FOREST GENETICS PROBLEMS IN GROWING INSECT-RESISTANT TREES*

H. J. MacAloney 1/

Little information is available on the subject of insect resistance in forest trees. Much of the general background material on which this discussion is based was obtained from Painter's "Insect Resistance in Crop Plants," although he stated that little had been done on forest insects. This discussion, which is primarily devoted to susceptibility studies, is based partly on published material and partly on unpublished reports from other stations. The problem of insect resistance in forest trees is extremely complicated -- it would seem that more attention, for one reason or another, has been paid to studies of the resistance of insects to control rather than to studies of the resistance of the plant itself to insect attacks.

The entomological work connected with breeding trees for resistance to insects differs from research into a control problem. A population must be built up and maintained in the laboratory or the forest, rather than be destroyed. The difficulties in carrying on such a long-time or long-maturing project such as tree growing, are apparent. It is of considerable interest to know that some of the previous speakers have encountered difficulty in preventing insect damage in their tree breeding or disease resistance studies. The projects in the West on susceptibility of pines to bark beetle attack and susceptibility of pines to reproduction weevil attack, carried on in cooperation with the Institute of Forest Genetics, at Placerville, California, are the outstanding examples of tree breeding to prevent insect attack.

1/ In charge Forest Insect Laboratory, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Milwaukee, Wis.

Much of the research on resistance and susceptibility has been developed through management and cutting practices designed to prevent further damage or losses in stands already existent. The bark beetle susceptibility classification for "east-side° ponderosa pine stands in northern California and Oregon, and the risk-rating method for individual ponderosa pine trees have given excellent results in controlling damage by the western pine beetle. Following these methods, areas operated a decade or more ago still show a substantial differential between the number of trees attacked and the losses in untreated areas. Similar criteria have been developed and are being tested in western white pine stands in Idaho, where selective logging of low-vigor trees reduces the amount of timber killed by the mountain pine beetle.

In the North Central Region some information on limitation of attack or resistance to injury has been obtained during the course of research work on plantation insects. Studies of the red-headed pine sawfly, for example, have shown that serious infestations develop under certain stand conditions. Choice of planting sites, with due regard to the presence of the alternate hosts on which the nymphs develop, is a very important factor in prevention of severe damage by the Saratoga spittlebug. Injury by the White-pine weevil may be reduced through silvicultural practices by creating growth or stand conditions, in the early years of the plantation or natural stand, that will be unfavorable for development of the weevil. These practices, again, are designed to decrease susceptibility in stands already existent and infested. We are in a better position now to advise on selection of planting sites and tree species than we were 20 years ago when large-scale planting was started in the Lake States, but more research is needed before we can solve some of the factors that determine susceptibility or resistance.

In connection with the discussion on maple syrup production and the selection of maple trees with the highest sugar content in the sap, attention was called to the fact that sugar maple is a favored host of the forest tent caterpillar. This insect is in outbreak form in the Lake States at the present time and continued heavy feeding in maple sugar orchards could result in a reduction in sugar content, thereby necessitating more gallons of sap to produce the required syrup concentration.