

The RED PINE SCALE

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Red pine scale killed these trees in Easton.

The CONNECTICUT

Circular 207
March 1959

AGRICULTURAL EXPERIMENT STATION
NEW HAVEN

Foreword

Interest in reforestation of land no longer used for farming developed in Connecticut about 60 years ago. It was obvious then as now that pines grew well on soils unable to support good growth of hardwood trees. White pine was the first choice for reforestation, but it was heavily damaged by the white pine weevil which killed the leaders, leaving a misshapen tree.

The red or Norway pine flourished further north in New England and was chosen as an alternate because it was not as severely damaged by weevils.

Many red pine plantations were established, particularly in the southern part of the State. By 1925 the pine shoot moth, a native of Europe, had infested the plantations. This insect was even more destructive to red pine than were weevils to white pine. Research by Dr. Roger B. Friend of this Station established that the shoot moth seldom attacks large trees and that it is kept in check by cold weather in the northern part of the State.

Many plantations survived attacks by the shoot moth and have grown well since. However, few red pines have been planted in southern Connecticut in the past 30 years.

The recent appearance of red pine scale adds another very destructive pest of red pine in this area. It has killed many large trees and necessitated salvage and replanting.

This circular has been written to summarize knowledge of this insect.

The Red Pine Scale

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The red pine scale, *Matsucoccus resinosa* Bean and Godwin, is a small, rather inconspicuous insect that attacks and kills the red or Norway pine, *Pinus resinosa* Ait. It was unknown prior to 1946 when a large number of plantation red pines were found either dying or dead in Easton, Connecticut. Observations on these pines by Plumb (1950) revealed the presence of an unknown scale insect that proved to be a species new to this country. Later this scale was described and named by Bean and Godwin (1955). This scale must be considered a most serious pest because of its ability to kill mature plantations of red pine.

Hosts

The red or Norway pine is the only native North American tree attacked by the red pine scale. In addition, three imported ornamental pines are susceptible to attack (Hartzell 1957). These are the Japanese red pine, *Pinus densiflora* Sieb. and Zucc., a variety of the Japanese red pine, *P. densiflora* var. *umbraculifera* Mayr., and a Chinese pine, *Pinus tabulaeformis* Carr.

Distribution

Since the discovery of the red pine scale at Easton in 1946 periodic surveys have been made on the distribution of the scale. Figure 1 shows the present boundaries of the infestation in Connecticut. An extensive infestation also may be found on Long Island and in local areas in or near New York City.

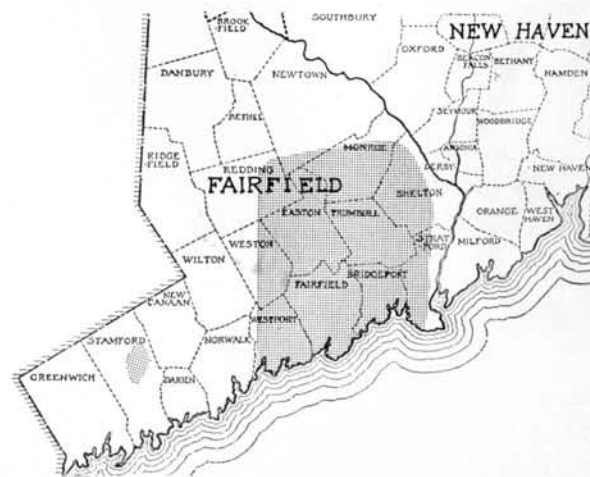


Figure 1. The known distribution of the red pine scale in Connecticut.

Although the origin of the insect is still in doubt, there are some interesting possibilities relating to its introduction to this country. Mr. Alton Miller has observed that it may have been imported on exotic pines that were planted on the grounds of the New York World Fair in 1939. The same trucks that carried the trees from the port to the fair grounds were also used to transport large red pines from Easton to the fairground for ornamental planting. These trucks very likely transported the crawlers to red pines that were growing near Easton. The infestation then had time to become established before its discovery in 1946. The infestations of the scale in Connecticut are at the southern edge of the natural distribution range of the red pine, where it is grown only in forest plantations or ornamentally. Hartzell (1957) has shown that repeated exposure to a temperature of -10° F. gave 99 per cent kill of the scale. Such temperatures are common in the natural distribution range of *Pinus resinosa* and these may restrict the scale in its northward spread.

