A Guide To Forest-Tree Collections Of Known Source Or Parentage In The Western United States And Canada

Results Of A Preliminary Survey

A. F. STETTLER AND J. C. CUMMINGS

Bulletin No. 3 • Coniferous Forest Biome • Ecosystem Analysis Studies • U.S./International Biological Program

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ABSTRACT

This publication reports the results of a preliminary survey listing 527 forest-tree plantations in the western United States and Canada. Of these, 250 involve families of known parentage, 131 provenance-test material, 87 clonal material, and 59 interspecific hybrids. The report is intended (1) to serve forest researchers in locating genetic material relevant to their work, and (2) to facilitate an assessment of regional forest-gene resources. A list of agencies, a species index, a brief discussion of survey results, and recommendations complete the report.

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INTRODUCTION

> . . . The remarkable differences between replicates are probably due to genetic variation in the plant material used. The experiment should be repeated on clonally propagated stock. . . .
>
> . . . I wish we had, side by side, trees from a coastal and from an interior source to test this hypothesis. . . .
>
> . . . The beetles seem to be able to tell these two trees apart. Of course, they could be genetically different, but we don't know. . . .

Such statements are commonly found in forestry publications or theses and are frequently heard in conversations among forest researchers. They bear witness to the fact that pedigree trees would be useful in many contexts but are hard to obtain. Or are they? Not if we consider the increasing number of living collections of forest trees growing in research arboretums, clone banks, commercial breeding orchards, and provenance and progeny-test plantations that have been established over the years. While possibly not as convenient as a mail-order strain of white mice, these living collections constitute an important resource both as research material and as a repository of germ plasm.

In the western United States and Canada, this resource has been steadily augmented ever since the first seed-source test plantations of ponderosa pine were established in 1911 in Idaho. They are still in existence and, together with the historical 1913 Douglas-fir test plantations, provide a long-term record rarely found on this continent. Valuable tree material has also been accumulated at the Institute of Forest Genetics in Placerville, California, where nearly 50 years of systematic efforts have resulted in probably the most complete arboretum of pine species and hybrids in the world. Beyond such singular collections, there are an increasing number of breeding orchards, clone banks, and test plantations materializing from long-term commitments made to genetic tree improvement by private industry and public agencies in the region. Collectively, this material represents a major economic and biological investment. If used to its fullest potential, it will pay handsome dividends.

Where is this material, what is its nature, and how can it be used? More importantly, how does this material relate to the natural populations from which it was derived, and does it provide an adequate pool of genetic variability for tree generations to come? These are the questions to which this report is addressed. Thus, while of interest to forest geneticists, this report is intended primarily for researchers in <u>other</u> disciplines, so that they may become aware of this regional resource and participate in putting it to a wise use.

BACKGROUND

At its first meeting on 20 April 1972 the genetics committee[1] of the Coniferous Forest Biome (IBP) recognized two major needs as falling within its purview: (1) to advise on the preservation of gene resources and (2) to facilitate coordination between researchers in forest genetics and those in other disciplines. The two needs may be briefly explained.

Preservation of Gene Resources

Domestication of our major agricultural crop plants took place over a period of 2000-9000 years. Associated with domestication were systematic changes in the original gene pools, involving depletions and shifts in gene frequencies. Today it is impossible to reconstruct a faithful picture of the original gene pools, let alone to restore them physically. Yet our future success in plant breeding will be limited, or at least hindered, by our failure to understand adequately the cause-and-effect relationship between natural populations and their environments, as well as by the reduced genetic diversity available in a given species.

In forest trees, however, domestication has only just begun. Thus we have the opportunity of avoiding the restraints within which agriculturists must now operate. It calls for systematic efforts involving (1) the genetic study of natural populations both in the centers of diversity and at the periphery of natural distribution ranges, and (2) the preservation of genetic diversity.

The region west of the Rocky Mountains is one of the few remaining large reservoirs of natural and near-natural, economically important forest-tree populations in the world. The region harbors a vast acreage of production-oriented, intensively managed forest land, and also contains some of the most rapidly expanding urban agglomerates. Thus there are the resources, there is an economic incentive, and there is the urgency to launch a successful program aimed at preserving forest gene resources in this region.

One of the most tangible efforts of gene preservation has been the recent symposium on the conservation of forest gene resources organized by the Committee on Forest Tree Breeding in Canada (Fowler and Yeatman, eds., 1973). Its proceedings provide an excellent overview of the subject, in both its theoretical aspects and practical implications, from

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[1] Drs. R. K. Campbell, W. K. Hershberger, W. J. Libby, G. I. McDonald, F. Sorensen, and R. F. Stettler (Chairman). In 1973 two additional members, Drs. P. S. Dawson and M. T. Conkle, joined the committee.

a variety of perspectives. While we make no attempt to review this conference, we feel that its emphasis on a *combined* approach to preservation, namely, in situ and ex situ, deserves mention. Clearly, gene conservation is achieved not only in natural preserves, but equally importantly in the breeding orchards, clone banks, test plantations, and seed and pollen collections of forest genetics researchers and of operational tree-breeding programs.

Multidisciplinary Coordination

Recent concerns for long-term efficiency and soundness in forest management have emphasized the increasing need for a holistic approach both in the use and in the perpetuation of forest resources. To this end, information from a variety of disciplines must be integrated and brought to bear on management planning and operational decisions. The traditional approach, i.e., to solve one problem at a time by isolating it from all the others, has inherent shortcomings whenever we deal with *systems*, as forests are, in which all components and processes are to some extent interdependent. In such systems, as has been abundantly demonstrated, the effects of any number of factors may not be simply additive but may involve significant interactions that cannot be predicted from knowing the effect of each factor operating independently. Clearly, this calls for multidisciplinary teams studying clusters of problems that can then be integrated into an overall framework.

For example, to the extent that a significant proportion of our future production forests will be established from selectively bred stock, we need to know:

1. whether different strains react differently to intensive cultural treatments (fertilizer applications, pruning, thinning, etc.) and, if so, to what extent this should be considered in the selection of parents;

2. how stands composed strictly of high-performance genotypes behave in long-term overall productivity, site fertility, stability relative to perturbations, and so on, as compared with stands composed of mixes of contrasting genotypes or as compared with natural stands;

3. what resistance mechanisms are inherent in our stands of tomorrow and how these mechanisms are expected to operate under the environmental conditions they are likely to experience; how these stands will cope with the constant, if mild, selection pressures from endemic pathogens, and, perhaps more importantly, how effectively they are buffered against the most likely exotic pests to be anticipated.

Questions also can be formulated relative to naturally regenerated forests, protection forests, and recreational forests.

Answering these questions requires, on the one hand, a sufficient and rapid flow of information among forest geneticists, physiologists, ecologists, pathologists, entomologists, soil scientists, and other specialists. On the other hand, it requires that these specialists physically coordinate their work to focus on the *same experimental material*. There are but few precedents for such physical integration in the region. Probably the best operational example is the well-coordinated group of USDA Forest Service researchers working since 1949 on the complex question of blister rust resistance in western white pine (Bingham et al. 1971). Increasingly, we become aware that the convenience of working with the tree that happens to stand in front of the laboratory, or the commercial seedlot that happens to be available in one's refrigerator, should not be the decisive argument in the choice of experimental material. In fact, such a choice may exact an unduly high price in the ultimate interpretation of results. In the past, such practice often could be explained by the fact that alternative material more suited to the experimental needs was not available. As we try to document in this report, this is no longer so.

Committee action

Recognizing the needs for forest gene preservation and multidisciplinary coordination among forest researchers, the Genetics Committee of the Coniferous Forest Biome (IBP) decided to conduct a preliminary survey of known forest genetics material available in the western United States and Canada, and to bring this material to the attention of those who are likely to be interested in it or to make use of it. The results from this survey are presented in this report. Incomplete as it is, it may serve in the short run as a useful medium at the interface of several disciplines in forest research, and in the long run to stimulate efforts for a more complete accounting of the forest gene resources in the region.

THE SURVEY

This survey was planned during the summer of 1972. Its objectives were: (1) to provide a listing in which forest researchers can locate genetic material relevant to their work; (2) to provide a vehicle by which owners of such material can advertise the availability of their material for study as well as indicate the type of study most beneficial to their interests; and (3) to facilitate an assessment of regional forest gene resources. As a by-product, this survey would also allow a comparison of forest-genetics activities as a function of geography, agency, and species.

The region for which the survey was conducted was broadly defined as the western United States and Canada, including the Rocky Mountain, intermountain, and Pacific Coast states and British Columbia. The main criteria used for this arbitrary delineation were that the survey had to cover the area of the Coniferous Forest Biome (IBP), and that, from a practical point of view, the Western Forest Genetics Association (WFGA) would serve as the most effective clearinghouse for the information sought. This organization, a branch of the Western Forestry and Conservation Association, draws the bulk of its membership from among forest geneticists, foresters concerned with tree improvement, nurserymen, and the like, affiliated with industry, public agencies, and universities in the western United States and Canada. It is fair to say that from the point of view of both the number of people contacted and those responding, the coverage achieved was best in the Pacific Coast states and British Columbia, less complete in the intermountain states, and spotty in the Rocky Mountain states.

On 2 August 1972 the plan for the survey was brought to the attention of the WFGA members attending the annual meeting in Corvallis, Oregon, and their cooperation was solicited. Subsequently, questionnaires were designed and critically reviewed by members of the CFB/IBP directorate, the genetics committee, and a few additional experts in the region. The questionnaires were then revised and transcribed to a computer format for a CDC 6400 computer. Apart from other advantages, this made it possible to integrate the questionnaire forms with the mailing list and thus to print personalized forms.[2] This, in turn, minimized any errors during the compilation of returns.

On 5 October 1972 the questionnaires were sent out to all 241 addresses of the then-current WFGA mailing list. Returns were requested by 30 October but those arriving as late as April 1973 were included in this report.

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[2] See pages 54-57.

Each return was copied and filed together with all pertinent correspondence, reports, and so on, for future reference. No reminders were sent out to addressees failing to respond except in two cases where we knew of valuable tree collections that had not been reported. A few returns were omitted from this report because they came from outside the geographical boundaries set for the survey (e.g., Michigan, Illinois) or they reported material that was still at the seed stage.

At the termination of this report, 48 respondents from 35 different agencies in eight states and one province had returned information describing over 500 plantations involving 44 different species and many additional species hybrids. This information is presented in the subsequent tables.

THE TABLES

The survey data have been compiled in two types of tables, each of which offers a different criterion for access: Table 1 is a summary of agencies (organizations responsible for the reported forest-tree collections listed by region). Tables 2-5 are summaries of the different types of material in the reported forest-tree collections. Finally, there is a species index to the tables.

The tables contain the most essential, but not all, information requested on the questionnaires. Additional information on a particular material may be obtained from R. F. Stettler (College of Forest Resources, University of Washington AR-10, Seattle, WA 98195) or, preferably, from the agency or principal investigator involved.

Terminology and abbreviations used in the tables are defined on page 58 and on a loose sheet inserted in each copy of the report. Some editorial discretion was used in the preparation of the tables. As previously mentioned, plant material at the seed stage was not included in the report. Nursery material was incorporated only if it was to be outplanted within a year and if the outplanting locations were already known. In a few cases there was not sufficient information given on a material to make its inclusion meaningful. Additional explanations are given with each table.

