

extended a short distance beneath the green forest. Evidence in many cases seems to indicate that the under-story of hemlock so common beneath old stands of fir was established as the result of ground fires. The root system of hemlock seedlings is shallower than that of fir. This means that hemlock must have soils moister near the surface than is necessary for the fir, a condition supplied by the cover of the older trees checking evaporation. Another condition, however, is perhaps more important, and this is the cover of moss which usually follows surface fires beneath old stands. The moss cover conserves the moisture of the surface soil and forms an ideal germinating medium for the hemlock. Fir also germinates in these moss beds, but it soon dies out on account of the shade, while the hemlock, capable of enduring more shade than the fir, persists. Where moss is lacking the bracken fern or salal forms the protecting cover. One also finds abundant reproduction of hemlock, as represented by seedlings, on burned-over areas along the margins of dense undergrowth which has escaped the fire. This undergrowth furnishes protection from strong light and keeps the surface soil moist, while the adjacent burned places have too much light and are too dry for the hemlock.

The most extensive Douglas fir reproduction was found on burned areas. In fact, it is believed that moderate burning is necessary to establish pure stands of fir. The young seedlings, to grow vigorously, must have considerable overhead light, a condition secured by burning away the slash and the dense growth of under-vegetation. On approximately half of the area covered by adequate reproduction the trees were either four years or 16 years old, with the two ages about equally divided, and nearly one-fourth was eight or twelve years old, and again the two age classes were about equally divided. Reproduction of these four ages was met with on every area where detailed studies were made, and general observation showed them to be prevalent over the entire region. That these stands originated as the result of fire is indicated by the fact that fire scars of the same age or one year older were found in every case on adjacent trees. The next most frequent stands were 24 and 30 years of age. Other ages of fir which had evidently risen after burning, were 10, 26, 34, 40, 44 and 50. Besides these are the two age classes mentioned on p. 8, namely, 70 years and 100 years. These, too, were accompanied by fire scars, of approximately the same age, on standing older trees. All this indicates that fires have been frequent and that they have been particularly extensive within the past 20 years, the period of the great development of the lumber industry and of settlement in the region. The average interval between widespread fires during this period is five years. Stands 30, 70 and 100 years old, evidently fol-