Injury

An infested pine tree does not show injury until the scale insects have become quite numerous. The needles of the tree begin to turn yellow and at death become brick red in color as compared to a lighter yellow if they die normally. At first only needles on one or two branches may show discoloration, but eventually the whole tree may become affected. Heavily infested bark becomes rough and cracked. Below the surface of such bark reddish-brown lesions may be seen. If many of these lesions are deep enough to reach the cambium, the limb will be girdled and killed. More than a simple girdling of the bark seems to be involved: it does not account for the discolored foliage where the limbs are not girdled. The scales probably inject toxin as they feed. When the scales increase to a certain number, the toxin is able to cause chlorosis of the foliage as well as the extensive lesions in the bark which finally kill the tree.

Life history and habits

There are two broods of the scale each year. The insects overwinter under the bark scales as partially grown larvae and complete their feeding and development the following spring. The adults (Fig. 2a) emerge over an extended period and egg-laying begins in May and continues through most of June. This results in an even longer period of adult emergence and egg deposition for the fall generation. Adults begin to emerge and lay eggs about the middle of August and continue to do so until the end of October. For control purposes adults and crawlers should be considered present from the end of August until the end of November. Cutting and hauling operations of infested lumber should be done only in the winter months. This will minimize the danger of spreading the scale to uninfested trees.

The first stage larva or crawler emerges from the egg and moves over the bark in search of a suitable feeding site under a bark scale. Once it inserts its stylet into the bark and commences to feed it cannot move until it becomes full-grown. On heavily infested trees large numbers of the first stage larvae may be found under a single bark scale (Fig. 2b).