DISCUSSION OF SURVEY RESULTS

Incomplete as this survey is, it documents a number of trends that are likely to persist even in a more complete sampling and therefore deserve mention.

Types of Material

Of the 527 tree collections and plantations reported in this survey, 250 involve families of known parentage, 131 provenance-test material, 87 clonal material, and 59 interspecific hybrids. The proportionate distribution of these various types of materials should not be discussed without pointing out the deliberate omission in our data of the interspecific hybrid material at the Institute of Forest Genetics (IFG) in Placerville. This institution, the first of its kind in this country, has focused much of its effort over the 48 years of its still-active research program on interspecific hybridization, notably in the genus *Pinus*. The resulting material, including backcrosses and advanced-generation hybrids, has been established in numerous test plantations primarily in California but in smaller numbers in other states as well (Tichenor 1965). While this monumental program is acknowledged, it is not duly represented in our survey except in summary fashion. Accordingly, the low profile of interspecific hybrid material in Figure 1 should be interpreted with caution. Another shortcoming of Figure 1 is that it is based on the numbers of plantations rather than on the acreage or plant numbers involved, as the latter figures are not available. Since plantations with families of known parentage, particularly open-pollinated progenies, tend to involve larger numbers and acreages than clonal collections, the prominence of the former over the latter, as shown in Figure 1, should be probably even more pronounced. This is not surprising since the establishment and maintenance of clonal material, particularly in the heavily represented Douglas-fir, is more cost-intensive than that of any alternative material.

Sponsoring Agencies

The breakdown of sponsoring agencies (Figure 1) demonstrates a significant involvement of private industry in the two types of material (families of known parentage, and clonal material) most directly related to the genetic improvement of managed forests. About two-thirds of the industrial contribution to families of known parentage is attributable to the Cooperative Industrial Forestry Association, while the contribution to clonal material is more uniformly distributed among the seven

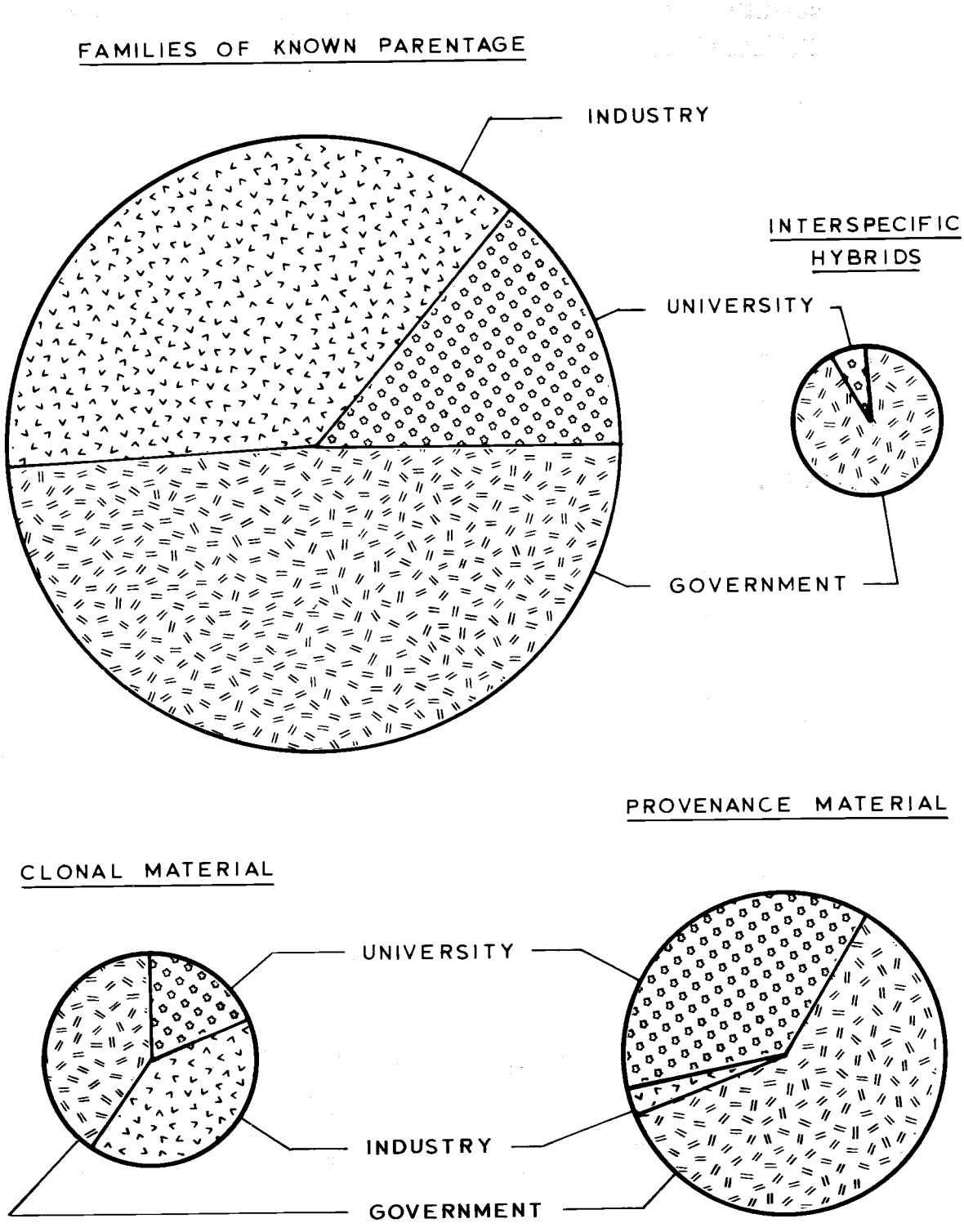

Figure 1. Distribution of genetic material by type and by agency. The diameter of each circle is proportionate to the number of plantations of each type of material. The Interspecific Hybrids circle does not include any material at the Institute of Forest Genetics, Placerville, California.

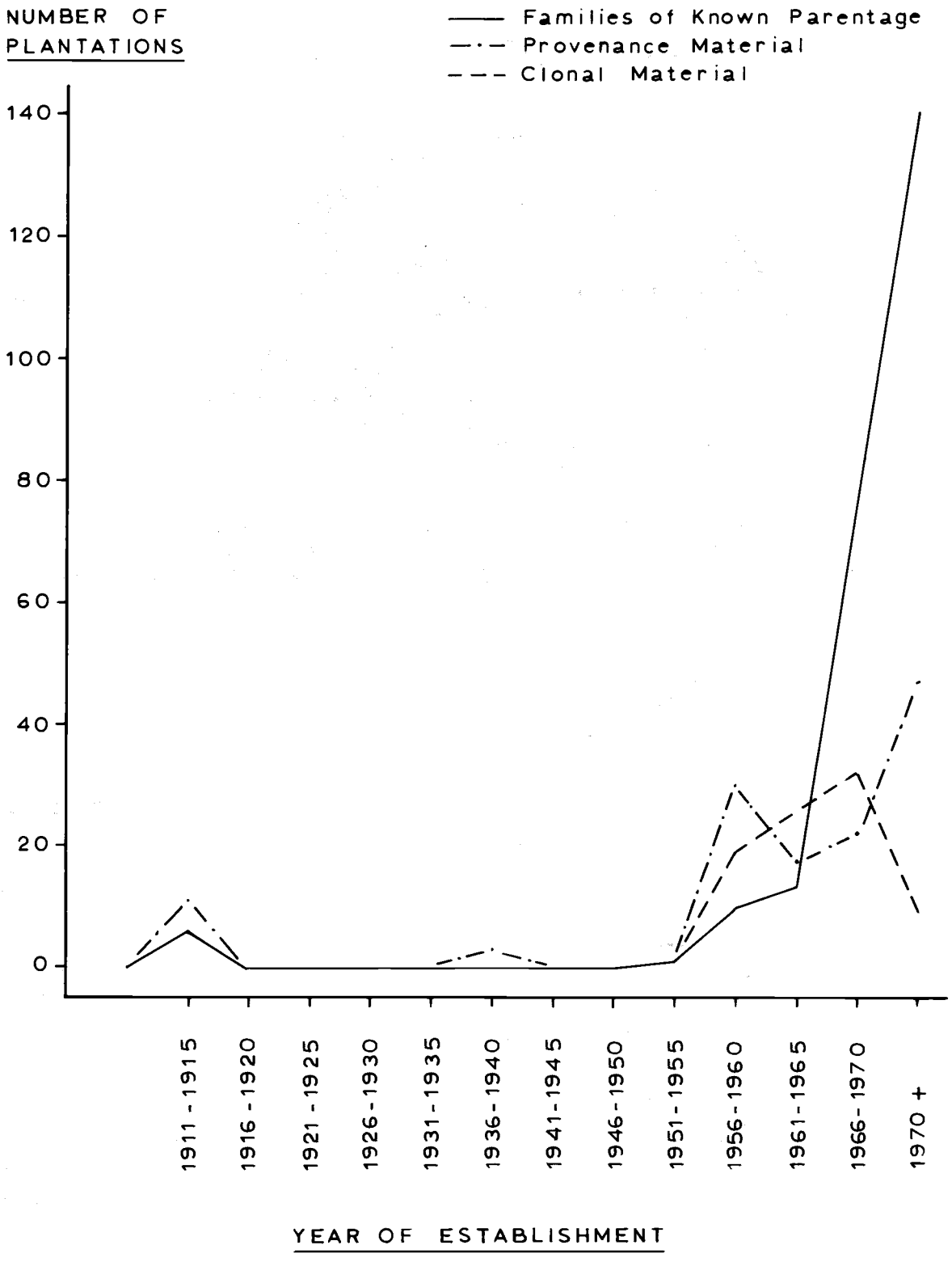

Figure 2. Temporal trends in the establishment of plantations.

