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COOPERATIVE TREE IMPROVEMENT
IN THE DOUGLAS FIR REGION

by

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SUMMARY

During the past decade a unique system of cooperative tree improvement programs has developed in the Douglas Fir Region of Oregon and Washington involving intermingled public and private ownerships, both large and small. Programs are briefly described as to genetic approach, participation, funding, agreement, results, and second phase.
The primary purpose of this paper is not to detail any approach to the genetic improvement of forest trees, but rather to tell the story of a unique cooperative effort that has arisen in response to an ownership pattern of intermingled private and public lands. It may not be applicable to many parts of the world lacking this diversified ownership. It has, however, been found applicable to the incorporation of almost all kinds of genetic approaches now in practical use.

The Douglas Fir Region includes the Pacific slopes of western Oregon, western Washington, part of northern California, and the southwestern part of the Canadian province of British Columbia. However, for the purposes of this paper, the term is restricted to those mentioned portions of Oregon and Washington.

The Region contains 26 million acres of commercial forest land, almost equally divided between public and private ownership. The federal government is the largest holder of public lands under such agencies as the U.S. Forest Service and Bureau of Land Management. Much of this is in large blocks for which single-ownership programs apply. Part of the public and most of the private, however, is in a very mixed ownership pattern. About 30 percent of the private lands are in small ownerships.

Climate is very favorable to tree growth, though topography and elevational extremes cause rapid climatic changes within relatively short distances. The native forest species also vary genetically in response to local climates, resulting in indeterminate numbers of local "races" blending into each other. Recent research strongly suggest that these local races should be the basis of breeding zones to avoid problems associated with poor adaptation.


**EARLY PROGRAMS**

Fortunately, tree improvement can utilize the natural gene pool mostly intact. First programs were initiated 20 years ago. Concentration has been almost entirely upon Douglas fir, other than blister-rust-resistance programs for white and sugar pines. Work only recently has begun on western hemlock.
Early Douglas fir programs were of the classical plus-tree approach dependent upon grafted seed orchards. Stock-scion incompatibility became an overwhelming problem by the early 1960's, and progress nearly came to a standstill. Some programs were abandoned, though others were successful after 10 years of hard work and patience.

PROGRESSIVE APPROACH

In 1966 Silen described in a research note "A simple, progressive, tree improvement program for Douglas fir" based upon an old Douglas fir heredity study. After 50 years of growth it could be shown that from randomly selected parents within a race, the one best parent in four would have provided more than 10 percent increased volume over the average of unselected parents. His plan called for selection of three roadside seed (parent) trees per thousand acres, accepting a low selection intensity, if necessary, since the parent trees would all be tested. These trees would supply seed with a small degree of genetic improvement for the immediate future. Open-pollinated progeny testing would be started with the first cone crop, and periodic measurements from the test would be the basis for elimination of poor performers from the seed-tree list. Thus, the list would become progressively better. The top one-quarter, after sufficient testing, would become the genetic base for further improvement through cross pollinations.

The progressive approach was first put into practice on a Crown Zellerbach tree farm in northwest Oregon in time to take advantage of the excellent cone crop of 1966.

COOPERATIVE PROGRAMS

An organized cooperative approach stemmed directly from emergence of the new program. Neighboring landowners soon were wanting to start similar programs. Since they would be duplicating CZ's effort from the same wild population, Silen and Wheat proposed a cooperative effort. This resulted in the Vernonia Cooperative Tree Improvement Program involving Crown Zellerbach Corp., Oregon State Forestry Department, Longview Fibre Co., and International Paper Co. with 360,000 acres of intermingled ownership and selection of 900 parent trees.

Other programs were soon to follow so that two million acres of cooperatives were active by 1971. Most adopted the progressive system, though several have incorporated plus-tree programs started earlier. One of the latest, because of age-class limitations, will rely mostly upon plus-tree selections and clonal seed
orchards for Douglas fir, and the progressive system for hemlock. Now, after 10 years, there are 18 programs involving 25 private companies, 4 public agencies, and almost 5 million acres of their ownership. Well over one-half million tagged seedlings have been outplanted into 120 test plantations to determine the genetic worth of over 4,500 selected trees. The last two figures will be more than doubled by already active and funded programs. Thus, much of the intermingled ownership of the Douglas Fir Region of Oregon and Washington is in cooperative-type programs.

PROGRAM AREA

The area of a cooperative program can be confined to a single seed source or breeding unit with uniform environment; or it can include a number of breeding units. Most programs have several breeding units. In addition to geographic boundaries a break is usually made on elevation. The largest program at present has five breeding units with one latitudinal division and a further division made between the coastal fog belt and the interior valley climate. Breeding units are never more than 96 kilometers from north to south and usually less from east to west, with an elevational band usually less than 450 meters.

PARTICIPATION

Cooperatives aim to serve all the landowners in a breeding zone with a common tree improvement plan, with each contributing the same effort per acre.

