

AN ABSTRACT OF THE DISSERTATION OF

Thomas S. Sensenig for the degree of Doctor of Philosophy in Forest Science presented on June 12, 2002.

Title: Development, Fire History and Current and Past Growth, of Old-Growth and Young-Growth Forest Stands in the Cascade, Siskiyou and Mid-Coast Mountains of Southwestern Oregon

I evaluated fire occurrence, growth and recruitment and determined the fire history of 21 old and 20 young 8 ha stands in Cascade, Siskiyou and mid-Coast mixed conifer and evergreen forests in southwestern Oregon. The rates and patterns of growth were measured and analyzed on 1,079 old-growth and 2,111 young stand trees. I compared stand development among and between young and old-growth stands.

I dated 1,262 fire scars on all sites. There were no significant differences in the number of fire scars among the three forest types ($p = 0.610$) and found evidence of only three fires after 1900. The most probable fire frequencies ranged from 7-13 yrs in the Cascades, 9-14 yrs in the Siskiyou and 9-19 yrs in mid-Coast stands. For all sites, fire occurred 66% of the decades from 1700-1900 and conifer trees were recruited in 56% of the decades during the same period. Thus, in all old-growth stands establishment and fires occurred simultaneously. In young stands establishment occurred very rapidly after about 1900 when fires apparently stopped.

In all forest types, current basal area in the old and young stands was not significantly different ($p = 0.444$); however, there were significantly more trees in the young stands ($p = 0.002$). Agglomerative clustering indicated that the developmental patterns of the old-growth trees was statistically dissimilar to young stand trees in all forest types suggesting that young stands densities are affecting tree growth.

At age 50 yrs the diameters of the old-growth trees were significantly greater than that of the largest 50% of the young-growth trees. In old stands, tree size at 250 yrs was strongly related to size and growth rate at age 50 (i.e. Cascade $r^2 = 0.48$), suggesting that early growth rate was a major influence on final tree size.

Height:diameter ratios averaged 51–55 for trees in old-growth stands and 71–79 in the young stands and *tree height:live crown* ratios averaged 56–61 for all trees in old-

growth stands and averaged 47–48 in the young stands. This is a further indication of the differences in stand development in these stand types.

These results strongly indicate that the currently abundant young stands are developing on significantly different pathways than that of the historical development of the old-growth stands. The lack of fire has replaced the occurrence of fire as a major factor influencing the development of forest stands. Therefore, in southwestern Oregon young forest stands will likely develop profoundly different and less complex, stand structures and species compositions than that of old-growth stands. Management implications of these results are discussed.