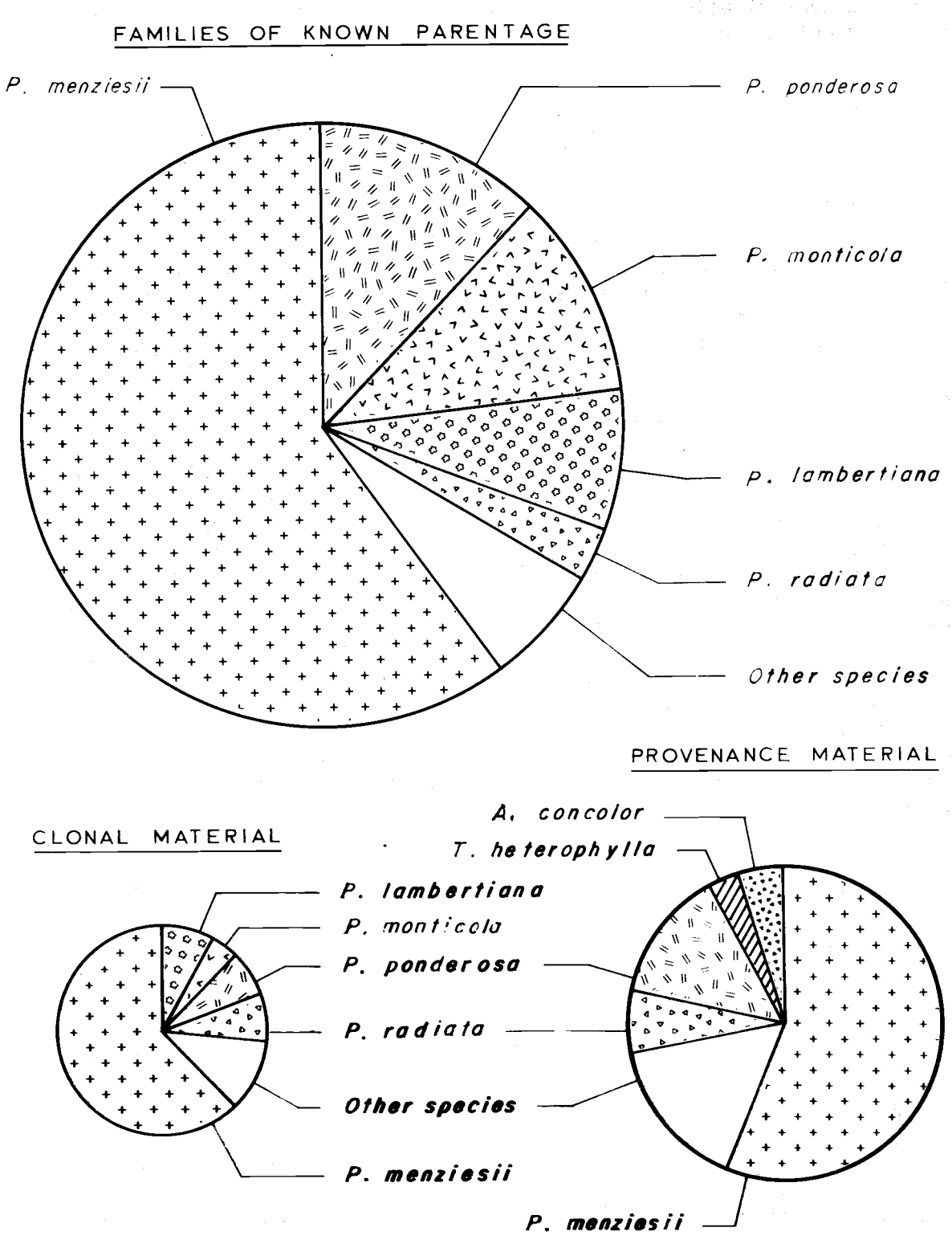

Figure 3. Distribution of genetic material by type and by species. The diameter of each circle is proportionate to the number of plantations of each type of material.

industrial agencies reporting. By contrast, provenance tests and interspecific hybridization experiments are undertaken primarily by government and university agencies.

Temporal Changes

Figure 2 presents a capsule history of forest genetics in the western United States and Canada. After the early pioneering efforts in the 1910s, there was a quiescent period (except for the activities at the IFG beginning in 1925 and not shown in the graph) until the 1950s. At that time, work began in earnest along two major lines: (1) establishment of provenance tests to determine major patterns of geographic variation and to serve as a guide in the designation of seed-collection zones, and (2) selection of "plus-trees" and their establishment in clonal orchards. During the middle sixties, a major change occurred when it was realized that host/graft incompatibility was beginning to cause significant losses in Douglas-fir clonal orchards. Although techniques were eventually developed to minimize this problem, it caused the major shift in strategy from clonal to seedling orchards that is reflected in the dramatic increase in plantations of families of known parentage. By 1970, genetic tree improvement had established itself as an accepted practice in intensive forest management of the region. We have every reason to believe that the vast acreages allocated during the last two to three years to plantations of known genetic stock are not a transient boom but represent a systematic change in management attitudes. It seems safe to say that there will be a sustained annual increment in the number of such plantations, and that, if efforts should be made to develop an inventory system of this rapidly expanding resource for the benefit of researchers and managers, now is the time to do it.

Species Coverage

As shown in Figure 3, Douglas-fir accounts for the bulk of the material in provenance plantations, clonal collections, and families of known parentage. In fact, more than one-half the total number of plantations included in this survey are Douglas-fir plantations in the Pacific Northwest (British Columbia, Washington, and Oregon). Second in prominence are the pines, notably ponderosa and western white pine in the intermountain region. The representation of hemlock, coast redwood, spruces, and true firs is scanty, whereas the most important hardwood, red alder, occurs in a single provenance test, and two commercially significant species, western redcedar and western larch, are not represented at all.

Sampling errors of this survey and incomplete reporting may account for part but not all of the species bias. We also realize that the number

of plantations devoted to a given species provides at best an incomplete measure of the amount of research effort spent and the genetic information potential gained on this species. On the other hand, there are few, if any, alternatives in obtaining basic information on the amount and pattern of geographic variation within a species than to conduct a provenance test.

In spite of these shortcomings, the question may be asked, to what extent the relative allocations of space, time, and effort to the various species, as portrayed in Figure 3, are in agreement with regional priorities, taking into account the current and future importance of these species. While hardly one to be answered in a simple forthright fashion and for the region as a whole, this question must be addressed from time to time and reexamined at regular intervals as management and research policies are formulated. Nor should the answers be left to the whims of the market. In this light, it seems hard to explain why it took so long for any systematic work on western hemlock to begin when this species has maintained a prominent position on the lumber market for several decades and dominated the pulpwood market for many years as well. Sitka spruce, western redcedar, lodgepole pine, western larch, red alder, and coast redwood are further examples of unjustified neglect. Considering the time it takes to develop the most basic genetic information on any species, it seems hardly a wise practice to delay the initiation of systematic research programs until we need the know-how.

Cooperative Research

All respondents in our survey were receptive to establishing cooperative research on their material. Since few plantations have definite expiration dates, sampling is generally confined to the nondestructive type or must be coordinated with planned thinnings. Understandably, the kinds of cooperative research suggested by the respondents are related to the maintenance and perpetuation of forest-genetic material. For example, areas of primary concern were cone initiation, protection of cones from insects, scion/rootstock incompatibility, estimation of heritability, pollen dispersal, and collection and storage of pollen and seed. In addition, a wide range of other research possibilities was suggested including the disciplines of entomology, pathology, and physiology. The availability of a given material for a particular type of study, and the constraints pertaining to its use, can best be ascertained by direct contact with the agency and investigator involved.

RECOMMENDATIONS

We fully realize that the readers of the following recommendations may be only a fraction of those to whom they are addressed. Nonetheless, we hope that the substance of the recommendations eventually will reach those who are instrumental in formulating operational and research policies as well as those responsible for implementing them.

1. We recommend that the forest-tree material listed in this report be brought to the attention of, and made available to, a broad spectrum of researchers, and that the use of this and related but unlisted material in multidisciplinary studies be encouraged.

2. We recommend that more effective methods be studied for collecting, storing, updating, and disseminating information on forest-genetic material. Specifically, we recommend that the appropriate professional societies (e.g., Canadian Institute of Forestry, Society of American Foresters, Western Forestry and Conservation Association, Western Forest Genetics Association, and so on) appoint study committees to examine the needs for establishing a data bank and to make recommendations as to its format and funding.

3. We recommend that a careful assessment be made of regional priorities relative to genetic information needed on specific species. Specifically, we recommend that those concerned with formulating research policy in public agencies and private industry develop a coordinated framework to serve as a long-term master plan that transcends the temporal or spatial limitations of individual organizations. Additional working groups, similar to those concerned with the genetics of western hemlock, Sitka spruce, and the like, should be formed to coordinate studies on those species receiving a high rating in regional priority. Special attention should be paid to an early establishment of long-term provenance studies.

4. Finally, we recommend that a careful assessment be made of the current and future needs for forest gene preservation in the region, with special emphasis being placed on identifying endangered species and on coordinating action programs for a balanced in situ and ex situ storage of germ plasm.

ACKNOWLEDGMENTS

We gratefully acknowledge the help received from several people in different phases of this project: Eddie R. Hamerly advised us on all matters concerning the computer program; Harry E. Bell compiled the data from the questionnaires; Martha G. Ellis painstakingly scrutinized all the tables and edited the report; D. W. Cole, M. T. Conkle, P. S. Dawson, S. P. Gessel, R. P. Guries, W. H. Hershberger, W. J. Libby, and H. Riekerk critically reviewed the manuscript and made many valuable suggestions. The work reported in this paper was supported by National Science Foundation grant no. GB-20963 to the Coniferous Forest Biome, Ecosystem Analysis Studies, U.S./International Biological Program. This is contribution 17 from the Coniferous Forest Biome.

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TICHENOR, L. M. 1965. Research at the Institute of Forest Genetics--A bibliography, 1927-1965. USDA For. Serv., Pac. Southwest For. Range Exp. Stn., Berkeley, Calif. 18 p.

Table 1. Agencies responsible for forest-tree collections of known source or parentage.

This table lists the addresses of organizations, by region and state or province, under whose jurisdiction falls a particular collection of tree material. Name(s) of principal investigator(s) if known and numbers of plantations by species and type of material are also included. For a given state or province, this table serves as a quick summary of the species and type of material under investigation by the various agencies.

Abbreviations are explained on page 58.

Table 1. Agencies responsible for forest tree collections of known source or parentage.

	Agency	Investigator	Type of material	Number of plantations by species
		PACIFIC NORTHWEST		
		British Columbia		
BC-1	British Columbia Forest Products 1190 Melville Street Vancouver 5, B.C., CANADA	Burch, W. G.	FAM CL PROV HYB	*P. menziesii* (2) *P. menziesii* (3) *P. menziesii* (1)
BC-2	British Columbia Forest Service Reforestation Div., Koksilah Nursery 5847 Chesterfield Street Duncan, B.C., CANADA	Seed Orchard Forester	FAM CL PROV HYB	*P. menziesii* (3) *P. menziesii* (3)
BC-3	British Columbia Forest Service Research Division Parliament Buildings Victoria, B.C., CANADA	Heaman, J. C. Illingworth, K. Orr-Ewing, A. Schmidt, R. L.	FAM CL PROV HYB	*P. contorta* (2), *P. menziesii* (31) *P. contorta* (1), *P. menziesii* (2) *P. contorta* (2), *P. menziesii* (35)
BC-4	British Columbia, University of Faculty of Forestry Vancouver 8, B.C., CANADA (Res. Forest, P.O. Box 506, Haney)	Smith, J. H. G. Sziklai, O. Walters, J.	FAM CL PROV HYB	*P. menziesii* (5) *Populus* spp. (1), *P. menziesii* (1) *P. menziesii* (2)
BC-5	Canadian Forest Products Box 11, Woss Camp Beaver Cove, B.C., CANADA	Hopwood, W. A.	FAM CL PROV HYB	*P. menziesii* (1) *P. menziesii* (2)

