

this condition. In cases where all conifers have been killed, the much-desired evergreen effect can often be obtained by planting holly where that tree is within its climatic range. In many places the holly has proved particularly resistant to smoke.

Frequently, particularly serious damage to or even death of white pines and other trees will be noticed along driveways. This may often be observed to be due to change of level in the process of grading roads or paths. A change in the level of the surface of the ground raises or lowers the water-table in the soil, thus drowning or drying the roots. Few trees are able to resist such changes. Often materials used in road building or repairing, such as calcium chloride, get deposited under certain trees, resulting in the death of the trees at a later period, when perhaps the presence of the salt has been forgotten. A coal-burning fire-engine operating under a large tree on a curb will often leave no conspicuous immediate effect, but the tree will die within the following year.

Finally it must be remembered that there are cultural limits to the well-being of large trees particularly. Growing naturally in close association with its fellows, and under the right forest humus, the white pine, like all other trees, is unfavorably affected by the hard soil and shaved lawn of the average golf course and park. It is well recognized that it is necessary to maintain a certain minimum of fertility in order to save the trees beyond a certain age; and finally it must be remembered that the age limit for ornamental trees in general is much lower than for the same trees growing in the forest. A great deal of money is wasted in trying to save trees which have reached the term of their existence under the unnatural conditions in which they grow. The death of such trees can be foreseen with a reasonable degree of accuracy; and all such mature trees should therefore have understudies, eventually to take their places.

Insects Injurious to White Pine

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The most serious insect pest of white pine in the southern portion of its range is the southern pine beetle or pine barkbeetle (*Dendroctonus frontalis* Zimm.). This insect feeds on the inner bark of living pines, making mines which destroy the living tissues, thus girdling and killing the trees.

Pines infested by barkbeetles very rarely are so lightly attacked as to permit their recovery, and they are a menace to the neighboring healthy trees. It is important to recognize infested trees early in the course of the attack of the barkbeetles and before these tree-killing species have an opportunity to complete their development and leave the trees. Infested pines are recognized by the following characters. The foliage fades through pale green, becoming yellowish and finally pale brown. The bark of the trees will usually show some fresh pitch tubes or crater-like resinous masses in which fragments of reddish bark are mixed. When the bark is removed, small blackish to reddish-brown beetles or small whitish to yellowish grubs are found in their galleries between the bark and the wood. Such trees should be located and marked between November 1 and March 1, and treated by removing and burning the infested bark before March 1, either by peeling and burning, or cutting down the tree and burning it, or

using the wood for fuel during the winter. It is essential to complete the destruction of the material before the beetles leave the bark in the spring. Cooperation of the other land-owners of the vicinity is especially important.

It is of little use to treat the trees after the tree-killing barkbeetles leave. After the new generation leaves the trees, the foliage becomes reddish brown and partially or completely fallen, and the bark of the trunk is completely riddled with the exit-holes of the barkbeetles, resembling shot-holes.

Another insect pest of white pine is the white pine weevil (*Pissodes* sp.), with which young trees are often infested. This insect attacks and kills the pine leaders, and while it seldom kills the tree, often stunts it, causing it to become crooked. The adult snout-beetle of the white pine weevil appears on the pines in the spring, feeding somewhat on the terminal shoots, producing resinous wounds, and then deposits its eggs in small pits cut in the bark of the previous year's growth. The larvae or grubs hatching from the eggs feed on the inner bark, constructing mines which girdle and kill the shoot. When the grubs are full-grown they terminate these mines in rather large cells excavated in the wood, where the resting or pupal stage is passed. These cells are very characteristic of the work, in that they are surrounded by shredded wood fiber. The adult weevils emerge in July and August of the year in which the eggs were laid, and hibernate over winter.

The white pine weevil must be combatted by the removal and destruction of the infested leaders over as wide an area and as thoroughly as possible. This work should be done in the late spring or early summer, while the leaders still contain the insect in its injurious stages. Burning is usually resorted to, but the infested leaders may also be placed in tight barrels having the ends covered with wire fly-screen netting, which will permit the parasites of the weevils to escape but at the same time retain the weevils. Such treatment is required for several consecutive years.

