose of Ribes and keep a record of same under the immediate direction of the foreman. Crew men who are also linesmen shall, in addition, properly mark and follow the boundaries of crew strips.

FOREMAN

Responsible for the efficiency of crew personnel and their work and for their conduct during official working hours. The foreman has authority to dismiss crew men for improper conduct or unsatisfactory work.

Duties: Make certain each crew man is properly equipped for field work - direct alignment, spacing and speed of crew - make sure that trail is properly marked - remain with crew during working hours unless otherwise instructed by his immediate superior -

overcome lost motion and lost time by approved methods - check to ascertain efficiency of eradication work - record Ribes and time data - prepare necessary records and reports - designate at headquarters, in some approved manner, the daily location of his crew in the field so that anyone may get in touch with the men at any time - report all accidents immediately to his superior - prevent injury by crew members to private or public property - prohibit smoking while crew is in operation and take adequate precaution against fires at all times - when working in conjunction with a scout the foreman will work under the scout's direction.

SCOUT

Responsible to the supervisor for the proper performance of the following duties:

Systematic inspection of pine areas to determine Ribes conditions and width of protective zones - eradicate Ribes where bushes are few and localized - designate areas for crew work when bushes are generally distributed or in heavy concentrations and designate such areas on suitable map according to approved procedure. When working in conjunction with a crew he will coordinate the control

work within the assigned control area.

SUPERVISOR

Directly responsible to the state leader for the conduct of the eradication work in his assigned district.

Duties: Organize control activities - instruct personnel regarding disease and details of field work - coordinate working units - maintain efficiency by frequent checking of eradication work and by personal inspection of scout and crew activities - maintain and allot field equipment - enforce observance of official working hours - make contacts with cooperators and public in order that they may be informed regarding the problems and control activities - establish and maintain personnel camps - keep adequate records of all expenditures - compile, summarize and analyze crew and scout records - prepare adequate maps showing status of control work.

RESPONSIBILITIES OF ALL FIELD EMPLOYEES

Field men are representatives of the Connecticut Agricultural Experiment Station or of the United States Department of Agricul-

ture, and as such are expected to be courteous and considerate at all times regardless of the reception encountered. If refused information or permission to examine premises after explaining the nature of the work, do not threaten. Say that you are instructed to refer the matter to the New Haven office in case of non-cooperation.

Never represent yourself as a federal man in regulatory matters. Your authority comes from the state legislature through the Director of the Experiment Station. Always carry your identification card or badge with you and display it when requested.

REPORTS AND RECORDS REQUIRED

Employee	Reports
Foremen	Nos. 1, 2
Scouts attached to crews	Nos. 1, 2
Preliminary scouts	Nos. 3, 10
Pre-eradication scouts	Nos. 3, 8
Eradication supervisors (or agents when acting in that capacity)	Nos. 3, 5, 9 (and must check and transmit No. 2)

Agents (assigned to service work)	Nos. 3, 5, 6
Employees on Cultivated Ribes Survey	Nos. 3, 7
Employees on Nursery Sanitation	Nos. 3, 7 and sheets showing location of Ribes found

REPORTS DESCRIBED

1. Field Notebooks (BRC A) Complete data to be entered each day from time to time as the work progresses. Use separate sheet for each block in which work is done. To be kept by crew foreman for himself and crew. Scout attached to crew will fill out separate form for his work.

2. Daily Crew Report (BRC B) Complete in duplicate at end of each day from notebook entries. To be filled out by crew foreman for himself and crew and turned over to supervisor or agent in charge. Scout attached to crew will make separate report for himself alone. Duplicate reports are for supervisor's files.

3. Daily Individual Report (SF-1) This report is required in duplicate of all employees except crew men, foremen, and scouts

attached to crew. Complete daily and mail to New Haven office daily unless otherwise instructed. Duplicate kept by employee until requested.

4. Weekly Itinerary Report (BRC-3) Required of federal agents only. Complete in duplicate at end of each week. Mail one copy to New Haven office and one copy to Boston office.

