

SUMMARY OF FOREST TREE IMPROVEMENT WORK IN CALIFORNIA

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Most of the actual work in forest tree improvement research in California has been done at the Institute of Forest Genetics of the California Forest and Range Experiment Station, U. S. Forest Service, and most of it has been done in Pinus which, because of its size and economic importance, offers exceptional possibilities to geneticists and tree-breeders. The history and status of the work of the California Forest and Range Experiment Station were summarized in 1954² and some later developments are given in the Station's annual reports for 1954, 1955, and 1956. Most of the researches touched on in that summary are continuing, and hence this report will not touch on them; rather, it will be concerned with other developments, activities, and researches.

Growth of Public Interest

The growth of public interest in forest genetics, although much less spectacular than in other regions, has been steady and reassuring. Evidence of increased interest need not be presented here, but it is appropriate to credit the southern and southeastern originators of the epidemic with the development of an exceedingly contagious virus. California tree-breeders have long contemplated with almost immoderate envy, the progress of the epidemic through other regions; and the only satisfaction they could muster in appeasement of their envy was from the supposition that work in California may have helped to weaken the resistance of other regions to the virus. It also seems fitting to suggest in passing that this widespread interest is not misplaced; for although very impressive progress has already been made by the various regions in this new field of research, future developments will be such as to cause later generations of forest geneticists to regard the present era as the early stone-age of tree-breeding.

Developments and Activities

The Forest Genetics Research Foundation, which was established in 1951³ has provided substantial financial support for much needed investigations in California and elsewhere. The comprehensive study of racial variation in ponderosa pine, which is being made by R. Z. Callaham of the California Forest and Range Experiment Station, is now drawing to a close. This study was made possible by two grants from the Foundation.

¹ Maintained at Berkeley, California, by the Forest Service, U. S. Department of Agriculture, in cooperation with the University of California.

² Righter, F. I. Forest tree improvement research in California. Jour. Forestry 52(9): 680-682. 1954.

³ Wyckoff, Stephen N. Forest Genetics Research Foundation. Jour. Forestry 52(4): 686-688. 1954.

The interest and work of the Foundation is not restricted to any region or even to any country. Hence, all benefit from its work. Other contributions to progress include untiring efforts to interest people in the possibilities and importance of forest genetics research and numerous other valuable services which, however, have not been publicized and which probably are unknown even to many who are actively engaged in forest tree improvement work.

The University of California has contributed greatly to the advancement of forest genetics research in California. Since the founding of the Eddy Tree Breeding Station, members of the University's academic staff (foresters, geneticists, botanists, physiologists, and others) have made generous contributions of their time and influence in furtherance of the Institute's research. Recently, the University made a substantial area at Berkeley available for use in the California Forest and Range Experiment Station's program of research in forest genetics, and it also has executed several cooperative agreements with the Station in furtherance of current researches.

The California State Division of Forestry is host to one of the California Forest and Range Experiment Station's field tests, which is the only one at low elevation (1,900 feet) on the west slope of the Sierra Nevada. Numerous companies are participating in a similar way, and so many offers of similar help are received that it is impossible under present conditions to take advantage of most of them. It is, perhaps, pertinent to state that numerous similar offers are received from sources outside California.

In a recent meeting, the Northwest Forest Genetics Association expanded its province so that now it includes western Canada and eleven western states of this country. Henceforth its name will be the "Western Forest Genetics Association." This development carries very welcome implications for California tree-breeders.

Another noteworthy development in California was the entrance this year of the administrative branch of the Forest Service into the field of hybrid-production for planting on national forests. Present plans specify production of hybrids between knobcone and Monterey pines and the Jeffrey-Coulter backcross hybrid (Jeffrey x (Jeffrey x Coulter)).

Research

As noted above, most of the research in California has been done by the California Forest and Range Experiment Station. It has given major emphasis to species hybridization over the past 17 years. While continuing with the pine hybridization work, it has, in recent years, placed increasing emphasis on studies of racial variation, selection, and reproduction.

Racial Variation

The importance of work in this field has been heavily emphasized in the literature and so-called "source-of-seed" or "provenience" tests have been very popular. Neither the emphasis nor the popularity is out of line. Both are well merited. If there were any doubt about this, the magnificent study of racial variation in Pinus contorta, which was made recently by Dr. W. B. Critchfield, then a graduate student at the University of California, would certainly eliminate the doubt. The California Forest and Range Experiment

Station was a special beneficiary of Dr. Critchfield's work since stock from the various seed-sources were donated to the Institute. The value of such an acquisition may be indicated by the fact that a hybrid made at the Institute between local lodgepole pine and lodgepole pine from Shuswap Lake, British Columbia, is between two and three times the size of the natural progeny of the seed-parent at the age of 3 years.

The study of ponderosa pine previously referred to is the most comprehensive investigation ever made of that important species. In planning this test, Dr. Callaham consulted frequently and long with Dr. Critchfield.

The California Forest and Range Experiment Station hopes to be able to study racial variation in several other local species, including Pinus attenuata, *P. jeffreyi*, *P. coulteri*, and *P. lambertiana*, and in any event, it is now in a position to establish a breeding orchard of *P. attenuata* stocks from most of the range of that species.

Selection

Individual selection through intraspecific crossing has received considerable attention at the Institute in recent years. Most of the work has been done with *Pinus jeffreyi* and *P. ponderosa*. Particularly interesting are the early results crossing, as the pollen parent, an exceedingly vigorous ponderosa pine on the Blodgett Forest of the University of California, to several other ponderosa pines. The progenies of this cross are about equal to the natural progenies of the seed-parent in vigor. Selfings made in conjunction with some of the tests indicate that obligate heterozygosity is characteristic of those species and probably of most of the pines. The inbred progenies abound with so-called phenodeviants, indicating that their chromosomes are loaded with lethal factors.

The California Forest and Range Experiment Station's Division of Forest Disease Research in close cooperation with the Division of Genetics and other agencies, including some in the Pacific Northwest, is engaged in a search for blister-rust resistant sugar pines. In a recent meeting to discuss plans for this work, the following organizations were represented: Bureau of Indian Affairs; Bureau of Land Management, U.S.D.I.; California Forest and Range Experiment Station; California Department of Natural Resources; California Division of Forestry; The Lumberman; United States Forest Service, San Francisco; University of California; Western Lumber Manufacturers, Inc.; Western Pine Association.

Physiological Studies

Problems of reproduction and regeneration are extremely serious ones in California with respect to several important species. Intensive work on flowering in pines is being done at the California Institute of Technology by Dr. Bonner of that Institution and Dr. Helmers of the Division of Forest Management Research of the California Forest and Range Experiment Station, and at the University of California and the Institute of Forest Genetics by Dr. Mirov and Dr. Stanley of the Division of Forest Genetics of the California Forest and Range Experiment Station. The latter study is supported by a grant from Resources for the Future, Inc. A similarly intensive attack on the culture of nursery stock for planting is being made by Dr. Stone, of the School of Forestry at Berkeley.