BC-6	Canadian Forestry Service Pacific Forest Research Center 506 West Burnside Road Victoria, B.C., CANADA	Piesch, R.	FAM CL PROV HYB	*T. heterophylla* (1) *P. sitchensis* (1), *P. monticola* (2), *P. menziesii* (2), *T. heterophylla* (1) *T. heterophylla* (4) *Picea*, 2 spp. (1)
BC-7	MacMillan-Bloedel, Ltd. Forestry Division 55 Gordon Street Nanaimo, B.C., CANADA	Handley, D. L.	FAM CL PROV HYB	 *P. menziesii* (3) *P. menziesii* (3)
BC-8	Pacific Logging Company, Ltd. P.O. Box 10 Victoria, B.C., CANADA	Crown, M.	FAM CL PROV HYB	*P. menziesii* (3) *P. menziesii* (4)
BC-9	Tahsis Company, Ltd. East Asiatic House 1201 West Pender Street Vancouver 1, B.C., CANADA	Rasmussen, S.	FAM CL PROV HYB	*P. menziesii* (5) *P. menziesii* (13)
		Washington		
WA-1	Industrial Forestry Association Route 12, Box 475 Olympia, Washington 98503	Wheat, J.	FAM CL PROV HYB	*P. menziesii* (69) *P. menziesii* (1)
WA-2	USDA Forest Service Olympic National Forest Shelton Ranger Station P.O. Box 520 Shelton, Washington 98584	Allen, V. E.	FAM CL PROV HYB	*P. menziesii* (1) *P. menziesii* (1)
WA-3	Washington, State of Department of Natural Resources Forest Land Management Center Olympia, Washington 98504	Wilson, B. C.	FAM CL PROV HYB	*P. menziesii* (10)

	Agency	Investigator	Type of material	Number of plantations by species
WA-4	Washington, University of College of Forest Resources, AR-10 Seattle, Washington 98195	Stettler, R. F.	FAM CL PROV HYB	*P. trichocarpa* (1), *P. menziesii* (2) *Populus*, 4 spp. (1)
WA-5	Weyerhaeuser Company Forestry Research Center P.O. Box 420 Centralia, Washington 98531	Daniels, J. D. Webb, W.	FAM CL PROV HYB	*P. ponderosa* (4), *P. menziesii* (8), *A. procera* (1), *P. menziesii* (7)
		Oregon		
OR-1	Crown Zellerbach Corporation P.O. Box 998 Seaside, Oregon 97138	Malmberg, D.	FAM CL PROV HYB	 *P. menziesii* (1)
OR-2	Georgia Pacific Corporation P.O. Box 248 Springfield, Oregon 97477	Hahn, P.	FAM CL PROV HYB	 *P. menziesii* (1)
OR-3	Oregon State University Dept. of Botany and Plant Pathology Corvallis, Oregon 97331	Roth, L. F.	FAM CL PROV HYB	 *P. ponderosa* (2)
OR-4	Oregon State University School of Forestry Corvallis, Oregon 97331	Ching, K. K. Hermann, R. K. Irgens-Moller, H.	FAM CL PROV HYB	*P. menziesii* (2) *P. menziesii* (27) *Pseudotsuga*, 2 spp. (1)

OR-5	USDA Forest Service, Region 6 P.O. Box 3623 Portland, Oregon 97208	Theisen, P.	FAM	*P. lambertiana* (1), *P. monticola* (1), *P. menziesii* (1)
			CL	*P. lambertiana* (1), *P. monticola* (1), *P. ponderosa* (1), *P. menziesii* (4)
			PROV	*A. rubra* (1)
			HYB	*Pinus*, 2 spp. (33)
OR-6	USDA Forest Service Deschutes National Forest, Bend Nursery Route 3, Box 965 Bend, Oregon 97701	Bigelow, C.	FAM	
			CL	
			PROV	
			HYB	*Pinus*, 2 spp. (1)
OR-7	USDA Forest Service Pacific Northwest Forest and Range Experiment Station Forestry Sciences Laboratory P.O. Box 887 Corvallis, Oregon 97330	Silen, R.	FAM	*P. ponderosa* (3), *P. menziesii* (3)
			CL	*P. menziesii* (1)
			PROV	*P. ponderosa* (5), *P. menziesii* (5)
			HYB	
OR-8	USDA Forest Service Siuslaw National Forest 545 South Second Street Corvallis, Oregon 97330	Oliver, D. M.	FAM	
			CL	*P. menziesii* (1)
			PROV	
			HYB	
OR-9	USDI Bureau of Land Management 729 N.E. Oregon Street Portland, Oregon 97208	Mayer, B.	FAM	*P. lambertiana* (17), *P. monticola* (16)
			CL	*P. lambertiana* (1), *P. menziesii* (1)
			PROV	
			HYB	

PACIFIC SOUTHWEST

California

CA-1	California, State of Division of Forestry 1416 Ninth Street Sacramento, California 95814	Hartzell, L. E.	FAM	*P. ponderosa* (11)
			CL	*P. menziesii* (1)
			PROV	*P. radiata* (1)
			HYB	*Pinus*, 4 spp. (11)

	Agency	Investigator	Type of material	Number of plantations by species
CA-2	California, University of School of Forestry and Conservation Berkeley, California 94720	Libby, W. J.	FAM	*A. concolor* (4), *P. muricata* (4), *P. radiata* (7), *S. sempervirens* (1)
			CL	*P. radiata* (6), *S. gigantea* (2), *S. sempervirens* (3)
			PROV	*A. concolor* (6), *P. muricata* (3), *P. radiata* (7),
			HYB	*Pinus*, 2 spp. (1)
CA-3	USDA Forest Service, Region 5 Division of Timber Management 630 Sansome Street San Francisco, California 94111	Alden, J.	FAM	*P. menziesii* (1)
			CL	*P. lambertiana* (1), *P. ponderosa* (1), *P. menziesii* (1)
			PROV	
			HYB	
CA-4	USDA Forest Service El Dorado National Forest 100 Forni Road Placerville, California 95667	Parks, G.	FAM	
			CL	*P. lambertiana* (2), *P. ponderosa* (2), *P. menziesii* (1)
			PROV	
			HYB	*Pinus*, 4 spp. (2)
CA-5	USDA Forest Service Pacific Southwest Forest and Range Experiment Station P.O. Box 245 Berkeley, California 94701	Conkle, M. T. Critchfield, W. B. Johnson, L. Kinloch, B. B.	FAM	*P. lambertiana* (1)
			CL	*P. lambertiana* (2)
			PROV	*P. ponderosa* (3)
			HYB	*Abies*, 6 spp. (4); *Pinus*, numerous hybrids (see page 50)

INTERMOUNTAIN

Idaho

ID-1	USDA Forest Service Intermountain Forest and Range Experiment Station Forestry Sciences Laboratory P.O. Box 469 Moscow, Idaho 83843	Bingham, R. T. Hoff, R. J. Rehfeldt, G. E. Steinhoff, R.	FAM CL PROV HYB	*P. flexilis* (2), *P. griffithii* (1), *P. monticola* (7), *P. strobiformis* (1), *P. menziesii* (2) *P. monticola* (1) *P. ponderosa* (1) *Pinus*, 2 spp. (1)

Montana

MT-1	USDA Forest Service, Region 1 Division of Timber Management Federal Building Missoula, Montana 59801	Howe, G. E.	FAM CL PROV HYB	*P. monticola* (3), *P. ponderosa* (8) *P. monticola* (1) *P. engelmannii* (1), *P. pungens* (1) *Picea*, 2 spp. (1)

Utah

UT-1	USDA Forest Service, Region 4 Division of Timber Management 324 - 25th Street Ogden, Utah 84401	Patee, R.	FAM CL PROV HYB	*P. ponderosa* (2) *P. ponderosa* (4)

ROCKY MOUNTAIN

Arizona

AZ-1	USDA Forest Service Rocky Mountain Forest and Range Experiment Station Forestry Sciences Laboratory Northern Arizona University, Box 4078 Flagstaff, Arizona 86001	Schubert, G. H.	FAM CL PROV HYB	 *P. ponderosa* (1) *Pinus*, 2 spp. (1)

	Agency	Investigator	Type of material	Number of plantations by species
		Nebraska		
NE-1	USDA Forest Service Rocky Mountain Forest and Range Experiment Station 205 Miller Hall, East Campus University of Nebraska Lincoln, Nebraska 68503	Bagley, W. T. Read, R. A.	FAM	*P. ponderosa scopulorum* (3)
			CL	
			PROV	*F. pennsylvanica* (2), *L. leptolepis* (1), *P. banksiana* (4) *P. flexilis/strobiformis* (1) *P. nigra* (1), *P. ponderosa* (4), *P. resinosa* (1), *P. rigida* (1) *P. strobus* (1), *P. sylvestris* (1) *P. deltoides* (1), *P. menziesii* (1) *Q. macrocarpa* (1), *Q. rubra* (1)
			HYB	*Populus*, 2 spp. (1)

Table 2. Families of known parentage.

This table lists, by species and agency, the location of plantations involving families of which one or both parents are known (but excluding interspecific hybrids, which are listed in Table 5). It also gives the year of plantation establishment, the number of parents represented and, where known, the general criteria by which the parents were selected.

Explanations: The agencies are referred to by their code numbers as given in Table 1. Under "No. of parents" a single number refers to the number of female parents involved, a double number to the number of female and male parents, respectively (e.g., 11/14 means 11 female and 14 male parents). States are indicated after counties when the county is outside the state coded in column 1.

Abbreviations are explained on page 58.

Table 2. Families of known parentage.

Agency	Plantation	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	No. of parents	Type	Selection criteria
			Abies concolor					
CA-2	Hoopa	41°05'/123°40'	1350	Humboldt	65-66	40	OP	
	Baker	39°55'/121°05'	1200	Plumas	65-66	40	OP	
	Blodgett	38°50'/120°35'	1250	El Dorado	65-66	40	OP	
	Camino	38°45'/120°40'	1020	El Dorado	65-66	40	OP	
			Pinus contorta					
BC-3	Red Rock	53°46'/122°42'	620	Mainland	71+73	785	OP	F,G,C
	Stone Fire	53°40'/122°30'	750	Mainland	71+73	785	OP	F,G,C
			Pinus flexilis					
ID-1	Priest River	48°22'/116°48'	850	Bonner	68	70	OP	
	Benton Creek	48°21'/117°50'	1400	Bonner	72		OP	
			Pinus griffithii					
ID-1	Benton Creek	48°21'/117°50'	1400	Bonner	72		OP	
			Pinus lambertiana					
CA-5	Happy Camp	45°40'/123°20'	900	Siskiyou	62-72		HS,FS,OP	BRR
OR-5	Dorena	43°42'/122°58'	300	Lane	58		SF,HS,FS	BRR
OR-9	Sprague	42°30'/123°35'	300	Josephine	68		SF,FS,HS	BRR,G,F
	16 plantations in northern California and Oregon		300-1500		68-72		HS,FS	BRR

Pinus monticola

ID-1	Priest River	48°22'/116°48'	850	Bonner	55-59	29	OP	BRR
	Priest River	48°22'/116°48'	850	Bonner	55-59	20/23	FS	BRR
	Priest River	48°22'/116°48'	850	Bonner	55-59	10	SF	BRR
	Hog Meadows	46°50'/116°25'	900	Latah	71	220	OP	
	Priest River (Ida Creek)	48°22'/116°48'	750	Bonner	71	220	OP	
	Canyon Creek	48°21'/117°50'	730	Bonner			HS,FS	BRR
	Canyon Creek	48°21'/117°50'	730	Bonner	71		HS,FS	BRR
MT-1	Coeur D'Alene	47°45'/116°50'	680	Kootenai(ID)	71	12/12	FS	BRR
	Lone Mountain	48°45'/116°45'	760	Kootenai(ID)	71	12/12	FS	BRR
	Lone Mountain	47°45'/116°45'	760	Kootenai(ID)	71	12/12	FS	BRR
OR-5	Dorena	43°42'/122°58'	300	Lane	58		SF,HS,FS	BRR
OR-9	16 Plantations in northern California and Oregon		300-1500		68-72		HS,FS	BRR

