Section 4.—Noxious Forest Insects and Their Control.*

A sound appreciation of the losses caused by forest insects over any given period of time cannot always be confined to an estimate of damage to productive forests alone. Insect outbreaks in inaccessible stands may have an important bearing on the fate of commercial forests. Their significance must be calculated in terms which it is next to impossible to define. Furthermore, it is a common practice to evaluate insect damage by a measure of dead or dying stands and to ignore the depreciation entailed by the ravages of insects which actually do not kill the timber but merely render it unfit for profitable utilization. Loss of increment resulting from repeated attacks of defoliators is hardly, if ever, taken into consideration. The same may be said of loss of vitality, the effects of forest depletion on the so-called forest influences, the deterioration of fire-killed timber and of logs left in the woods. Increased fire risk in insect-killed stands, damage to stored stock, and even to manufactured articles, as well as a number of other factors should be taken into account to give a true idea of the destructive role played by insects affecting forests and forest products.

The losses thus sustained in Canada during the past fifty years, if they could be at all accurately computed, would no doubt be appalling. Classical examples of large-scale insect calamities are the larch saw-fly outbreak that some years ago destroyed practically all commercial larch stands in Eastern Canada, and the spruce bud-worm infestation with its toll of about two hundred million cords of spruce and balsam. The eastern spruce bark-beetle, the hemlock looper, the jack pine saw-fly, the black-headed bud-worm, the balsam woolly aphid, and several other species have all, at one time or another, appeared in destructive numbers over large areas. In some cases the changes brought about in the composition of the forest by insect outbreaks have been distinctly prejudicial to their commercial value since, the more useful species of trees having been replaced by less valuable ones, it may take centuries to repair such damage. In any event a merchantable forest crop, once lost, cannot be replaced in less than fifty to a hundred years.

The Depredations of the European Spruce Saw-fly and the Jack Pine Bud-worm in Canada.—At the present time, two outstanding outbreaks of forest insects are in progress in Canada, one caused by the European spruce saw-fly and the other by the jack pine bud-worm. The former is particularly important. In 1930 it was discovered that over an area approximately two thousand square miles in extent, situated in the Gaspe peninsula of the province of Quebec, the spruce trees had been severely defoliated by the larvæ of a saw-fly. Specimens submitted to specialists in the United States and in England were determined as *Diprion polytomum* Htg., a species native to Europe. By 1938 the area of heavy infestation had increased to approximately twelve thousand square miles and the insect was known to be present in greater or lesser numbers throughout Eastern Canada as far west as Sudbury, Ont., and in the United States as far south as New Jersey. (See the chart on p. 255.)

This saw-fly attacks all species of spruce grown in Canada. The larvæ feed principally on the old needles and usually do not attack the new growth until the supply of old needles has been exhausted. This peculiar feeding habit has the effect of retarding the decadence and death of infested trees and accounts for the comparatively small number of trees which have been killed in areas

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