5. Monthly Report of Cooperative BR Control Work (BRC-4) Completed in duplicate at end of month by educational agents and supervisors. If accurate acreages cannot be given they should be estimated. One copy to New Haven office and one copy to Boston office.

ADDITIONAL RECORDS

6. Interview and Inspection Record (BR-25) This record card is designed as a permanent file record of the service efforts of the agent and the status of control work on individual cooperation jobs. In Connecticut there are no permanent agents assigned to districts and the record is filed in New Haven office.

The interview and examination sections are to be made out at the time the effort is made. If the eradication work is to be done

during the season in which the interview is made, the agent should keep the card and record the eradication data. It should then be mailed to the New Haven office.

7. Cultivated Ribes Record This card to be completed by the employee conducting the cultivated Ribes survey or black currant eradication and mailed to the New Haven office at the end of the seascn.

8. Pre-eradication Survey Map Maps of blocks or groups of blocks are made on these sheets according to special instructions issued for this type of work. They are the permanent map record of the pre-eradication survey. The sheets are transparent to permit tracing of block outlines and topographic features, and copies may easily be made for field use. The finished map should be mailed to New Haven office at completion of survey or at end of season.

9. Blister Rust Control Data Map Maps of blocks or groups of blocks are made on transparent sheets designed to permit tracing. Eradication data is recorded by symbols and colors according to printed legend. They are made for each eradication job.

10. Preliminary Scout Map Required of preliminary scouts. Prepared on pre-eradication sheets. Blocks are enlarged to scale of 8" to 1 mile. The areas eradicated by the scouts are mapped and the number, species and location of Ribes found is indicated. Areas requiring crew work are mapped and artificial and natural details such as walls, fences, streams, etc., are plotted, together with eradication difficulties such as will aid the crew foreman in planning the crew work.

PUBLICATIONS AVAILABLE REGARDING WHITE PINE BLISTER RUST

U. S. D. A. Miscellaneous Publication No. 22 (Eastern Edition)
PROTECT WHITE PINE FROM THE BLISTER RUST

U.S.D.A. Miscellaneous Publication No. 2[illegible]
BLACK CURRANT SPREADS WHITE PINE BLISTER RUST

U.S.D.A. Technical Bulletin No. 87
WHITE PINE BLISTER RUST - A COMPARISON OF EUROPEAN WITH NORTH AMERICAN CONDITIONS

U.S.D.A. Simplified Leaflet
PROTECT WHITE PINE FROM BLISTER RUST

U.S.D.A. Department Bulletin 1186
WHITE PINE BLISTER RUST IN WESTERN EUROPE

U.S.D.A. Technical Bulletin 240
THE CHEMICAL ERADICATION OF RIBES

U.S.D.A. Technical Bulletin 261

LONGEVITY AND GERMINATION OF SEEDS OF RIBES, PARTICULARLY R. ROTUNDIFOLIUM UNDER LABORATORY AND NATURAL CONDITIONS

U.S.D.A. Farmers Bulletin No. 1398

CURRANTS AND GOOSEBERRIES - THEIR CULTURE AND RELATION TO WHITE PINE BLISTER RUST

Journal Agricultural Research Separate

THE RESULTS OF INOCULATING PINUS STROBUS WITH THE SPORIDIA OF CRONARTIUM RIBICOLA

Agricultural Yearbook Separate 1182

BLISTER RUST CONTROL IS EFFECTIVE WITH PUBLIC'S COOPERATION

Mimeographed Articles

STUDIES OF RIBES ECOLOGY
EDIBLE FRUITS BORNE ON MANY ORNAMENTAL SHRUBS
SUBSTITUTES FOR CURRANTS AND GOOSEBERRIES

State Publications

Connecticut Agricultural Experiment Station Bulletin 314
WHITE PINE BLISTER RUST CONTROL IN CONNECTICUT