Pinus muricata

CA-2	Jackson State For.	39°20'/123°30'	120	Mendocino	65	98	OP	
	Russell	37°55'/122°08'	250	Contra Costa	65	98	OP	
	Russell	37°55'/122°08'	240	Contra Costa	68	160	OP	
	Naval Weapons	37°58'/121°59'	100	Contra Costa	68	160	OP	

Pinus ponderosa

CA-1	11 Locations in northern and central California				70+72	9/10	FS	G,F
MT-1	Wolf Creek	48°15'/115°05'	1000	Lincoln	74	432	HS,OP	G,F
	Condon	47°30'/113°40'	1100	Missoula	74	432	HS,OP	G,F
	Savenac	47°25'/115°25'	960	Mineral	74	432	HS,OP	G,F
	Tensed	47°10'/117°50'	790	Benewah(ID)	74	432	HS,OP	G,F
	Lubrecht	46°55'/113°30'	1220	Missoula	74	432	HS,OP	G,F
	State Nursery	46°50'/114°00'	980	Missoula	74	432	HS,OP	G,F
	Rage Creek	46°00'/114°00'	1830	Ravalli	74	432	HS,OP	G,F
	Meadow Creek	45°55'/115°55'	1070	Idaho(ID)	74	432	HS,OP	G,F

Agency	Plantation	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	No. of parents	Type	Selection criteria
OR-7	Deschutes	44°00'/121°30'	1370	Deschutes	12-73	200/200	HS,FS,OP,SF	F
	Linn	44°30'/122°45'	300	Linn	12-73	200/200	HS,FS,OP,SF	F
	Polk	44°48'/123°17'	30	Polk	12-73	200/200	HS,FS,OP,SF	F
UT-1	Boulder Creek	45°08'/116°24'	1450	Adams(ID)	66	270	HS	G
	Holcomb	43°46'/115°59'	1130	Boise(ID)	67	270	HS	G
WA-5	Camp 4-SB	42°07'/122°14'	1230	Klamath(OR)	73	337	OP	G
	Yamsay-BB	42°46'/121°25'	1500	Klamath(OR)	73	337	OP	G
	Yamsay-SB	42°47'/121°19'	1780	Lake(OR)	73	337	OP	G
	Chewaucan-SC	42°26'/120°48'	1650	Lake(OR)	73	337	OP	G
				Pinus ponderosa scopulorum				
NE-1	East campus	40°48'/96°42'	360	Lancaster	58	1	HS,OP	C
	East campus	40°48'/96°42'	360	Lancaster	60	1	HS,OP	C
	East campus	40°48'/96°42'	360	Lancaster	60	1	HS,OP	C
				Pinus radiata				
CA-2	Simpson Coop.	40°58'/123°57'	380	Humboldt	66-67	8/8	SF,FS,OP	
	Russell	37°55'/122°08'	250	Contra Costa	66-67	8/8	SF,FS,OP	
	Gill Tract	37°54'/122°19'	10	Alameda	66-67	8/8	SF,FS,OP	
	Russell	37°55'/122°08'	240	Contra Costa	68	160	OP	
	Naval Weapons	37°58'/121°59'	100	Contra Costa	68	160	OP	
	Jackson State For.	39°20'/123°30'	120	Mendocino	65	76	OP	
	Russell	37°55'/122°08'	240	Contra Costa	65	76	OP	
				Pinus strobiformis				
ID-1	Priest River	48°22'/116°48'	850	Bonner	68	30	OP	

Populus trichocarpa

WA-4	U.W. Arboretum	47°36'/122°20'	20	King	66	9/3	HS	

Pseudotsuga menziesii

BC-1	Caycuse	48°49'/124°33'	450	Van. Island	71	37	OP	G,F
	Caycuse	48°49'/124°33'	450	Van. Island	71	54/18	FS	G,F
BC-2	CRSO-1, Quinsam	50°00'/125°15'	150	Van. Island	68-69	46/12	HS,FS,OP	G,C
	CRSO-2, Snowdon	50°01'/125°15'	140	Van. Island	70-71	42	HS,OP	G,C
	Koksilah S.O.	48°45'/123°41'	10	Van. Island	70	56	OP	F,G,C
BC-3	Cowichan	48°47'/124°08'	160	Van. Island	52	43/43	SF1-SF3,HS	F,C
	Test Site 1	48°35'/123°40'	180	Van. Island	66		FS	G,F
	Test Site 2	48°46'/124°26'	490	Van. Island			FS	G,F
	Test Site 3	48°36'/124°10'	180	Van. Island	66		FS	G,F
	Test Site 4	48°55'/124°05'	520	Van. Island	66		FS	G,F
	Test Site 5	50°11'/123°24'	430	Mainland	67		FS	G,F
	Test Site 6	49°02'/123°35'	30	Van. Island	67		FS	G,F
	Test Site 7	48°34'/123°40'	370	Van. Island	67		FS	G,F
	Test Site 8	50°10'/126°04'	300	Van. Island	67		FS	G,F
	Test Site 9	48°43'/122°58'	670	Mainland	67		FS	G,F
	Test Site 10	49°21'/122°13'	490	Mainland	67		FS	G,F
	Test Site 11	49°54'/126°11'	330	Van. Island	67		FS	G,F
	Test Site 12	50°19'/126°43'	490	Van. Island	67		FS	G,F
	Test Site 13	48°36'/124°11'	240	Van. Island	68		FS	G,F
	Test Site 14	48°41'/124°05'	670	Van. Island	68		FS	G,F
	Test Site 15	49°17'/125°19'	120	Van. Island	68		FS	G,F
	Test Site 16	49°07'/125°42'	30	Van. Island	68		FS	G,F
	Test Site 17	49°57'/126°15'	30	Van. Island	68		FS	G,F
	Test Site 18	49°04'/124°17'	520	Van. Island	69		FS	G,F
	Test Site 19	49°03'/125°02'	500	Van. Island	69		FS	G,F
	Test Site 20	48°47'/124°08'	160	Van. Island	71		FS	G,F
	Test Site 21	48°38'/124°10'	400	Van. Island	71		FS	G,F
	Test Site 22	48°35'/123°46'	640	Van. Island	71		FS	G,F
	Test Site 23	49°10'/124°33'	550	Van. Island	71		FS	G,F
	Test Site 24	50°08'/126°26'	460	Van. Island	71		FS	G,F

Agency	Plantation	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	No. of parents	Type	Selection criteria
	Test Site 25	49°28'/123°35'	610	Mainland	71		FS	G,F
	Test Site 26	50°06'/123°22'	150	Mainland	71		FS	G,F
	Test Site 27	49°21'/122°20'	460	Mainland	71		FS	G,F
	Test Site 28	49°55'/122°55'	610	Mainland	71		FS	G,F
	Cowichan Lake F.E.S.	48°49'/124°07'	180	Van. Island	72	26/4	FS	G,F
	Cowichan Lake F.E.S.	48°49'/124°07'	180	Van. Island	68-72	13/4	FS	G,F
BC-4	Haney	49°17'/122°35'	170	Mainland	67	120	OP	C
	Vancouver	49°16'/123°15'	100	Mainland	67	120	OP	C
	Haney	49°17'/122°35'	150	Mainland	64	4/4	FS	C
	Haney	49°17'/122°35'	170	Mainland	70	540	OP	G,F
	Project 60-4 (Haney)	49°17'/122°35'	370	Mainland	60	35/35	HS,OP	G,F,C
BC-5	Nimpkish progeny test	50°20'/126°40'	720-820	Van. Island	71	27	HS	G,F
BC-8	Sooke	48°30'/123°50'	520	Van. Island	69	30	HS	G,F
	Cowichan	48°43'/124°05'	700	Van. Island	69	30	HS	G,F
	Saanichton S.O.	48°35'/123°25'	80	Van. Island		50	HS	G,F
BC-9	Saanich S.O.	48°35'/123°24'	20	Van. Island	69-71	13/19	FS	G,F
	TP-12	49°59'/126°07'	440	Van. Island	71	11/14	FS	G,F
	TP-12	49°59'/126°07'	440	Van. Island	71	48	OP	G,F
	TP-13	49°48'/126°31'	20	Van. Island	71	1/2	FS	G,F
	TP-13	49°48'/126°31'	20	Van. Island	71	25	OP	G,F
CA-3	Humboldt	41°00'/124°10'	50	Humboldt	69	19	OP	G
ID-1	Emerald Creek	47°00'/116°20'	1050	Latah	73	60	HS	
	Bechtel Mt.	47°00'/116°20'	1440	Latah	73	60	HS	
OR-4	McDonald For.	44°40'/123°40'	600	Benton	67	80/40	HS,OP,FS	G,F
	Hospital tract	44°50'/123°10'	60	Benton	67	80/40	HS,OP,FS	G,F
OR-5	Dennie Ahl	47°26'/123°15'	200	Mason(WA)	58	16/10	FS	G,F

OR-7	Deschutes	44°00'/121°30'	1370	Deschutes	12-73	200/200	HS,FS,OP,SF	F
	Linn	44°30'/122°45'	300	Linn	12-73	200/200	HS,FS,OP,SF	F
	Polk	44°48'/123°17'	30	Polk	12-73	200/200	HS,FS,OP,SF	F
WA-1	Molalla CTIP 9 plantations	44°50'-45°26'/ 121°52'-122°42'	300-760	Oregon	71	375	OP	G,F
	Umpqua CTIP 40 plantations	43°20'-44°17'/ 123°17'-124°10'	0-660	Oregon	71-74	1620	OP	G,F
	Vernonia CTIP 12 plantations	45°26'-46°10'/ 122°50'-123°28'	150-460	Oregon	71	900	OP	G,F
	Burnt Woods CTIP 8 plantations	44°17'-44°44'/ 123°17'-123°58'	150-500	Oregon	71	161	OP	G,F
WA-2	Dennie Ahl	47°26'/123°15'	200	Mason	64	35/10	FS	G,F
WA-3	Sherman Valley	46°53'/123°10'	100	Thurston	65	4/3	FS	F
	Heilman	43°00'/123°40'	30	Douglas(OR)	67	100	OP	F,C
	Kintigh	44°00'/122°58'	100	Lane(OR)	67	100	OP	F,C
	Schudel	44°30'/123°16'	100	Benton(OR)	67	100	OP	F,C
	McKee	44°50'/123°12'	40	Polk(OR)	67	100	OP	F,C
	Martin	45°12'/122°20'	150	Clackamas(OR)	67	100	OP	F,C
	Kirk	46°26'/122°50'	50	Lewis	67	100	OP	F,C
	Hofert	46°57'/122°45'	30	Thurston	67	100	OP	F,C
	Burnett	47°12'/123°20'	100	Mason	67	100	OP	F,C
	Onalaska	46°33'/122°38'	150	Lewis	69	6/30	HS,FS	F,C
WA-4	Pack For.	46°50'/122°15'	200	Pierce	69	1	SF	M
	Pack For.	46°50'/122°15'	200	Pierce	69	11/5	FS,SF	
WA-5	Porcupine	46°48'/122°33'	670	Thurston	73	22	OP	G,F
	Eatonville	46°52'/122°07'	880	Pierce	73	22	OP	G,F
	Coos Bay family test	43°30'/123°47'	210	Coos(OR)	73	31/31	FS	G
	Coos Bay family test	43°28'/123°45'	240	Coos(OR)	73	31/31	FS	G
	Coos Bay family test	43°20'/123°40'	430	Coos(OR)	73	31/31	FS	G
	Coos Bay progeny test	43°30'/123°47'	210	Coos(OR)	73	27	HS,OP	G
	Coos Bay progeny test	43°28'/123°45'	240	Coos(OR)	73	27	HS,OP	G

Agency	Plantation	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	No. of parents	Type	Selection criteria
	Coos Bay progeny test	43°20'/123°40'	430	Coos(OR)	73	27	HS,OP	G
			Sequoia sempervirens					
CA-2	Gill	37°54'/122°19'	10	Alameda	67	2/2	SF,FS	
			Tsuga heterophylla					
BC-6	Cobble Hill	48°43'/123°41'	180	Van. Island	72	100	OP[a]	

[a]Average trees in selected stands.

