

The instruction of forest rangers on making observations and insect collections is an important phase of this work. Whenever possible short courses are given at various points during the winter or spring and these are supplemented by field demonstrations throughout the summer season.

FUNDAMENTAL STUDIES.—Fundamental studies are designed particularly with a view to unravelling the mysterious maze of ecological relationships which underlie the fluctuations in insect populations. Although, at present, they are purely scientific in scope, there cannot be the least doubt that ultimately they will lead to eminently practical results in the prevention and control of insect outbreaks. The thorough investigation of the biotic and physical factors influencing insect behaviour and reproduction will eventually eliminate much that is now empirical and uncertain from the practice of forest entomology. The very intricacy of the problem makes it a long-term project requiring a detailed analysis of soils, sites, flora, fauna, and meteorology of the region studied. The two sub-laboratories at Petawawa and Laniel are engaged upon work of this kind: the first is concerned with forests under intensive management, the second with forests under more or less natural conditions.

EMERGENCY PROGRAMS.—The last subdivision of activities in forest entomology is the one which deals with emergencies or, in other words, the problems of the hour. That it should have a more universal, popular appeal than the other two is readily understood. Sudden and spectacular outbreaks of insects, whether of local or country-wide importance, usually cause considerable alarm, and urgent appeals are made for immediate action. The entomologist must resort, at first, to his stock-in-trade, that is to say, to palliatives and remedies of more or less proved or even sometimes uncertain value. He must do as best he can and, in the meantime, make use of every opportunity to increase his knowledge and improve his methods. For this reason, any extensive operation in forest-insect control is always accompanied by a thorough-going study of the bionomics of the species involved. Control operations may be broadly classified as mechanical, chemical, silvicultural, and biological. Mechanical and chemical methods have only a limited application under conditions such as prevail in the Canadian forests. In nurseries, plantations, small parks and resorts, and in small-scale operations in the forest in the case of incipient outbreaks they have a definite place. In recent years some of them have been successfully employed in the control of bark-beetles by the burning of brood trees; in the prevention of injury from wood-borers by brushing over log piles and immersion of logs in water; in the reduction of hemlock-looper infestations by means of stomach poisons distributed from aeroplanes.

In our day and time, it is becoming increasingly evident that silvicultural and biological methods offer the true solution of the majority of our forest-insect problems.

Silvicultural Control.—The practice of silvicultural methods in the control of insects is beset with serious difficulties.

First among these is the fact that operators generally have not arrived at a realization of either the necessity or the advantages of rational silvicultural practices. In other words, they do not consider them profitable under the present conditions. This is no doubt due, primarily, to the fact that virgin stands are still available. As time goes on and as the depletion of our forests progresses, the present attitude towards silviculture in commercial forestry will gradually become altered, in fact, the industries are already looking for guidance in the management of their forests for continuous production. The second difficulty, knowledge of the factors involved, is, as yet, extremely rudimentary. One principle seems to be fairly well established,