Still another insect injurious to white pine is the pine bark-louse (*Pineus* sp.). While this insect is seldom a serious menace to the life of the pine, infested trees are often of a poor and unhealthy appearance. Its presence is evidenced by a coating of a dirty or grayish-white waxy or cottony material on the smooth bark of the upper trunk and limbs. The pine bark-louse is a small sucking insect which coats itself with the protective waxy or cottony grayish-white material observable. The activity of the insect begins in the spring about the time the tree starts new growth. The forms overwintering on pine, feed, develop, and lay eggs, which produce winged forms that migrate to spruce. The louse deposits its eggs on spruce, and the forms hatching from these eggs overwinter and lay their eggs in the spring. The lice hatching from these eggs enter the opening spruce buds and cause them to develop abnormally into spruce twig-galls. Winged forms develop in these galls, and emerging migrate back to pine. A wingless form continues to live on pine throughout the season.

The pine bark-louse can be controlled by spraying both infested pines and spruces early in the spring when the new growth starts on the twigs of pine and the buds are opening on spruce, with a kerosene emulsion. This emulsion is prepared by dissolving $\frac{1}{2}$ pound of fish-oil or laundry soap in 1 gallon of boiling water. When the soap is dissolved, its container is at once removed from the fire, 2 gallons of kerosene immediately added, and the mixture thoroughly agitated or churned for about five minutes, or

until it becomes uniformly creamy. One-third gallon of this mixture is diluted with 2 gallons of water, and sprayed thoroughly and with force.

A fourth insect which calls for attention here in the pine leaf-scale (*Chionaspis pinifoliae* Fitch), which sometimes infests the needles of white pine. This insect is a small white comma-shaped body usually found in quantities extending along the needles. Although small, the insects are rather conspicuous, the white scales imparting a grayish cast to the pine foliage. They are hardly to be considered a serious menace to the life of the pines, but may contribute materially to their poor appearance, causing the needles to become faded to yellowish.

Under the whitish scale a soft-bodied sucking insect is found which sucks juices from the needles by means of its long thread-like beak. The insect overwinters in the egg stage, the eggs hatching in the spring, the time of hatching varying with the locality and advance of the season. The young scale-insects crawl about until they find a suitable place, which is usually the new needles, where they settle and insert their beaks and commence to feed and prepare for the development of their protective covering, the scale. There may be two or three generations during a year, depending on the locality and the season.

The pine leaf-scale is often controlled by natural enemies, such as ladybird beetles, although it occasionally becomes sufficiently numerous to affect the vitality of the tree, when artificial control measures should be adopted. Spraying with a kerosene emulsion prepared and diluted as directed for the pine bark-louse will be found effective if resorted to when the young scales or crawlers are appearing. A careful watch of infested trees, using a hand lens on the scales and young needles, will enable one to determine the presence of the young scales or crawlers with greater assurance than will a reliance on their time of appearance above indicated; it can, however, be stated that in the vicinity of Washington, D. C., the first generation usually hatches from the eggs about the middle of May.

Some English Books on Golf Course Construction and Turf Upkeep.

SOME ESSAYS ON GOLF ARCHITECTURE. By Colt and Alison. Charles Scribner's Sons, New York, N. Y.

THE BOOK OF THE LINKS. By Sutton. W. H. Smith & Son, Stamford Street, S. E. 1, London, England.

GOLF ARCHITECTURE. By Mackenzie. Simpkins, Marshall, Hamilton, Kent & Co., 4 Stationers' Hall Court, E. C. 4, London, England.

THE LAYING OUT AND UPKEEP OF GOLF COURSES AND PUTTING GREENS. By Sutton. Simpkins, Marshall, Hamilton, Kent & Co., 4 Stationers' Hall Court, E. C. 4, London England.

LAWNS, LINKS, AND SPORTSFIELDS. By Macdonald. 1923. Charles Scribner's Sons, New York, N. Y.

(It is suggested that the purchasing of these books may be facilitated by ordering them through your local bookstore.)

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