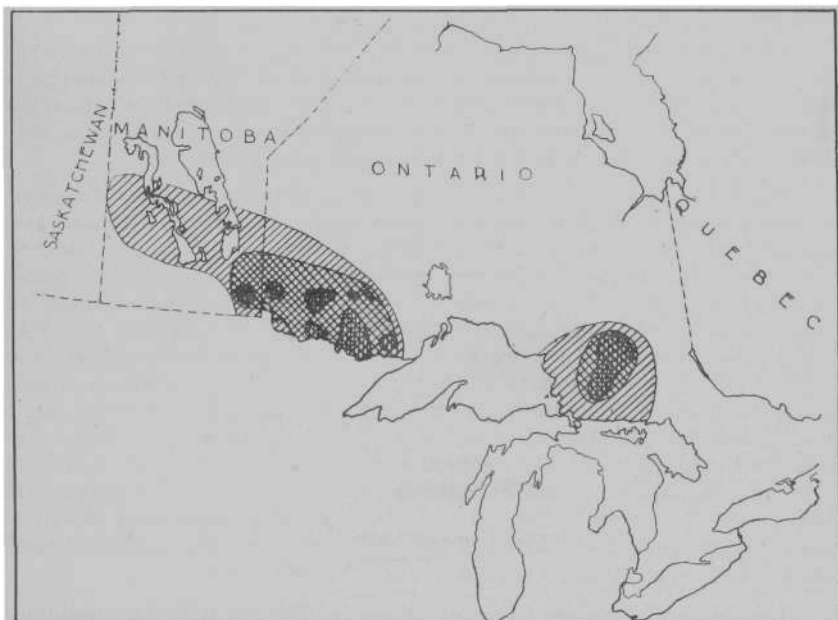


worm consists in the defoliation of the host-tree. Usually the tops of the crowns suffer more severely than the lower parts, resulting in the formation of stag-heads which are a striking characteristic of infested stands. Repeated heavy defoliation or complete defoliation before the formation of the next year's buds is fatal. Although large trees are likely to succumb first, young trees growing under them are frequently killed by larvæ dropping from the older trees. Thus far, comparatively few trees have been killed outright, but the production of stag-heads is very general in heavily-infested stands and is likely to favour the entrance of rots and secondary insects which may ultimately either kill the tree or render it unfit for utilization except as firewood.



Areas Infected by Spruce Bud-worm and Jack Pine Bud-worm in Ontario and Manitoba (intensity of infection is shown by density of shading).

The outbreaks of the European spruce saw-fly and the jack pine bud-worm have been described somewhat in detail, because they constitute the most pressing problems at present and also because they will serve to illustrate the more important principles and practices adopted in dealing intelligently with emergencies of this kind.

The Approach to the Problems Involved.—The widespread, but fundamentally erroneous, belief that such insects as the spruce bud-worm, the spruce bark-beetle, the European spruce saw-fly, etc., are inherently noxious and that the sole reason for their existence is to cause calamities, should be deprecated at all times "in season, and out of season". In the natural order of things insects are part and parcel of that great economy commonly referred to as the "balance of nature". The forest is a vast biological unit composed of plants and animals; it is perpetually subject to changes through the succession of species and individual organisms competing with each other for a place in the sun, and its composition at any one point of time is the resultant of the complicated interaction of all its vegetational and animal components, itself again dominated by climatic and edaphic conditions.