wood region. Preliminary reductions were carried through by the writer[7] in 1932. Recently, the dating was reviewed and extensions made.

Asymmetric radial growth appears closely related in these collections to lack of crossdating. Cross section SMR 1c in the Smith River group, from the 140 foot level above the ground, showed good crossdating between opposite radii for the first 600 years of growth, with no missing rings and approximately concentric growth. For the next 340 years, however, growth became extremely compressed and one-sided and the short radius showed 99 rings missing as compared with the long radius in this interval. The "wedging-out" of these rings and the lack of crossdating destroy completely the value of the outer one-third of this specimen as a climatic record.

The very complacent Weott sections WT 6 and WT 5 (enormous average ring-width of 2.5 mm. for 1574-1930) provided the opening to a dated sequence. Dating was then extended to other more sensitive Weott trees and then carried into several other groups so that finally about half of the sections and cores were crossdated.

Of particular interest is the group of cores from the Willits-Ft. Bragg region. These were taken from felled trees at levels mostly of a hundred feet or so above the base, and dated readily. Thin rings were common for 1924, 1918, 1913, 1867, 1846, 1844, 1834, and 1824. Examination of several sets of sections at various levels supported the theory that going to upper levels in the trunk minimizes the effects of root influences and of mechanical stress or other factors favoring irregular growth about the circuit.

The fact of crossdating over considerable areas in some coast redwoods can only mean that in such specimens variations in climate are leaving an intelligible record. Fog is a characteristic of the redwood habitat, but no relationship appears in our curves between seasonal variation in fog and tree growth. The relationship to seasonal precipitation, however, is good for the extreme years; of the eight outstanding thin rings since 1824, seven correspond to dry years and only 1834 is erratic. The interval of large growth from 1914 to 1917 corresponds to the heavy precipitation of those years; the ring for 1894, however, is much thicker than the rainfall for that year would warrant. Temperature effects have not yet been studied. It is evident that a year of highly deficient rainfall is likely to leave its mark on redwoods growing on sensitive sites; under normal circumstances, however, there are apparently so many factors having an important bearing on the total growth that correlation with any one of them is not feasible.

We may say in conclusion then, that by proper selection of redwoods with special attention to freedom from neighbors and to upper level radii, it is possible to find a fair degree of crossdating in the hitherto unsolved ring records of this very long-lived species.

[7]Carnegie Inst. Wash. Yearbook, 208, 1933.

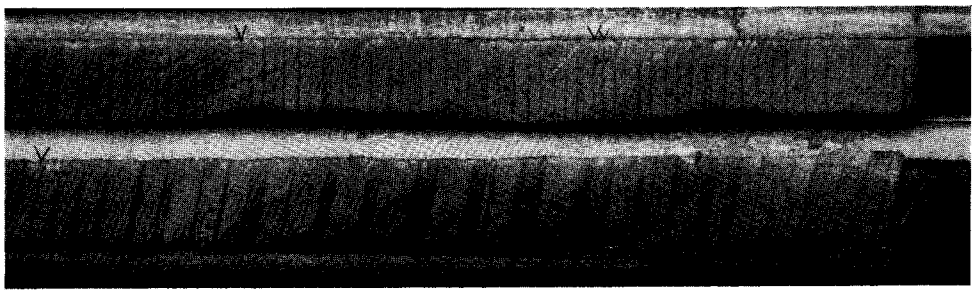
COMPRESSION WOOD AND THE RECENT CHRONOLOGY IN MESA VERDE FIRS

A. E. DOUGLASS

The accompanying photographs show the outer rings of MVD-7 and 7A which contain features that are important in the correct interpretation of these superb Douglas fir ring series. The specimens are Swedish increment cores taken on the upper and lower sides of one of the firs (spruces) showing in the "site" picture in the October, 1939 number of this bulletin. On that site in lower Fewkes' Canyon, Mesa Verde, the ground slopes very steeply in a northerly direction. The trunks of the older trees usually are curved in the lower 6 to 10 feet; they start up at the ground with a slant in

the down-hill direction of possibly 20 degrees from the vertical and at higher points gradually approach the vertical position. The borings were made in the lower part of the curve where the strain of the tree's weight is very great. Here there is a longitudinal pull on the upper side and a pressure on the lower side.

Dates are shown by pinpricks. A single pinprick indicates a decade ring, two indicate a mid-century date (e.g., 1850), and three pinpricks indicate the year 1900. A microscopic ring is indicated by opposite pinpricks on each side of the ring. If the ring is missing then the two pinpricks are not opposite each other. The outside ring in each core is 1939 and shows in 7A on July 29 with some latewood at the very edge.



Scale 3:1

Fig. 3. Above: upper side of trunk, MVD-7, 1840-1939. Below: lower side of trunk, MVD-7A, 1899-1939.

The upper photograph showing the growth of the upper side of the trunk gives a normal series of rings in a dry area. The rings in the other photograph, from the lower side of the trunk, present highly exaggerated changes from year to year with greatly increased growth in favorable years. The sapwood on the upper side has a thickness of 22.2 mm. and includes growth from 1888 to 1939. The sapwood on the lower side covers 54 mm., nearly 2½ times as much, and includes rings from 1889 to 1939. This shows an agreement in years but not in dimension. The length of the core on the upper side is 175 mm. and reaches the center of the tree in the year 1654; on the lower side it is 236 mm. long reaching only to the year 1724. Compression wood constitutes substantial parts of the increased growth on the lower side. Deficient years appear much alike on the two sides. Thus 1902 is absent in each; 1904 is absent above and miscroscopic below; 1899, 1896, and 1894 are much the same on each side and are very thin or microscopic.

A striking difference between these two sides is the presence in 7A only of doubles of the Douglas fir type for 1908 and 1930. In these doubles the red color persists in the interval between the false ring and the final annual ring. However, this color is only seen readily under a power of 50 to 100 and in the photograph it is not at all evident. In 1917-1918 taken together there is much the same effect but each has, in fact, a real annual ring. Another such double is the ring of 1724 in IF-20. The ring of A.D. 302 in M-106, a piece of charcoal with a superb ring record, shows this sort of double in a part of the circuit. The charcoal of course does not show the red color but there is a continuity of thickened cell walls between the two latewoods which shows their relation.

This type of double in the Douglas fir was first seen in 1923 in the case of BE-11 which gave an excellent ring series in the 1300's; 1361 had a ring of this type which caused a great deal of study. Its dating was not solved till 1928 when many additional specimens were secured and adequate comparisons were made.