Table 3. Clonal material.

This table lists, by species and agency, the location of orchards, clone banks, and the like, containing vegetatively propagated material (grafted scions or rooted cuttings). It also gives the year of establishment and, where known, the general criteria by which the material was selected.

Explanations: The agencies are referred to by their code numbers as given in Table 1. States are indicated after counties when the county is outside the state coded in column 1.

Abbreviations are explained on page 58.

Table 3. Clonal material.

Agency	Orchard	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	Selection criteria
		Abies procera				
WA-5	McDonald	46°00'/123°00'	240	Lewis	57	G,F
		Picea sitchensis				
BC-6	Cobble Hill	48°43'/123°41'	180	Van. Isl.	72	WVR
		Pinus contorta				
BC-3	Red Rock	53°46'/122°42'	620	Mainland	72+73	G,F
		Pinus lambertiana				
CA-3	Happy Camp	41°45'/123°20'	850	Siskiyou	60-	BRR
CA-4	Badger Hill	38°47'/120°38'	970	El Dorado	59-73	BRR
	Foresthill	39°05'/120°42'	1280	Placer	71-74	G,F
CA-5	Badger Hill	38°47'/120°38'	1070	El Dorado	62-68	BRR
	Happy Camp	41°45'/123°20'	960	Siskiyou	62-68	BRR
OR-5	Dorena	43°42'/122°58'	300	Lane	58	BRR
OR-9	Sprague	42°30'/123°35'	300	Josephine	68	G,F,BRR
		Pinus monticola				
BC-6	UBC Res. For.	49°05'/122°45'	60	Mainland	60-64	BRR
	Robertson River	48°08'/124°01	150	Van. Isl.	60	BRR
ID-1	Sandpoint S.O.	48°16'/116°34'	640	Bonner	60	BRR
MT-1	Sandpoint S.O.	48°17'/116°33'	640	Bonner (ID)	58	BRR
OR-5	Dorena	43°42'/122°58'	300	Lane	58	BRR

Pinus ponderosa

CA-3	Mt. Shasta	41°00'/122°00'	1050	Siskiyou	72	G
CA-4	Foresthill	39°05'/120°42'	1280	Placer	68-73	G,F
	Placerville	38°44'/120°43'	850	El Dorado	68	G,F
OR-3	Pringle Butte (2 locations)	Approx. 43°47'/121°28'	1280	Deschutes	66	DMR
OR-5	Dorena	43°42'/122°58'	300	Lane	58	G,F

Pinus radiata

CA-2	Simpson Coop.	40°58'/123°57'	370	Humboldt	66-67	
	Russell	37°55'/122°08'	250	Contra Costa	66-67	
	Gill Tract	37°54'/122°14'	10	Alameda	66-67	
	Simpson Main	40°54'/123°58'	300	Humboldt	70	
	Russell	37°55'/122°08'	250	Contra Costa	63	
	Gill Tract	37°54'/122°19'	10	Alameda	63	

Populus spp.[a]

BC-4	UBC "populetum"	49°17'/122°35'	100	Mainland	57	

Pseudotsuga menziesii

BC-1	Caycuse	48°53'/124°23'	150	Van. Isl.	64	G,F
	Wilson Creek	48°51'/124°31'	450	Van. Isl.	62	G,F
	Clone Bank B-13	48°52'/124°18'	240	Van. Isl.	65	G,F
BC-2	Mesachie Lake	48°50'/124°15'	170	Van. Isl.	73-	G,F,C
	Koksilah	48°45'/123°41'	10	Van. Isl.	67	G,F,C
	CSRO-1 Quinsam	50°00'/125°05'	150	Van. Isl.	63	F,C
BC-3	Cowichan Lake F.E.S.	48°49'/124°07	180	Van. Isl.	66-	G,F
	Cowichan Lake F.E.S.	48°49'/124°07'	180	Van. Isl.	56-	G,F

Agency	Orchard	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	Selection criteria
BC-4	Haney	49°17'/122°33'	370	Mainland	64-65	G,F
BC-5	Canfor	49°20'/123°30'	60	Mainland	72	G,F
	Nimpkish	50°15'/126°30'	180	Van. Isl.	64	G,F
BC-6	Cobble Hill	48°43'/123°41'	180	Van. Isl.	72	NCR
	Burnside Lab.	48°28'/123°24'	40	Van. Isl.	69	C
BC-7	Central Clone Bank	49°08'/123°58'	10	Van. Isl.	73	G,F
	Franklin River	48°52'/124°41'	300	Van. Isl.	63	G,F
	Nanaimo River	49°04'/124°08'	400	Van. Isl.	63	G,F
BC-8	Boneyard Lake	48°26'/123°45'	220	Van. Isl.	70	G,F
	Saanichton	48°35'/123°25'	80	Van. Isl.	65-67	G,F
	BCFS 19 Creek	48°50'/124°10'	300	Van. Isl.		G,F
	PLC 19 Creek	48°50'/124°10'	330	Van. Isl.	64-65	G,F
BC-9	Clone Bank A-1	49°49'/126°04'	180	Van. Isl.	61-63	G,F
	Clone Bank A-2	49°51'/126°05	210	Van. Isl.	61-63	G,F
	Clone Bank A-3	49°50'/126°04	180	Van. Isl.	61-63	G,F
	Clone Bank B-1	49°48'/126°04'	120	Van. Isl.	63-65	G,F
	Clone Bank B-2	49°50'/126°05'	150	Van. Isl.	63-65	G,F
	Clone Bank C-1	49°47'/126°04'	150	Van. Isl.	63-65	G,F
	Clone Bank C-2	49°51'/126°08'	240	Van. Isl.	63-65	G,F
	Clone Bank G-1	49°51'/126°05'	150	Van. Isl.	65-66	G,F
	Clone Bank G-2	49°46'/126°04'	120	Van. Isl.	67-72	G,F
	Seed Orchard A	49°55'/126°06'	330	Van. Isl.	62-68	G,F
	Seed Orchard B	49°55'/126°06'	300	Van. Isl.	64-68	G,F
	Saanich S.O.	48°35'/123°24'	20	Van. Isl.	68-72	G,F
	Local Orchard	49°55'/126°06'	330	Van. Isl.	68-72	G,F
CA-1	Sam. Gossard	Approx. 39°25'/123°42'	270	Mendocino	62-72	G,F
CA-3	Humboldt	41°00'/124°10'	50	Humboldt	70	G
CA-4	Badger Hill	38°47'/120°38'	970	El Dorado	64	G,F
OR-1	N. Nemah Orchard	41°27'/123°46'	100	Pacific	59	F,G

OR-2	Row River	43°43'/122°52'	400	Lane	57	F,G,C,Q
OR-5	Beaver Creek	44°26'/126°26'	180	Benton	66	G,F
	Dee Flat	45°49'/121°39'	460	Hood River	60	G,F
	Dennie Ahl	47°26'/123°15'	200	Mason (WA)	58	G,F
	Heather	43°34'/122°19'	1220	Lane	61	G,F
OR-7	Polk	44°48'/123°17'	30	Polk	67	Grafting incompatibility
OR-8	Elk Ridge	44°22'/123°48'	150	Lincoln	66	G,F
OR-9	Horning	45°15'/122°25'	360	Clackamas	68	G,F
WA-1	Tomolla	47°02'/122°10'	30	Pierce	58	G,F
WA-2	Dennie Ahl	47°26'/123°15'	200	Mason	57	
WA-5	Coos Bay	45°00'/123°00'	60	Marion (OR)	68	G
	Springfield	45°00'/123°00'	60	Marion (OR)	69	G
	Everett	47°00'/123°00'	50	Thurston	70	G
	Cascade	47°00'/123°00'	50	Thurston	70	G
	Twin Harbors	47°00'/123°00'	50	Thurston	70	G
	Longview	47°00'/123°00'	50	Thurston	68	G
	McDonald	46°00'/123°00'	240	Lewis	57	F
		Sequoia gigantea				
CA-2	Baker	39°55'/121°05'	1200	Plumas	66	
	Blodgett	38°50'/120°35'	1250	El Dorado	66	
		Sequoia sempervirens				
CA-2	Russell	37°55'/122°08'	250	Contra Costa	68	
	Gill	37°54'/122°19'	10	Alameda	66	
	Gill	37°54'/122°19'	10	Alameda	67	

Agency	Orchard	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	Selection criteria
		Tsuga heterophylla				
BC-6	Cobble Hill	48°43'/123°41'	180	Van. Isl.	72	C

[a]See also Interspecific Hybrids.

Table 4. Provenance material.

This table lists, by species and agency, the location of plantations containing, side by side, material from different geographical sources. It also gives the year of establishment, the number of sources, and information on the geographical range represented.

Explanations: The agencies are referred to by their code numbers as given in Table 1. States are indicated after counties when the county is outside the state coded in column 1.

Abbreviations are explained on page 58.

Table 4. Provenance material.