Connecticut Agricultural Experiment Station Bulletin 237
CONTROL OF WHITE PINE BLISTER RUST IN CONNECTICUT

Connecticut Agricultural Experiment Station Circular 69
EUROPEAN BLACK CURRANTS OUTLAWED

Connecticut Agricultural Experiment Station Circular 70
NURSERY SANITATION ZONES

FACTS ABOUT OTHER PESTS OF WHITE PINE

Relatively speaking, white pine is not susceptible to many plant pests, but there are a few which do attack the species to some extent and the injury which they inflict is often mistaken for blister rust. In order to assist you in making intelligent reply regarding these few rather common pests, the following brief descriptions are included at this point. These pests include a few insects; namely, the white-pine weevil, Pales weevil, the pine bark aphid, mound-building ants. One fungus, commonly known as Phoma, is also of importance. Finally, the so-called needle blight, which apparently cannot be traced either to insects or fungous disease, is mentioned briefly.

THE WHITE PINE WEEVIL

Brief description: The unfailing sign of the presence of white-pine weevil is the wilting and dying back of the terminal or leading shoots of white pines. It is particularly noticeable

on trees of relatively small size, 2 to 15 feet in height. This injury is the result of a process of girdling, due to the activity of a small beetle which lays its eggs in the terminal shoot. These eggs hatch into small white grubs which immediately begin feeding just beneath the bark on the wood of the shoot. As the grubs increase in size, they feed deeper into the wood, working downwards. The leader is soon girdled and immediately begins to wither and turn brown. The result of this destruction of the main shoot is that the tree becomes crooked, since, after the destruction of the terminal shoot, one of the branches grows upwards to make a new trunk. Repeated attacks result in a decidedly stunted and forked tree.

Life history and description: The winter is passed by the adult insects - reddish brown to very dark brown beetles about one-quarter of an inch long, with a rather stout, long, snout - within the shelter of the leaves or refuse under the trees. The beetles resume activity from March to the middle of May and feed upon the bark, sap and buds of the leading shoot.

They cut small holes in the shoot and deposit their eggs therein. After a few days, the eggs hatch and the resulting larvae - white, footless, grub-like, about one-quarter of an inch long when full grown - begin feeding inward and downward, girdling the tissues of the shoot as they progress. By August, the larvae construct nest like fibrous cells in the wood and transform into pupae - creamy white with brown head and about the size of the adult. After resting a short time the pupae transform to the adult or beetle stage. A neat round hole is then eaten through the confining wall of the host, and the beetle emerges.

Method of control: No practical control measures, in the case of an extensive area of white pine, have been developed, except through proper spacing and species-mixtures. In the case of a few trees, the most effective method has been the cutting off and burning of the attacked leaders or terminal

shoots before the adults emerge in August. The close planting of the young trees used in establishing a plantation, is effective in partially preventing the deformation of the young trees. Where pines are growing in groups with older trees, there is apparently less damage by the weevil. Plantations and natural pine stock in the open, suffer the most from attack by this insect. In heavily infested plantations it has been found possible to salvage the plantation by girdling the heavily weeviled dominants to release the uninfested intermediate and suppressed trees.

Confusion of the injury with blister rust: The average individual associates the weevil injury with blister rust simply because of the rusty color of the dying shoot. None of the other characteristics of blister rust are present in the case of weevil damage and blister rust injury is seldom confined so characteristically to the terminal shoot.

PALES WEEVIL

Brief description: Young seedling or sapling pines are often seriously injured by the attack of small snout beetles known as the Pales Weevil. These insects are ravenous feeders, eating the tender bark from young pines or the younger bark on larger sized pines. When the attack is sufficiently severe, large numbers of the smaller trees may be completely girdled, while on the older trees, large numbers of the smaller branches all over the trees may be killed.

Life history and description: The adult beetles - dark, chestnut-colored weevils, 3/8 of an inch in length - are responsible for the injury done. The beetles feed only during the night, so it is almost impossible to detect them on the plants which they are attacking. They hide near the trees during the day time, under bits of wood, stones, or other refuse.

