

The injuries of a detrimental character are those which are detrimental to the health, perfect growth, or future usefulness of the tree or its product, but do not cause its death.

Of the injuries affecting the dying and dead trees we find, as among those affecting the living, some which are of a destructive character, while others are simply detrimental. The destructive injuries are those caused by wood-boring insects, which render the wood worthless for any practical use to man. The detrimental injuries are those which produce defects in the wood and hasten the decay of the affected parts.

#### CHARACTER AND EXTENT OF DAMAGE TO FORESTS BY INSECTS.

Few persons who have not given considerable thought to the subject realize the serious character of insect depredations upon our forests and forest products. This is evident from the fact that the subject is seldom discussed at the meetings of forestry associations and is rarely referred to by writers upon forestry economy in this country.

If we were to assert as our belief that the annual damage and loss occasioned by insects to owners of forest and forest products in the United States was greater than that caused to the same by fire, few persons, if any, would believe that it could be possible. Yet when we come to consider the varied losses resulting from insect depredation, both in a destructive and detrimental manner and in the general influence of their work upon the forest economy of the country, we believe that such an assertion would not be far from correct.

The pine and spruce killed by bark beetles over vast areas in New England and in the Southern States within the last few years has caused an enormous loss of valuable timber; yet this is only a small portion of the damage to timber by insects. That caused in oak by the oak timber worms (*Lymantria sericeum* and *Eupsalis minuta*), the Columbian timber beetle (*Corthylus columbianus*) and the carpenter moths of the family Cossidae, to the chestnut by the chestnut timber worm (*Lymantria sericeum*), and to the tulip and other kinds of timber by the Columbian timber beetle, all of which attack living trees, will equal that caused by many forest conflagrations. Then when we come to consider the damage to the wood of dying, dead and felled timber, and the work of destruction only begun by fire and completed by wood-boring species, it appears to us that the damage caused by insects is at least equal to that caused by fire.

There is also another feature of the question, and that is in reference to the effect of the detrimental and destructive ravages of forest insects upon the forestry economy of the country. Owing to the large amount of timber destroyed and rendered defective by insects, it is necessary for the manufacturers to cut over a larger area than would otherwise be necessary in order to supply the demand for the best grades of lumber and other timber products. According to a statement by Hon. J. Sterling Morton at the last meeting of the American Association of Agricultural Colleges and Experiment Stations, the area cut over every day in this country to supply the demand for forest products is 30,000 acres. From our observation in the lumber regions of West Virginia it would indicate that at least ten per cent. less timber might be cut each year for this purpose were it not for the detrimental ravages of insects upon the standing and felled timber. Therefore, in this item alone the annual loss to the country and to the manufacturer is enormous, for it must be remembered that a large per cent. of the defective lumber is manufactured and disposed of at a loss to the manufacturer, and is often the cause of serious loss to the consumer.

No accurate estimates of the pecuniary losses caused by forest insects can be made. Yet with the knowledge gained on the subject from recent investigations of the ravages of forest tree insects, from correspondence with lumber manufacturers upon the subject, and reference to the statistics of forest products, we feel justified in presenting some figures which will at least indicate the extent of the loss.

We would estimate the loss caused by bark beetles of the family Scolytidae, which have caused the death of pine and spruce trees over vast areas within the last ten years,