Agency	Plantation	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	No. of sources	Range
			Abies concolor				
CA-2	Hoopa (2 plantations)	41°05'/123°40'	1350	Humboldt	65-66	30-43	Most of range
	Baker	39°55'/121°05'	1200	Plumas	65-66	30-43	Most of range
	Blodgett	38°50'/120°35'	1250	El Dorado	65-66	30-43	Most of range
	Camino (2 plantations)	38°45'/120°40'	1020	El Dorado	65-66	30-43	Most of range
			Alnus rubra				
OR-5	Cascade Head	45°20'/123°50'	300	Lincoln	69	10	Most of range
			Fraxinus pennsylvanica				
NE-1	Horning	41°00'/95°54'	330	Cass	71	20	N. Dakota to Texas
	USDA/FS	40°30'/98°18'	570	Adams	71	20	N. Dakota to Texas
			Larix leptolepis				
NE-1	Horning Ab	41°00'/95°54'	330	Cass	60	7	Most of range on Honshu, Japan
			Picea engelmannii				
MT-1	Savenac	47°23'/115°23'	960	Mineral	72	62	Central and northern Rockies

			Picea pungens				
MT-1	Savenac	47°23'/115°23'	960	Mineral	72	62	Central and northern Rockies
			Pinus banksiana				
NE-1	Horning L	41°10'/95°54'	330	Cass	65	28	NW Territories, Saskatchewan, Minnesota, to New Brunswick
			Pinus contorta				
BC-3	Red Rock	53°46'/122°42'	620	Mainland	72-73	153	34°13'-63°18'/
	Lake Cowichan	48°49'/124°08'	213	Van. Isl.	72-73	153	103°47'-139°10'
			Pinus flexilis/strobiformis				
NE-1	Horning N	41°00'/95°54'	330	Cass	64	33	Alberta to New Mexico
			Pinus muricata				
CA-2	Russell	37°55'/122°08'	240	Contra Costa	68	16	Entire range
	Naval Weapons Stn.	37°58'/121°59'	100	Contra Costa	68	16	Entire range
	Redwood Exp. For.	41°34'/124°05'	200	Del Norte	68	6	Entire range
			Pinus nigra				
NE-1	Horning J	41°00'/95°54'	330	Cass	62	25	Mediterranean

Agency	Plantation	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	No. of sources	Range
			Pinus ponderosa				
AZ-1	Fort Valley	Approx. 35°00'/111°30'	2200	Coconino	13-17	11	Most of range
CA-5	Pyramid	38°47'/120°11'	1720	El Dorado	38	7	Elev. transect
	I.F.G.	38°42'/120°44'	830	El Dorado	38	7	Elev. transect
	Bassi	38°45'/120°57'	290	El Dorado	38	7	Elev. transect
ID-1	Priest River (Ida Creek)	48°22'/116°48'	750	Bonner	11-17	19	Entire range, except Calif.
NE-1	Horning P	41°00'/95°54'	330	Cass	68	80	Central U.S.A.
	USDA/FS	40°30'/98°18'	570	Adams	68	80	Central U.S.A.
	USDA/FS	41°54'/100°18'	870	Thomas	68	80	Central U.S.A.
	Univ. Nebr. NW Stn.	42°06'/102°54'	1200	Box Butte	68	80	Central U.S.A.
OR-7	McDonald For.	44°35'/123°20'	290	Lincoln	28	10	Whole U.S. range
	Pack Forest	46°45'/122°20'	350	Pierce (WA)	28	10	Whole U.S. range
	Wind River For.	45°50'/121°55'	400	Skamania (WA)	28	10	Whole U.S. range
	Deschutes N.F.	43°55'/121°20'	1160	Deschutes	28	10	Whole U.S. range
	Whitman N.F.	44°35'/118°35'	1340	Grant	28	10	Whole U.S. range
UT-1	Holcomb	43°46'/115°59'	1120	Boise (ID)	66	37	SW Idaho, 850-2000 m
	Idaho City	43°49'/115°51'	1350	Boise (ID)	66	37	SW Idaho, 850-2000 m
	Boulder Creek	45°08'/116°24'	1450	Adams (ID)	66	37	SW Idaho, 850-2000 m
	Jack Creek	44°53'/116°00'	1650	Valley (ID)	66	37	SW Idaho, 850-2000 m
			Pinus radiata				
CA-1	Davis Nursery		20	Yolo	72	328	Entire range
CA-2	Russell	37°55'/122°08'	240	Contra Costa	68	16	Entire range
	Naval Weapons Stn.	37°58'/121°59'	100	Contra Costa	68	16	Entire range

	Redwood Exp. For.	41°34'/124°08'	200	Del Norte	68	6	Entire range
	Simpson Main	40°54'/123°58'	300	Humboldt	70	3	Entire range
	Simpson Coop.	40°58'/123°57	370	Humboldt	66-67	3	Mainland, Guadalupe and Cedrus Islands
	Russell	37°55'/122°08'	250	Contra Costa	66-67	3	
	Gill Tract	37°54'/122°19'	10	Alameda	66-67	3	
				Pinus resinosa			
NE-1	Horning M	41°00'/95°54'	330	Cass	63	52	Minnesota to New Brunswick & New York
				Pinus rigida			
NE-1	USDA/FS	40°30'/98°18'	570	Adams	73	28	Maine to Georgia
				Pinus strobiformis (See *P. flexilis*)			
				Pinus strobus			
NE-1	Horning T	41°00'/95°54'	330	Cass	69	36	West Virginia to Georgia
				Pinus sylvestris			
NE-1	Horning I	41°00'/95°54'	330	Cass	62	36	Most of range (Spain to Georgia, USSR, Scotland to Siberia, & Central Europe)
				Populus deltoides			
NE-1	Univ. Nebr. Mead Field Lab.	41°10'/96°30'	350	Saunders	66	119	Most of range

Agency	Plantation	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	No. of sources	Range
			Pseudotsuga menziesii				
BC-1	Caycuse	48°49'/124°33'	450	Van. Isl.	71	26	Most of range
BC-3	Cowichan Lake	48°47'/124°08'	160	Van. Isl.	60-73	220	Lat. 55° to 19°
	34 test sites	Lats. 48°30'-53°30'			69-73	88	Oregon to northern limit
BC-4	Haney	49°17'/122°35'	170	Mainland	57	16	B.C. & NW U.S.A.
	Haney	49°17'/122°33'	370	Mainland	54	16	Calif. and B.C.
BC-7	Ash River 74	49°28'/125°05'	300	Van. Isl.	56	8	NW U.S.A. & N.Zeal.
	Ash River 62	49°27'/125°04'	300	Van. Isl.	56	10	B.C. and N.Zeal.
	Sugarloaf Mt.	48°52'/123°57'	820	Van. Isl.	59	18	Elev. 30-1250 m, 42°20'-50°30'
NE-1	Horning O	41°00'/95°54'	330	Cass	65	29	Alberta to New Mexico
OR-4	A (2 plant.)	50°30'/127°00'	120-180	Van. Isl.	59	16	B.C., Wash., & Oregon
	B (2 plant.)	49°45'/125°00'	400-520	Van. Isl.	59	16	B.C., Wash., & Oregon
	C (2 plant.)	49°10'/124°10'	790-880	Van. Isl.	59	16	B.C., Wash., & Oregon
	E (2 plant.)	49°10'/122°30'	150-210	Mainland	59	16	B.C., Wash., & Oregon
	F (2 plant.)	47°30'/121°40'	1190-1250	King (WA)	59	16	B.C., Wash., & Oregon
	G (1 plant.)	47°45'/123°20'	30-150	Mason (WA)	59	16	B.C., Wash., & Oregon
	H (2 plant.)	46°45'/122°10'	560-610	Pierce (WA)	59	16	B.C., Wash., & Oregon
	K (2 plant.)	45°10'/122°20'	970-1190	Clackamas	59	16	B.C., Wash., & Oregon
	L (2 plant.)	44°50'/123°20'	60	Polk	59	16	B.C., Wash., & Oregon
	M (2 plant.)	44°30'/123°20	550-610	Benton	59	16	B.C., Wash., & Oregon
	O (2 plant.)	43°45'/122°20'	760-910	Lane	59	16	B.C., Wash., & Oregon
	Q	41°00'/123°50'	690	Humboldt (CA)	59	16	B.C., Wash., & Oregon
	Elderberry Flat	42°40'/123°05'	320	Jackson	64	14	42°-43°, 122°-123°
	Butte Falls	42°34'/122°25'	760	Jackson	64	14	42°-43°, 122°-123°
	Conte Creek	42°15'/122°30'	1520	Jackson	64	14	42°-43°, 122°-123°
	Dorena	43°47'/122°59'	388	Lane	64	14	42°-43°, 122°-123°
	Dunn Forest	44°40'/122°10'	100	Benton	58-62	300	Entire U.S. range

OR-7	Wind Riv. For.	45°50'/121°55'	330	Skamania (WA)	13-14	13	Oregon, Washington
	Snoqualmie Test	48°00'/121°40'	610	Snohomish (WA)	13-14	13	Oregon, Washington
	Siuslaw Test	45°10'/123°30'	640	Tillamook	13-14	13	Oregon, Washington
	Mt. Hood Test A	45°10'/121°50'	850	Clackamas	13-14	13	Oregon, Washington
	Mt. Hood Test B	45°10'/121°50'	1400	Clackamas	13-14	13	Oregon, Washington
				Quercus macrocarpa			
NE-1	Univ. Nebr. Mead Field Lab.	41°10'/96°30'	350	Saunders	67	50	Most of range
				Quercus rubra			
NE-1	Horning	41°00'/95°54'	330	Cass	62-63	30	Most of range
				Tsuga heterophylla			
BC-6	Coal Harbor	50°37'/127°33'	80	Van. Isl.	71	15	Vancouver Island and adjacent islands
	Franklin River	48°55'/124°55'	320	Van. Isl.	71	15	Vancouver Island
	Gold River	49°54'/126°08'	380	Van. Isl.	71	15	Vancouver Island
	Beaver Cove	50°27'/126°53'	550	Van. Isl.	71	15	Vancouver Island

Table 5. Interspecific hybrids.

This table lists, by maternal species and agency, the location of plantations of hybrids resulting from controlled crosses between different species. It also gives the year of establishment, the number of hybrid plants, the type of cross, and information on the availability of comparative material from the parental species.

Explanations: The agencies are referred to by their code number as given in Table 1. States are indicated after counties when the county is outside the state coded in column 1.

Abbreviations are explained on page 58.

Table 5. Interspecific hybrids (female parent x male parent).

Agency	Plantation	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	No. of plants	Type	Key
			Abies concolor x *A. bracteata*					
CA-5	I.F.G.	38°42'/120°44'	830	El Dorado	68	2	F_1	P,T
			Abies concolor x *A. grandis*					
CA-5	I.F.G.	38°42'/120°44'	830	El Dorado	68	7	F_1	P,T
			Abies concolor x *A. religiosa*					
CA-5	I.F.G.	38°42'/120°44'	830	El Dorado	68	7	F_1	P,T
			Abies magnifica x *A. procera*					
CA-5	I.F.G.	38°42'/120°44'	830	El Dorado	63	14	F_1	P,T
			Picea engelmannii x *P. pungens*					
MT-1	Savenac	47°23'/115°23'	960	Mineral	72	1410	Nat. hybrids	P,T
			Picea sitchensis x *P. glauca*					
BC-6	Green Timbers	49°11'/122°50'	80	Mainland	57	76		
			Pinus spp.					

CA-5 For a summary of the extensive pine hybridization program at the Institute of Forest Genetics, Placerville, refer to the end of this table.