Methods of control: There is no practical control of this insect, but serious damage can be avoided by not planting pine trees in cut-over areas for at least three years after the timber has been cut. Damage may be materially reduced by burning the slash over the freshly cut stumps, and utilizing the logs before spring. The point is that the insects are attracted by the odor of the freshly cut pine stumps, logs, boards, or even slash.

Confusion of the injury with blister rust damage: There should be no reason for confusing the injury caused by the activities of this insect, with that of blister rust. Examination will readily disclose the distinctly "chewed" condition of the bark, especially when the injury has been freshly inflicted.

PINE BARK APHID

Brief description: The pine bark aphid is a true plant louse, but is rarely seen, since usually it is hidden beneath a mass of white, cottony, secretion. These cottony masses occur in greatest abundance on the trunk and large branches of the host and when numerous are very conspicuous. The lice occur in large numbers and take an immense amount of vitality from the trees attacked. Pines attacked by this insect become sickly, the leaves turn yellow, limbs may die and occasionally the entire tree succumbs. The white patches on the trunks or branches of the larger sized trees disfigure and seriously detract from their appearance.

Methods of Control: In plantations, these aphids may be destroyed by spraying the trees early in the spring about the time new growth starts, with 40% nicotine sulphate - "Black leaf 40" - used at a dilution of one part nicotine to 800 parts of water (1-800) dissolving 1 ounce of soap in each gallon of

water. Kerosene emulsion and soap and water solution are also used effectively.

Confusion of the injury with blister rust damage: Of all the pests of white pine, the work of the pine bark aphid is most often confused with damage by blister rust. The only explanation is a psychological one, due to the fact that these colonies of aphids are so strikingly white, that persons simply think of the name white pine blister rust. There is perhaps one similarity in the nature of the damage, for when a pine is seriously attacked there usually develops a general browning of the foliage, producing a condition often referred to as the "yellows." Following a heavy infestation of these insects, there often develops on the bark of the trunk and branches, a very black sooty deposit. This growth results from the fact that the aphids secrete a sweetish liquid, known as "honeydew," which is an ideal medium for the development of the spores of the sooty fungus.

MOUND-BUILDING ANTS

Brief description: The so-called mound-building ants are of considerable importance because of their attacks on small pines under six feet in height and they often destroy all vegetation around their nests for a radius of twenty feet. The ants are supposed to kill the trees by injecting formic acid into the tissues of the main stem at a point just above the ground. The acid coagulates the cell contents, thus preventing the downward flow of sap.

Methods of control: These ant colonies are not easily destroyed, as the queens, or mothers, live deep down in the nest, often five or six feet below the surface of the ground, and unless these are killed, the colony will continue to live. The use of carbon bisulphide has, however, proved very satisfactory in destroying the colonies. A pint or so should be poured into the center of the mound if it is a good sized one. A few holes punched into the mound with a stick will assist in allowing the gases to penetrate. A few shovelsfull of dirt

should be thrown over the mound to prevent the escape of the ants as they endeavor to get away from the gas.

Carbon bisulphide gas is heavier than air and penetrates deep into the nests. The liquid evaporates readily upon exposure. CAUTION! Carbon bisulphide is very inflammable and should be used with care.

Confusion of the injury with blister rust damage: The injury caused is a shrinking of the tissues, causing a girdle. Associated with this constriction, is a yellowish discoloration of the adjacent uninjured bark. In other words, the damage is strikingly like that of blister rust, except that there is no swelling as in the case of a blister rust canker. However, when such injury is noted in the woods, careful search will always disclose the existence of one or more mounds nearby and a very pronounced area in which the trees are either dead or dying.