Membership in a cooperative varies from 2 to 8 landowners. Large and small in both public and private ownership are represented. For example: U.S. Forest Service, Bureau of Land Management, and State of Oregon are large public landowners commonly with more than 100,000 acres in a program; Coos County (Oregon) is a small public agency with only 8,000 acres in one program; large private owners (see attachment) have acreages comparable to the public agencies, and the smallest is a family estate of 7,500 acres. A typical cooperative program might embrace an area of 150,000 acres of which 100,000 is owned by participants. Such a program can be illustrated with the following example.

<table>
<thead>
<tr>
<th>Cooperator</th>
<th>Forest Acres</th>
<th>Parent Trees</th>
<th>Test Plantations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>45,000</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>25,000</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>20,000</td>
<td>60</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>10,000</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>100,000</td>
<td>300</td>
<td>9</td>
</tr>
</tbody>
</table>

The level of each cooperator participation is based upon his forest acres within the program area. Each cooperator is responsible for that part of the program on his ownership. He chooses his own parent trees, marks and protects them, collects the seed, chooses his share of test sites, installs and maintains them, all as part of a common plan. Initial cooperation is through the requirement that each test plantation represents all parent trees in the cooperative, and that results of the test along with access to any parent trees and their families are made available to all cooperators. The major feature of the cooperation, however, is that everyone shares the best parentage found in the
testing. Thus, each cooperator not only has access to his own best parentage, but that of his neighbors as well.

FUNDING

There is seldom the need for funding of any project not directly under the cooperator's control. Each cooperator simply works with the trees and land he owns. While this independence is expected to change, especially for the small cooperators, as programs advance from the initial selections and progeny-testing into seed orchards and advanced breeding, the first decade has actually seen few financial transactions between cooperators and has engendered a great amount of mutual confidence that should ease financial negotiations.

AGREEMENTS AND CONTINUITY

The use of the term "cooperative" in the Douglas Fir Region could be somewhat misleading for those acquainted with cooperative programs in other regions. First of all, there are no binding commitments. Most programs not involving federal ownership are held together only by oral agreements, the motivations for cooperation being so strong that written agreements are superfluous. Cooperatives that have federal membership have a signed "Memorandum of Understanding" to meet minimum governmental regulations, but even these still fall short of a binding agreement.

In tree improvement there are many obvious benefits that can be listed for a cooperative effort. One that is very real, though originally overlooked, is continuity. Independent programs in the past have suffered and failed because of cyclic budget cutting — and the lack of someone outside the organization to defend them. However, once a landowner or manager has agreed (though only orally) to carry their share of the local tree improvement program, there is a reluctance to letting the neighbors down. In fact and practice, the opposite can be stated — they try harder to make the program succeed.

RESULTS TO-DATE

Since their inception, cooperative, progressive programs have been providing a large portion of the seed needed by cooperators. This is known local seed providing some degree of immediate genetic improvement depending upon selection intensity. Progeny-test measurements at 9 years indicate that a prediction of 10 percent volume increase after 20 years of testing will be met and possibly exceeded.

SECOND-PHASE PROGRAMS

Controlled crossing of parent trees was started in 1971 by the original Vernonia Cooperative, and seedlings from about 400 crosses have been used to start a second-generation seed orchard. By 1976 three cooperatives have followed suit to start a major second phase of these cooperative programs. These orchards already have begun to pool into common management efforts among several cooperatives, suggesting the trend has been set for long-range cooperative efforts.
GUIDANCE & RESEARCH

The roles of Industrial Forestry Association and Pacific Northwest Forest & Range Experiment Station in these programs probably have received even less publicity than the programs themselves. IFA through one forest geneticist has provided guidance and coordination, while PNW with a staff of four scientists plus technicians has provided guidance and supporting research. Silen (PNW) and Wheat (IFA) work as a team with each of the cooperatives. No direct charge is made for their services, since the former is supported by federal tax money; and the latter through membership dues.

So far, this IFA-PNW staff has been able to handle a nearly exponential expansion in programs without any increase in their personnel. This has been possible only because every new program has added an appropriate number of new field personnel from cooperators. It has also been possible because ours has been a limited advisory role, and because research applicable to a few is just as applicable to many. However, there will come a day when our limit becomes evident.
COOPERATORS IN TREE IMPROVEMENT PROGRAMS
IN WESTERN OREGON AND WESTERN WASHINGTON

Species: Douglas fir, western hemlock, noble fir

LANDOWNERS

U. S. Forest Service
Bureau of Land Management
Crown Zellerbach Corp.
International Paper Co.
Oregon State Forestry Dept.
ITT-Rayonier, Inc.
Simpson Timber Company
St. Regis Paper Company
Scott Paper Company
Champion International
Timber Service Company
Burlington Northern, Inc.
Georgia-Pacific Corp.
Willamette Industries, Inc.
H. Crook Estate
Longview Fibre Company
Pope & Talbot, Inc.
Boise Cascade Corp.
Menasha Corporation
Publishers Paper Co.
Agnew Timber Products
Giustina Bros. Lbr. & Plywood Co.
Starker Forests
Merrill & Ring
Hampton Tree Farms
Simonson Lumber Co.
Pacific Denkmann Co.
Davidson Industries
Coos County (Oregon)

GUIDANCE & RESEARCH

Industrial Forestry Association

Pacific Northwest Forest & Range Experiment Station (U.S. Forest Service)