

proportion of the beetle broods, by determining the area affected by the cold. In Oregon and Washington and in the Rocky Mountains selected men from the C. C. C. camps assisted in conducting surveys to determine the need for control. During 1933, 37 of these men covered 18,240 acres of sample plots with intensive check cruises. They also assisted in analyzing the emergence from 2,879 square feet of bark affected by the winter freeze to determine the influence of this cold weather on bark beetle outbreaks.

J. M. MILLER,  
*Bureau of Entomology and Plant Quarantine.*

## BEECH Scale Scouting Reveals Infestations in Four New England States

The beech scale was first discovered in the United States in 1929 on American beech in the Arnold Arboretum, Boston, Mass. Its first occurrence in North America, however, was reported in 1911, when it was found infesting both native and ornamental European beeches in the vicinity of Halifax, Nova Scotia. In 1932 it was reported to have spread generally throughout the Maritime Provinces of Canada, and that many of the infested beech trees had died. This insect is well distributed over western Europe, and in some countries the infestation has at times been severe and followed by an extensive killing of beech trees.

The discovery of the scale in the United States on American beech (*Fagus grandifolia* Ehrh.), and also on varieties of European beech (*F. sylvatica* L.), threatened danger to the beech in this country. In 1931 the Bureau of Entomology, through its laboratory at Melrose Highlands, Mass., undertook a survey of the beech growing on or near many of the roadsides in each of the New England States. In this work they were assisted by the Maine Forest Service, the New Hampshire State entomologist's office, and the Massachusetts Department of Conservation. Scouting for new infestations was carried on for short periods each



FIGURE 5.—Trunk of American beech tree heavily infested with the beech scale.

year and occasional notes were made on the biology of the beech scale until September 1933, when a substantial allotment of E. C. W. funds made it possible to enlarge the scope of the work considerably.

As a result of this work infestations of the scale have been located as follows: Maine, 57 towns in 8 counties; New Hampshire, 3 towns in 2 counties; Massachusetts, 14 towns in 4 counties; and Connecticut, 1 town. The heaviest infestations have been found in Washington, Hancock, and Waldo Counties, Maine, where large forested areas of native beech are involved, and in scattered growth in eastern Massachusetts.

The beech scale has a single generation a year. In New England eggs are deposited from the middle of June until August. Hatching begins about the 1st of August, and by the 1st of October practically all the crawlers, as the newly hatched larvae are called, have become fixed by inserting their beaks in the bark. The secretion of woolly wax begins immediately and continues for a time in the fall, but the maximum deposition occurs the following spring and summer. In heavy infestations this wax may completely cover the trunk (fig. 5) and the under sides of the larger branches. Trees of all ages, including seedlings and saplings, have been found infested with the scale. The scale overwinters as the fixed immature form. In May it transforms to a preadult, and about 15 days later it becomes mature. No males or winged forms of this species are known. Distribution is accomplished by the wind and by transportation of eggs and crawlers by birds, insects, etc.

### Permanent Sample Plots Established

In order to study the injury caused by this insect and the associated fungus, *Nectria* sp., several permanent sample plots have been established in southeastern Maine. A survey of conditions on these plots in October 1933 showed that trees infested with the scale were less healthy than uninfested trees. Many dead and dying beeches were found in Washington and Waldo Counties, and such trees were usually infected with a fungus belonging to the genus *Nectria*. This fungus has not been found associated with the scale in New Hampshire, Massachusetts, or Connecticut.

In feeding, the scale inserts its beak into the bark for about 1.5 millimeters. Individual scales probably cause little or no injury, but when colonies of several hundred per square inch are present, the outer layer of the bark is killed and becomes brown. When a tree is heavily infested with the scale, extensive areas, often more than 50 percent, of the outer bark are killed. When the bark is removed, it is found that the killing often extends to the cambium and occasionally the sapwood is discolored. Slime fluxes often develop, and the cambium is killed for a radius of 2 or 3 inches from the point of injury.

Whether the tree would ultimately die from such injury without the aid of the *Nectria* has not yet been determined, but this seems to be possible if the areas of affected sapwood are sufficiently large to girdle the tree. If for some reason, such as winter-kill, the scale infestation disappears, the tree often shows recovery by producing healing tissue around the wound. When this takes place, a depression or pit is formed in the bark, giving the trees a gnarled appearance, especially

where the pits are numerous. In Washington County, Maine, many trees show these pits.

Observations made during May and June 1934 showed that the scale is very susceptible to low winter temperatures. In southeastern Maine over 95-percent mortality occurred above the snow line, while near the ground and on roots there was little mortality that could be attributed to low temperatures. In the vicinity of Boston, Mass., there was no appreciable mortality from this cause.

### One Natural Enemy of Importance

Only one natural enemy of importance has been found in New England. The predacious ladybird beetle known as the twice-stabbed ladybird, *Chilocorus bivulnerus* Muls., was especially effective in southeastern Maine during the spring and summer of 1934. With the reduced host population resulting from the abnormally low temperatures of the previous winter, which affected the beetle little or not at all, an opportunity was afforded for the predator to be most effective as a control agent. Observations at Liberty (Waldo County), Maine, have shown that on heavily infested trees, upon which the beetles prefer to congregate, the scale population has been reduced by fully 90 percent; on lightly infested trees the percentages of hosts destroyed were considerably less.

The impracticability of spraying large forested areas is recognized, but there is a need for controlling the beech scale by artificial methods in park and ornamental plantings. This insect may be controlled with a dormant spray of lime-sulphur, either the liquid form diluted at the rate of 5 gallons in 95 gallons of water or the dry mixture at the rate of 12 pounds to 100 gallons of water. Oil sprays should not be used indiscriminately on beech, as some brands are liable to injure the trees if applied in sufficient strength to kill the scale. The use of oils in controlling the beech scale is being given further study.

C. W. COLLINS and R. C. BROWN,  
*Bureau of Entomology and Plant Quarantine.*

### **B**EEF Cattle Especially Adapted to Gulf Coast Area Being Developed

The popular breeds of beef cattle in the United States—the Aberdeen-Angus, Hereford, and Shorthorn, all of British origin—have adapted themselves well to the greater portion of our vast beef-production areas. Owing to a combination of factors largely climatic, the breeds mentioned do not meet fully the requirements of the extreme South, particularly the Gulf coast area. The principal reasons appear to be the warm climate, low feeding value of native vegetation, and lack of sufficient hardiness in highly bred beef cattle to combat semitropical conditions.

The solution to this difficulty of adaptation appears to be not the finding or development of an entirely new breed, but rather a combining of the beef-producing ability of the British breeds with hardiness to tropical or semitropical conditions, as observed in some other foreign breeds and types. A distinct beginning in this direction was made in 1906, when the Pierce Estate of Wharton County, Tex., brought from India 30 bulls and 3 cows of the Nellore and other breeds of Brahman cattle. These were used largely in crossing with Here-