It has been observed, over and over again, that after a budworm outbreak, the percentage of balsam in the new stand is noticeably higher than it was in the old. The extraordinary accumulation of debris on the surface, while seriously hampering spruce regeneration, seems to offer no obstacle to the rooting of balsam. Root competition and competition for light further impede the growth of spruce that may succeed in becoming temporarily established. Generally speaking, the predominance of balsam is such as to reduce materially the possibility of its replacement by the residual spruce for several rotations if not forever. Under absolutely normal conditions, it is conceivable that sooner or later—in some localities—a spruce climax might develop from such antecedents. However, when repeated spruce budworm outbreaks enter into the picture, all such hopes vanish. It is a conservative estimate—probably an understatement—to say that, in many regions, any forest containing over 30 p.c. of balsam is more than likely to succumb to budworm attack upon reaching maturity. When this happens, not only the balsam but the greater part of the white spruce associated with it will be killed and the forest will enter a new and more advanced stage in the succession towards a pure balsam stand.

The European Spruce Sawfly.—In 1930 it was discovered that over an area approximately 2,000 square miles in extent, situated in the Gaspe Peninsula of the Province of Quebec, the spruce trees had been severely defoliated by the larvæ of a sawfly. Specimens submitted to specialists in the United States and in England were determined as *Gilpinia hercyniæ* (Htg.), a species native to Europe. By 1938 the area of heavy infestation had increased to approximately 12,000 square miles and the insect was known to be present in greater or lesser numbers throughout Eastern Canada as far west as Sudbury, Ont., and in the United States as far south as New Jersey.

The sawfly attacks all species of spruce grown in Canada. The larvæ feed principally on the old needles and usually do not attack the new growth until the supply of old needles has been exhausted. This type of feeding has the effect of retarding the decadence and death of infested trees. The ability of the tree to survive repeated attacks of the sawfly is offset somewhat by the fact that the insect is exceedingly prolific. Its progeny consists almost exclusively of females, and mating is unnecessary for fertilization of the eggs. The sawfly, moreover, is able to survive the most rigorous climatic conditions and, being of European origin, was at first almost completely free from attack by parasites. The main control factors operating against it, at that time, were small mammals, principally mice and shrews. These fed upon the cocoons in which the larvæ overwinter under the debris on the forest floor. Although perhaps between 40 and 50 p.c. of the cocoons was destroyed yearly in this way, the ultimate control effected by mammals, birds, native predacious and parasitic insects, was not sufficient to prevent a marked yearly increase in the intensity and spread of the infestation.

Estimates made in 1939 showed that, in the heavily infested areas on the upper Cascapedia River, 24·8 p.c. of the volume of white spruce and 27·4 p.c. of the black spruce were killed by the sawfly. These figures do not include the mortality due to an apparently independent outbreak of the eastern spruce bark-beetle between 1931 and 1934. During this period, 44·4 p.c. of the white and 5·6 p.c. of the black spruce were destroyed by the beetle, giving a total mortality for the region of about 69 p.c. of white and 33 p.c. of black spruce. In other parts, the mortality rates varied considerably from locality to locality. However, the number of trees actually killed by the sawfly did not give a true appraisal of the situation; the chances of