PHOMA

Brief description: Oftentimes pines will show "flags" that give every indication of the presence of blister rust, at least from a distance. Upon close examination, however, it is found that the injury is due to the attack of a fungus of the genus Phoma (pronounced Fo-mah). This fungus causes a shrinking or constriction of the tissues where the bark and cambium have been killed. In the dead bark, there is usually present large numbers of small black pustules. There is, however, no yellowing of the healthy bark above and below the canker as in the case of blister rust. The needles of a branch attacked by Phoma are usually reddish in color rather than the characteristic straw color of the blister rust "flag." Phoma is often found in plantations, particularly where the planting

has been poorly done, or where the trees have unfavorable conditions to contend with.

Control: There is no control, but it is always advisable to recommend the destruction of a small infected specimen or of the diseased branches of a larger tree.

Confusion of the injury with blister rust damage: The constriction closely resembles that of the blister rust canker, but no discoloration of the healthy bark above and below the constriction is present. There is no marked swelling of the tissue as in the case of blister rust. The injury, however, is quite often confused with that of blister rust, especially in the case of young trees growing in pine plantations.

NEEDLE BLIGHT OF PINES

General description: The term "white-pine blight" has been rather loosely applied to a number of troubles. In general, however the term is applicable to the condition which has prevailed in the past in several sections, where individual trees or groups of trees have suddenly turned brown or "rusted," and have been most conspicuous in the landscape. There is some difference of opinion as to the cause of the injury, but it is generally agreed that it is not caused by either insects or fungi. The best of opinion seems to be to the effect that the injury is due to one of two causes; namely, a winter injury causing the death of extensive portions of the sap wood, or an injury of some sort to the entire root system of the trees, either of which would result in a shortage of water for the use of the needles and cause them to dry up and turn brown as they do in the case of this blight.

Control: Since the trouble is apparently physiological there is no remedy.

Confusion of the injury with blister rust damage: This trouble when at all prevalent is very generally confused with blister rust probably because of the rusted appearance of the foliage of the trees affected. In the case of the needle blight, the entire tree becomes rusted and the condition of "flags" is entirely absent. The color of the foliage also has a characteristically reddish tinge. None of the usual symptoms of blister rust are present.

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WHAT ABOUT THE CHESTNUT? IS IT COMING BACK?

There is no more frequent inquiry met with in the field than the above query regarding the possible reestablishment or "come back" of the native American chestnut tree.

The chestnut blight was first found in the U. S. in 1904 in Bronx Park, New York City. It spread rapidly northeastward, westward, and southwestward. By 1926 nearly all the mature chestnut in southern New England, southeastern New York, New Jersey, eastern and central Pennsylvania and Maryland, and northern Virginia had been killed. As noted in Farmers Bulletin #1641 on the "Chestnut Blight" the disease now extends over the chestnut area of the Southern Appalachians. As a result of this phenomenal spread of the disease, it has been generally conceded that there is no practical method of stopping its spread.

In Connecticut and in other sections in fact, sprouting has taken place from blight-killed chestnut trees. At the present time,

some of the sprouts attain considerable size, frequently produce nuts, and in many cases do so in spite of the blight cankers in the stems. Just what the ultimate result of this struggle between host and parasite will be, is problematical. In time an immunity may develop. It is reasonable to say, however, that the species as a producer of an economically important crop of timber, will not "come back" in this generation. It may, in the next.

The Division of Forest Pathology has introduced many strains of the forest type of Asiatic Chestnuts which are very resistant to the blight under Asiatic conditions. The Department is interested in receiving reports of Asiatic Chestnuts which have survived the blight and reports of unusually resistant American Chestnut trees and sprouts. All Asiatic Chestnuts are worth reporting, but it is only very exceptional American Chestnuts that are worthy of noting.

The fact remains, however, that as a result of the chestnut blight, there has almost vanished from the forests of the country a most valuable timber tree species. The chestnut was particularly valuable to the farmer and small woodlot owner who was able to derive a relatively quick return because of its rapidity of growth and sprouting ability.

While the blister rust differs entirely from the chestnut blight, the almost complete disappearance of the chestnut can be cited as an example of what one fungous disease has wrought.