

be safe now to leave balsam in Quebec Province as long as it remains in a healthy condition; but when many dying trees are found, indicating a rapid increase of bark-beetle injury, the whole balsam stand should be utilized as rapidly as possible.

It has already been stated that very little spruce died in Quebec as a result of the spruce budworm attack, and although bark-beetles have killed a considerable quantity of the budworm weakened spruce their injury has not yet become very serious. Nevertheless this injury should not be overlooked, and during the next few years any considerable amount of dying spruce in the East should be reported to us without delay so that control measures may be arranged for as soon as they are needed.

In the Temiskaming District of Quebec we have an active primary Spruce Budworm Outbreak spreading, as already mentioned, across the Interprovincial line into Ontario. It was discovered in the Long Lake section on the Quebec side of the line only last summer, and the injury has already been very severe. Many of the trees are already dead, killed by the bark-beetles, which are exceedingly abundant, and give the trees defoliated by the budworm little chance for recovery. Our ground and air surveys conducted last summer determined that the heaviest injury was still on the Quebec side of the line, but that the infestation extended as far west as Lake Temagami, with western margin of the outbreak reaching a line extending from the southern end of Lake Temiskaming through Lake Temagami and then north and east, recrossing the interprovincial line just south of the height of land. While the infestation is still light on the Ontario side of the line it may be expected to develop in severity this summer and to extend rapidly westward through the balsam and spruce stands, becoming most destructive where the percentage of balsam is highest. It has not yet gone far north of the height of land but will probably extend northward in stands carrying a high percentage of balsam. We hope to follow the course of the injury closely through ground and air surveys this season and to record the centres of heavy infestation and the changing boundaries of the outbreak.

White pine foliage was attacked by the caterpillars to a limited degree last season, but no serious injury to pine from this cause need be anticipated.

Present Conditions in New Brunswick

The Balsam has been very seriously depleted throughout the central part of New Brunswick by the effects of the Spruce Budworm defoliation and the Balsam Bark-beetle attack which followed it. A forest insect survey of this infested area now in progress under the direction of Mr. J. D. Tothill will be completed this

season and it should then be possible to make a fairly close estimate of the loss that has been incurred.

The spruce was injured much less severely than the balsam and although on large areas the spruce was badly checked last year it is now probable that 90 per cent of this will recover unless, in its weakened condition, it is attacked by extensive bark-beetle outbreaks.

Possibilities of Control

We have not yet discovered any means of checking a primary budworm outbreak. With the balsam and spruce attacked by myriads of caterpillars, extending over thousands of square miles of territory, the outbreak spreads like a forest fire and no methods of control, feasible at the present time, will have any effect upon it. The Temiskaming outbreak covers a section more than 100 miles long and more than 30 miles wide. The young caterpillars have overwintered in myriads, chiefly on the twigs of the balsam, over most of this area. When the buds open towards the end of May, the caterpillars will commence their destructive work, feeding upon the young foliage as fast as it develops. The injury could be checked only by destroying the greater part of these caterpillars. That could be done only by poisoning the caterpillars with arsenical sprays or dusts or by killing the infested trees and so starving the caterpillars before they could complete their development. Either of these methods could be employed effectively on a small isolated area; but when thousands of square miles are infested we can as yet only keep in touch with the progress of the infestation and record the rate and direction of its spread, so that the threatened timber may be salvaged in advance of the injury.

The injury to balsam and spruce caused by the budworm and insects which accompany and follow it has been studied closely by officers of this Branch in Quebec and New Brunswick during the last five years. An endeavour has been made to discover all factors affecting the development and subsidence of the outbreaks and the relations of succeeding secondary injuries. A detailed report on this investigation is being prepared.

It is evident that, throughout the course of these outbreaks, the heaviest injury has been to stands containing a high percentage of balsam, and, further, that the secondary injury by bark-beetles became increasingly abundant as the outbreaks developed and that it continued the destruction after the budworm disappeared.

It, therefore, follows that, considering the possibilities of a future budworm outbreak, the faster the balsam is removed from our mixed stands the safer it will be for our forest in the future; and, further, that the destruction of bark-beetle breeding grounds by burning the slash from balsam and spruce cuttings will have

a decidedly beneficial effect upon the neighbouring forest.

Summary

It should be explained here again that the only active budworm outbreak now existant in Quebec Province is that in the Temiskaming district. Throughout all the rest of Quebec, with the possible exception of the north shore below the Saguenay, the spruce budworm has practically disappeared and we have now to deal only with the aftermath of its injury, chiefly bark-beetle attack in the weakened balsam and spruce. There is reason to believe that the most of this latter injury is past so far as the balsam is concerned, and the destruction of balsam slash will aid greatly in reducing future losses. There have been several rather severe local outbreaks of the Four-eyed Spruce Bark-beetle in spruce in Quebec during the last two years but none have yet proved of more than local importance. Bark-beetle outbreaks can be controlled effectively by modified lumbering operations, and if extensive loss should be threatened from this cause, we can recommend practical and effective means of control.

Fire Prevention Hints for Smokers.

Don't drop FIRE when you smoke in the woods, nor throw it out along the road. Keep the forests!

Matches, pipe coals, cigar stubs, and cigarette ends start many forest fires.

BE CAREFUL! Don't start a fire in the woods when you begin or end your smoke! Be sure your match, cigarette or pipe is out.

YOUR CO-OPERATION in order to keep down forest fires is asked. Break your match in two. Knock out your pipe ashes into your hand. Don't drop a burning cigarette.

FOREST FIRES cost millions a year. Don't start one.

Causes of Failure in Prairie Tree-Planting

It is safe to say that at least ninety per cent of the failures in tree-planting on the prairies are due to the fact that the importance of one or of all of three points has been overlooked. The three points are these:—

1. The soil must be most thoroughly prepared before planting;

2. Only such species of trees should be used as are known to be hardy in the district and suited to grow in the particular kind of soil and in the situation where it is desired to plant them;

3. A certain amount of cultivation of the soil after planting is absolutely necessary. This cultivation must be carried on until the trees are well established and able to grow without further care.—Norman M. Ross, Dominion Forestry Branch Nursery Station, Indian Head, Sask.