

namely, that the application of cultural practices will neither be effective nor profitable in the prevention or reduction of insect infestations unless the conditions which are favourable to the growth of trees are also, at the same time, either unfavourable or less favourable to the development of insects. Experience has shown that, in many cases, such a mutual inverse relationship exists. But there are exceptions. Other generalizations concerning the composition of the stand, the influence of site, density, crown cover, age, cutting methods, etc., cannot be made without considerable caution. The case of each insect, of each tree species, of each locality needs to be investigated.

The control of the jack pine bud-worm, for instance, is, according to entomologists in the United States, a problem which distinctly belongs to the field of silviculture. It hinges on the regulation of staminate flower production and may be accomplished by maintaining fully-stocked stands of jack pine. Planted trees and natural reproduction growing under susceptible trees should be protected by the removal of the latter. Large-crowned, orchard-type trees or overmature, round-crowned trees are the types which produce staminate flowers in great quantity. Their pollen is the preferred food of the young bud-worm larvæ and therefore such trees are most susceptible to bud-worm attack. The above recommendations are based on a study of the jack pine bud-worm in Michigan; to what extent they will apply in Canada has not yet been fully determined.

Cultural practices have been recommended in the case of the spruce bud-worm, the white-pine weevil, the locust borer, and many other insect pests of the forest; very often, however, such recommendations cannot be immediately put into practice.

*Biological Control.*—On the other hand, most important advances have been made in biological control. Although the use of natural enemies, more particularly insect parasites and predators, in fighting destructive insects has been practised for centuries in many countries, it is only in comparatively recent years that this method of control has been placed on a scientific basis and applied on a large scale. The campaign against gypsy and browntail moths in the United States was largely responsible for this development in entomology.

Biological control has been used almost exclusively in dealing with insects accidentally imported from other countries. This was a most logical deduction from the realization that introduced insects constitute a special menace by the very fact that they are free from the parasites and predators which help in keeping them in check in the country of their origin and that, usually, they are quite immune from attack by native species. In Canada the importation and propagation of foreign parasites have produced gratifying results. The European Lecanium scale and the satin moth have been successfully combated and a considerable measure of control has apparently been achieved in some areas by the introduction of parasites against the European larch saw-fly. It was only natural, therefore, that when the problem of the European spruce saw-fly arose, the importation of suitable parasitic species was resorted to at once. The seriousness of the situation fully warranted the expenditure of all the effort put forth in an attempt at stemming the progress of the saw-fly. In this work the forest entomologists co-operate closely with the Dominion Parasite Laboratory at Belleville, Ont. This laboratory is one of the most modern institutions of its kind in the world. It is adequately equipped for the importation, propagation, and liberation of parasites in large numbers. The following statement shows the number of parasites liberated against the European spruce saw-fly since 1933.