

SUMMARY OF FOREST TREE IMPROVEMENT IN THE PACIFIC NORTHEAST

John W. Duffield¹

Technical Director
Col. W. B. Greeley Forest Nursery
Nisqually, Washington

Tree Improvement work in the Pacific Northwest is of relatively recent origin, if one excepts the Douglas fir provenance studies of the Pacific Northwest Forest and Range Experiment Station dating from 1913. The Wind River Arboretum, established in the same year should also be mentioned as a collection of outstanding present and potential value to tree breeders.

Douglas fir, naturally enough, dominates tree improvement work in the Pacific Northwest. The scientific basis for improvement of this species has been furnished almost entirely by two Canadians, Dean George S. Allen of the Faculty of Forestry, University of British Columbia, and Dr. Alan Orr-Ewing, Research Division, British Columbia Forest Service. Their work has elucidated the reproductive morphology of Douglas fir, and has shown the significance of self-pollination in a number of individuals of this species. Orr-Ewing, moreover, has succeeded in demonstrating agamospermy in Douglas fir, and has a small uniform seedling progeny resulting from controlled non-pollination. Orr-Ewing has also done most of the basic work on pollination control in this species. Roy Silen, of the Pacific Northwest Forest and Range Experiment Station has recorded some basic pollen flight data utilizing a relatively Douglas-fir free area in the Willamette Valley. Studies of thermo- and photoperiod in Douglas fir, as revealed by bud-bursting time, are being conducted by Helge Irgens-Moller at Oregon State College, with the support of a grant by hr. Prentice Bloedel administered by the Forest Genetics Research Foundation. Hybridization of Pseudotsuga taxifolia and P. macrocarpa has been achieved by the research group of the Oregon State Board of Forestry which includes Dale Bever and Dr. K.K. Ching.

Work on propagation techniques dates back to the work of B.G. Griffith of the Faculty of Forestry of the -University of British Columbia who studied. the rooting of Douglas fir and numerous other forest trees of the Pacific Northwest in 1940. Some of the earliest and most effective work on grafting of Douglas fir has been done by Bent Gerdes of the Manning Seed Company. Douglas fir has proven to be one of the easiest of the conifers to graft. Outdoor grafts of several types give success percentages in the eighties and nineties in the climate of western Washington and British Columbia.

Numerous studies of fertilizer effects on cone production are under way. A comprehensive study started in 1955 cooperatively by the Weyerhaeuser Timber Co. and the Industrial Forestry Association has been followed by studies by the Crown Zellerbach Corporation, the Manning Seed Co., the U.S. Forest Service, and, in Canada, by MaciMillan and Bloedel, Ltd.

The wide individual variation in Douglas fir phenotypes has encouraged the development of "plus tree registers" and the establishment of grafted seed orchards. Orchards have already been established by the Manning Seed Co., the Industrial Forestry Association, Bloedel Timberlands Development Inc., the Port Blakely Mill Co., the Weyerhaeuser Timber Co., and the U.S. Forest Service. In addition, natural seed production areas are being developed by thinning out less desirable phenotypes.

¹Chairman Western Forest Genetics Association.

Basic studies of variation include a region-wide provenance test being established by Bever and Ching of the Oregon State Board of Forestry. Robert Campbell of the Industrial Forestry Association has completed field measurements which will be used to evaluate in detail the crown and upper stem form of more than 300 young Douglas firs in 10 different areas throughout western Washington. The same trees have also been sampled for specific gravity. These core samples have been supplemented by cores collected in the establishment of growth study plots by James King of the Weyerhaeuser Timber Co., as well as by cores collected from western hemlock and other pulpwood species as part of a program recently initiated to study the potentialities of selection for pulp yield and quality.

Western white pine is receiving the attention of a number of workers. Bingham and Squillace of the U.S. Forest Service have, by means of controlled pollination progeny tests and artificial inoculations, identified at least three white pines in northern Idaho which transmit resistance to white pine blister rust to a satisfactory percentage of their progeny. The promising nature of their results has received recognition in the development of a special work center located at Moscow, Idaho, where construction of complete propagation and experimental facilities is soon to start. R. A. Porter, of the Forest Biology Laboratory, Canada Department of Agriculture, in Victoria, B. C., has demonstrated resistance to blister rust in grafts from apparently resistant trees. Tests of presumably resistant hybrids and other controlled pollinated progenies are being conducted by the Port Blakely Mill Co., Bloedel Timberlands Development, Inc., and the U. S. Forest Service. Nursery screening of seedling progenies of western white and sugar pines for blister rust resistance is being conducted by Forest Service personnel at Bend, Oregon, and at the Wind River Nursery in Washington.

Sitka spruce, one of the fastest-growing conifers of the region, is little used in planting because of its susceptibility to the Sitka spruce weevil, *Pissodes sitchensis*, which resembles the white pine weevil in appearance, habits and silvicultural significance. The weevil is being attacked along two lines--selection within the species and hybridization between species. K. W. Wright of the U. S. Forest Service has been conducting tests and entomological studies, while J. W. Duffield of the Industrial Forestry Association has been propagating presumably resistant selections, hybrid populations and materials for a comprehensive species collection. In this work he has received material assistance from P. G. Haddock in British Columbia, R. F. Taylor in Alaska, Nark Holst in Ontario, and J. W. Wright while at the Norris Arboretum.

Other lines of work which can be mentioned in passing are phenotypic reconnaissance in western hemlock and black cottonwood and testing of various poplar-hybrids. A recent outbreak of the balsam woolly aphid in stands of *Abies amabilis* seems to be revealing a few resistant individuals as well as calling attention to wide species differences in susceptibility among native and exotic true firs.

A word should be added concerning organizational activities. The third field meeting of the Northwest Forest Genetics Association, held July 20-21 on Vancouver Island, B.C., resulted in enlargement of scope and a change of the name to the Western Forest Genetics Association. This was prompted by the participation of Californian and Inland Empire forest geneticists in Association activities as well as by the community of species and problems confronting workers of the whole Pacific Slope. In March 197 the Association held a two-day course in forest genetics and tree improvement under the auspices of Oregon State College. This was attended by more than 80 foresters from all fields of employment in Oregon, Washington, and British Columbia and was staffed in addition by forest geneticists from California and Idaho. Such courses may be given biennially in the future.