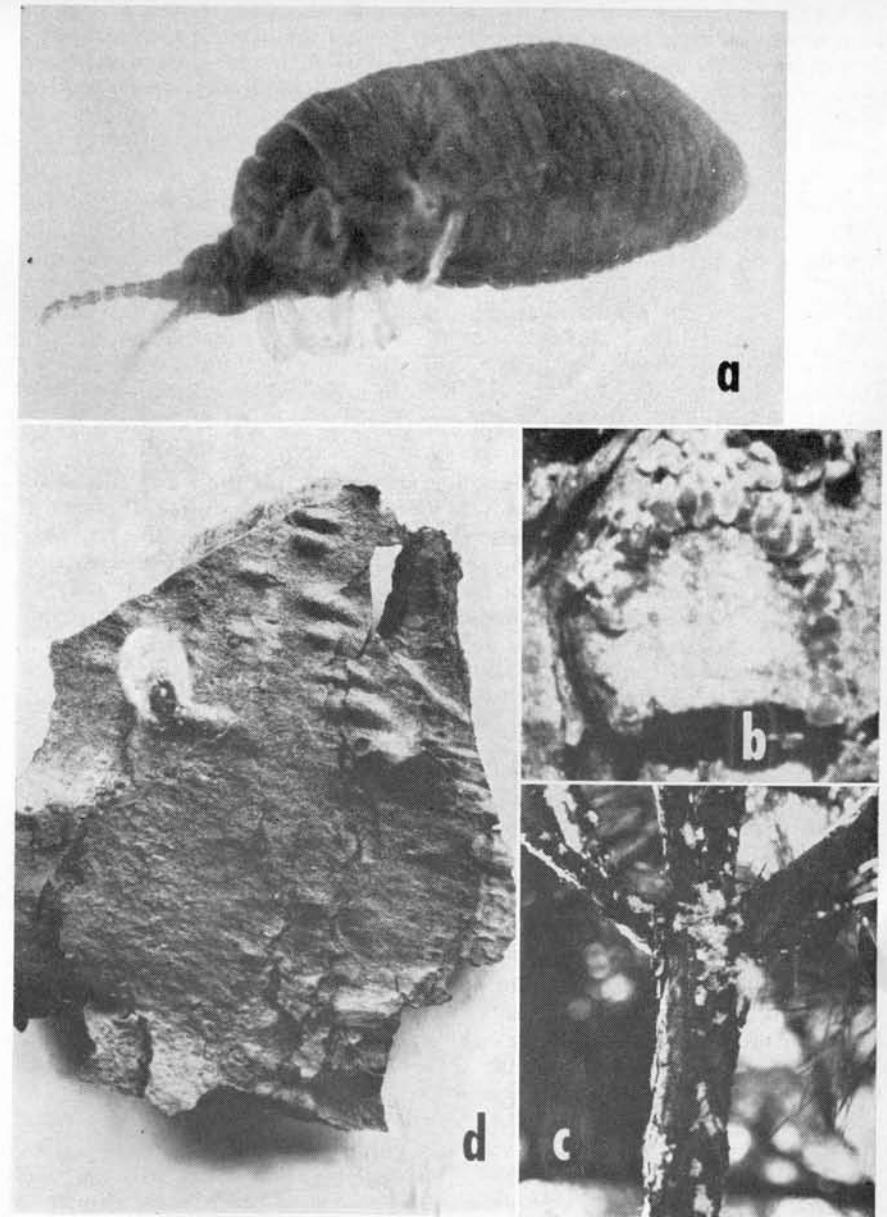


Figure 2.

- (a) A lateral view of the adult female enlarged to about 20 times actual size.
- (b) First-stage larvae on twig of red pine after the covering bark scale has been removed.
- (c) Masses of male cocoons on underside of branches.
- (d) Egg packet and body of female on underside of a bark scale.

The first stage larva moults into the intermediate stage. The body of the intermediate stage is rather formless and sac-like. It grows rapidly and often fills the restricted space under a bark scale and bulges out from under it. Early in this stage the body is soft, but the dermal layers harden and darken toward the end of the intermediate stage.

The intermediate stage larva moults into either the adult female or the pre-adult male. The female emerges fully-formed but the pre-adult male must undergo further change. These males congregate in large numbers on the undersides of branches and spin loose silken cocoons (Fig. 2c) from which emerge the winged adult males. The female never develops wings but is able to crawl in search of an oviposition site. When a place is located under a bark scale she wedges her body into the crevice and deposits the eggs in a fluffy packet or sac. All the eggs are laid at the same site and the body of the dead female may be found partially entangled in the threads of the egg sac (Fig. 2d).

The male cocoons and the egg sacs are visible on the bark of heavily infested trees. However, care should be taken to not confuse them with the fluffy secretions of the pine bark aphid that may attack the red pine in the early part of the growing season. The cottony secretion covering the aphids are usually found on the needles of the red pine. It may be difficult to separate the scale from the aphid without the aid of some magnification. However, the scale should not be suspected in any area far from its present known distribution. The pine bark aphid may occur anywhere in the State but does not kill mature red pines.

Control

At present, control of the scale is not economical on trees in plantations, especially if they are considered as crop trees. When a plantation is attacked, orderly salvage measures should be carried out. Since most plantations in the infested area of the State are now more than 20 years old, they contain much valuable material. Trees need not be cut until they become infested with the scale and begin to die. These operations should be carried out during the winter months to prevent spread of the scale. At this time no crawlers or adults are present and the forms on the tree die if disturbed. They cannot move to another tree. If infested trees are cut during the warm months, the branches should be burned and the logs stacked. The logs should be sprayed with either DDT or BHC to protect them from bark beetles that carry the blue stain fungus.

Any of several conifers may be used for replanting the spaces left by the removal of the red pine. Selection among these trees will vary according to local conditions, and it may be wise to plant more than one species. White pine and Norway spruce are suitable. White pine may be used in many situations, but may need protection from white pine weevil. It may be damaged less if planted in small blocks. Fortunately, the white pine weevil can now be controlled with a treatment of insecticides such as DDT. Norway spruce is also a satisfactory tree for planting. It is also attacked by the white pine weevil but appears to be not so seriously affected. Hemlock is very tolerant to shade and is an excellent choice

where there are small openings to replant. Other available trees are European larch, white spruce, pitch pine, and jack pine.

Certain insecticides have shown considerable promise in controlling the *Matsucoccus* scale. Bean and Godwin (1955), in preliminary control studies, have obtained high kills of the scale with a number of insecticides, including Systox (a phosphate systemic insecticide), ethylene dibromide, and a 2 per cent oil emulsion. Although they feel that further tests are needed on timing of the applications, their results indicate that some control may be expected with two applications during the growing season. A treatment applied in the first part of June followed by a second application around the first of September would have good possibilities of reducing the scales to a level that would prevent damage to the tree. Of the three most satisfactory insecticides, the 2 per cent oil emulsion offers advantages in safety and ease of handling. Such an emulsion should be made from a high paraffin content white oil that is safe for application on foliage.

These sprays may be especially useful to protect ornamental red pines.

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