

gradually work its way across the areas on which the young trees have been killed, but the time consumed in doing this will be very long. therefore such areas will remain waste land for many years so far as the raising of timber in commercial quantities is concerned.

Moreover, good evidence exists for the belief that the dense stands of Douglas fir which follow the first fire come not from one crop of seeds, but from several crops that have accumulated on the ground, where they await a favourable opportunity for germination, that is, the removal of the over-shading trees and undergrowth. This has been clearly demonstrated by Dr. Hofman, on the Columbia national forest in the state of Washington. A large area was so severely burned in 1902 that practically all the seed trees were killed. In 1913, dense stands of young fir, not over eleven years old, were found two and three miles from any seed trees, and no relationship could be established between the amount of reproduction and the distance from the seed trees, the reproduction often being more dense far from seed trees than near them. This would seem to indicate that seed was not blown to the areas of reproduction by the wind. If, on the other hand, the reproduction started from seed of trees escaping the fire, but dying since, then unburned cones or cone-scales should have been found on the ground beneath the stands. As a matter of fact, diligent search failed to discover any unburned cones or cone-scales, but they were always found in charred condition.

While most of the trees were eleven years old, indicating that they germinated the season following the fire which took place in the fall, some representatives occurred in every year down to five years old in 1913. Since the seed from which the trees sprang was not blown in by the wind, it must have lain in the litter and retained its capacity for germination for one to six years after the fire passed over. From the results of these and similar investigations, Dr. Hofman believes that the seeds of Douglas fir and hemlock can lie on the ground and retain their vitality for at least six years. This gives an opportunity for the accumulation of several seed crops from which the dense stands arise. In this connection it should be pointed out that, if the fire is sufficiently hot to burn the litter clean to the mineral soil, most of the seeds lying in the partially decayed vegetable matter would probably be destroyed and reproduction would fail. This is indicated by the fact that little or no reproduction followed on the area of the investigations where the fire was very severe.

No dense stands of reproduction were found by the writer as far as two or three miles from seed trees, but such stands were found one-half mile to three-fourths mile from them. These stands were just as dense, about 20,000 trees 16 years old to the acre, three-fourths