				Pinus attenuata x *P. radiata*				
CA-1	8 plantations in central and northern California				71-72	2200	F_1	P,T
CA-4	Badger Hill	38°47'/120°38'	980		59	600	F_1	P
				Pinus jeffreyi x (*P. jeffreyi* x *coulteri*)				
AZ-1	Fort Valley	Approx. 35°00'/111°30'	2200	Coconino	49	74	Back	
CA-1	3 locations in central and northern California				64-71	2500	Back	P,T
CA-4	Badger Hill	38°47'/120°38'	980	El Dorado	59	1000	Back	P
				Pinus monticola x *P. strobus*				
ID-1	Priest River	48°22'/116°48'	850	Bonner	57	50	F_1	P,T
				Pinus ponderosa x *P. engelmannii*				
OR-6	Bend Pine Nur.	Approx. 44°00'/121°00'	1050	Deschutes	60	7	F_1	
				Pinus radiata x *P. attenuata*				
OR-5	33 plantations in southwestern Oregon		70-1370		63-67	15,000	F_1	P,T
				Pinus radiata x *P. muricata*				
CA-2	Russell	37°55'/122°08'	240	Contra Costa	65	47	F_1	T
				Populus spp.[a]				
NE-1	Univ. Nebr. Campus	40°48'/96°42'	360	Lancaster	70			

Agency	Plantation	Lat N/Long W (deg, min)	Elev. (meters)	County	Year estab.	No. of plants	Type	Key
WA-4	U.W. Arboretum	47°36'/122°20'	20	King	66-67	23	F_1	P,T
	Pseudotsuga macrocarpa x *P. menziesii*							
OR-4	Hospital Tract	44°50'/123°10'	60	Benton	59	80	F_1	P,T
	Pinus spp.							
CA-5	67 interspecific hybrids 16 reciprocals 13 interspecific combinations involving other races 19 interracial combinations 16 groups of interspecific hybrid derivatives							

Since 1929 numerous arboreta and plantations have been established primarily in the central Sierra Nevada. In addition to the hybrids, some parental material is available especially from the more recent crosses.

A bibliography, up to 1970, on the research at the Institute is available and lists 39 publications on interspecific hybrids in the genus *Pinus* (Tichenor 1965). Also see the supplement to this publication.

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[a]See also Clonal Material.

SPECIES INDEX

(cont.)

CONIFEROUS FOREST BIOME/IBP

QUESTIONNAIRE FOR INVENTORY OF GENETIC MATERIAL
ON FOREST TREES

I INTERSPECIFIC HYBRIDS (FORM GC-1/72) I

PLEASE COMPLETE THE FOLLOWING FORM FOR EACH TYPE OF BETWEEN-SPECIES CROSS. XEROX IF ADDITIONAL FORMS ARE NECESSARY.

PARENTAL SPECIES:.....(F.)X.....(M.)
TYPE OF CROSS: F1 ( ) F2 ( ) BACKCROSS ( )
OTHER.....
NAME AND LOCATION OF PLANTATION:

NAME	COORDINATES LONG. LAT.	ELEV. (METERS*)	STATE	COUNTY	NEAREST TOWN

.....

YEAR ESTABLISHED:..... EXPIRATION YEAR:.....
APPROXIMATE NUMBERS OF PLANTS:.....
ARE PARENTS STILL AVAILABLE: YES ( ) NO ( )
ARE TEST PLANTS FROM PARENTAL SPECIES AVAILABLE:
YES ( ) NO ( )
IS MATERIAL AVAILABLE FOR COOPERATIVE RESEARCH:
YES ( ) CONDITIONALLY ( ) NO ( )
WHAT TYPE OF COOPERATIVE RESEARCH WOULD YOU ENCOURAGE:.....

.....

.....

PERMITTED TYPE OF SAMPLING: FOLIAGE ( ) CUTTINGS ( )
SEED ( ) ENTIRE PLANT ( )
ARE PUBLICATIONS OR REPORTS AVAILABLE ON THE MATERIAL:
NO ( ) YES ( ) LIST ATTACHED ( )
OTHER PERTINENT COMMENTS ON THE MATERIAL:.....

.....

.....

.....

.....
IS THIS YOUR CORRECT ADDRESS
MR. R.E. SR. RAPPLEYE
CALIF DIV OF FORESTRY
REDOING CALIFORNIA 96001

RETURN TO R. F. STETTLER, COLLEGE OF FOREST RESOURCES, UNIV. OF WASH., SEATTLE, WASHINGTON, 98195

* MULTIPLY ELEVATION IN FEET BY .3048 TO OBTAIN ELEVATION IN METERS.

CONIFEROUS FOREST BIOME/IBP

QUESTIONNAIRE FOR INVENTORY OF GENETIC MATERIAL
ON FOREST TREES

I PROVENANCE - TEST MATERIAL (FORM GC-2/72) I

PLEASE COMPLETE THE FOLLOWING FORM FOR EACH PROVENANCE TEST. XEROX ADDITIONAL COPIES IF NECESSARY.

SPECIES:.....
NUMBER OF SEED SOURCES:.....

RANGE REPRESENTED:.....

.....
NAME AND LOCATION OF PLANTATION(S):

NAME	COORDINATES LONG. LAT.	ELEV. (METERS*)	STATE	COUNTY	NEAREST TOWN

.....

.....

.....

.....
ARE EXACT SEED SOURCES IDENTIFIED: YES ( ) NO ( )
YEAR ESTABLISHED:..... EXPIRATION YEAR:.....
IS MATERIAL AVAILABLE FOR COOPERATIVE RESEARCH:
YES ( ) CONDITIONALLY ( ) NO ( )
WHAT TYPE OF COOPERATIVE RESEARCH WOULD YOU ENCOURAGE:.....

.....

.....
PERMITTED TYPE OF SAMPLING: FOLIAGE ( ) CUTTINGS ( )
SEED ( ) ENTIRE PLANT ( )
ARE PUBLICATIONS OR REPORTS AVAILABLE ON THE MATERIAL:
NO ( ) YES ( ) LIST ATTACHED ( )
OTHER PERTINENT COMMENTS ON THE MATERIAL:.....

.....

.....

.....
IS THIS YOUR CORRECT ADDRESS
MR. R.E. SR. RAPPLEYE
CALIF DIV OF FORESTRY
REDDING CALIFORNIA 96001

RETURN TO R. F. STETTLER, COLLEGE OF FOREST RESOURCES, UNIV. OF WASH., SEATTLE, WASHINGTON, 98195

* MULTIPLY ELEVATION IN FEET BY .3048 TO OBTAIN ELEVATION IN METERS.

CONIFEROUS FOREST BIOME/IBP

QUESTIONNAIRE FOR INVENTORY OF GENETIC MATERIAL
ON FOREST TREES

+----------+
I FAMILIES OF KNOWN PARENTAGE (FORM GC-3/72) I
+----------+

PLEASE COMPLETE THE FOLLOWING FORM FOR EACH TYPE OF FAMILY. (REPORT INTERSPECIFIC HYBRIDS ON FORM GC-1/72.) XEROX IF ADDITIONAL FORMS ARE NECCESSARY.

SPECIES:.....
TYPE OF FAMILY: SELFED ( ) FULL SIB ( )
HALF SIB ( ) OPEN POLLINATED ( )
NUMBER OF PARENTS: FEMALE..... MALE.....

BY WHICH CRITERIA WERE PARENTS SELECTED:.....

.....

DESCRIBE GENETIC MARKERS IF PRESENT:.....

.....
NAME AND LOCATION OF PLANTATION:

NAME	COORDINATES LONG. LAT.	ELEV. (METERS*)	STATE	COUNTY	NEAREST TOWN

.....
YEAR ESTABLISHED:..... EXPIRATION YEAR:.....
ARE PARENT TREES STILL AVAILABLE: YES ( ) NO ( )
IS MATERIAL AVAILABLE FOR COOPERATIVE RESEARCH:
YES ( ) CONDITIONALLY ( ) NO ( )
WHAT TYPE OF COOPERATIVE RESEARCH WOULD YOU ENCOURAGE:.....

.....

.....
PERMITTED TYPE OF SAMPLING: FOLIAGE ( ) CUTTINGS ( )
SEED ( ) ENTIRE PLANT ( )
ARE PUBLICATIONS OR REPORTS AVAILABLE ON THE MATERIAL:
NO ( ) YES ( ) LIST ATTACHED ( )
OTHER PERTINENT COMMENTS ON THE MATERIAL:.....

.....

.....

.....
IS THIS YOUR CORRECT ADDRESS
MR. R.E. SR. RAPPLEYE
CALIF DIV OF FORESTRY
REDDING CALIFORNIA 96001

RETURN TO R. F. STETTLER, COLLEGE OF FOREST RESOURCES, UNIV. OF WASH., SEATTLE, WASHINGTON, 98195

* MULTIPLY ELEVATION IN FEET BY .3048 TO OBTAIN ELEVATION IN METERS.

CONIFEROUS FOREST BIOME/IBP

QUESTIONNAIRE FOR INVENTORY OF GENETIC MATERIAL
ON FOREST TREES

I CLONAL MATERIAL (FORM GC-4/72) I

PLEASE COMPLETE THE FOLLOWING FORM FOR EACH CLONE BANK OR ORCHARD. XEROX ADDITIONAL FORMS IF NECESSARY.

SPECIES:.....
BY WHICH CRITERIA HAVE THE CLONES BEEN SELECTED:.....

ARE THE CLONES IN THE FORM OF: ROOTED CUTTINGS ( ) OR
GRAFTED CUTTINGS ( )

RANGE REPRESENTED:.....

NAME AND LOCATION OF THE CLONAL ORCHARD

NAME	COORDINATES LONG. LAT.	ELEV. (METERS*)	STATE	COUNTY	NEAREST TOWN

YEAR ESTABLISHED:..... EXPIRATION YEAR:.....
PRESENT SEED PRODUCTION: HIGH ( ) MEDIUM ( ) LOW ( )
NONE ( ). IF NONE YEAR EXPECTED:.....
IS MATERIAL AVAILABLE FOR COOPERATIVE RESEARCH:
YES ( ) CONDITIONALLY ( ) NO ( )
WHAT TYPE OF COOPERATIVE RESEARCH WOULD YOU ENCOURAGE:.....

PERMITTED TYPE OF SAMPLING: FOLIAGE ( ) CUTTINGS ( )
SEED ( ) ENTIRE PLANT ( )
ARE PUBLICATIONS OR REPORTS AVAILABLE ON THE MATERIAL:
NO ( ) YES ( ) LIST ATTACHED ( )
OTHER PERTINENT COMMENTS ON THE MATERIAL:.....

IS THIS YOUR CORRECT ADDRESS
MR. R.E. SR. RAPPLEYE
CALIF DIV OF FORESTRY
REDDING CALIFORNIA 96001

RETURN TO R. F. STETTLER, COLLEGE OF FOREST RESOURCES, UNIV. OF WASH., SEATTLE, WASHINGTON, 98195

* MULTIPLY ELEVATION IN FEET BY .3048 TO OBTAIN ELEVATION IN METERS.

KEY TO ABBREVIATIONS AND TERMS

Agency	Organization responsible for a particular material (see agency list for agency codes, e.g., BC1, CA2, . . .)
Back	Backcross, i.e., the cross of an F_1 hybrid with one of the parentals
BRR	Blister-rust resistance
C	Cone production, abundance of cones
CL	Clonal material, i.e., vegetatively propagated material
DMR	Dwarf-mistletoe resistance
F	Form
F_1	First-generation hybrid
FAM	Families of known parentage (excluding interspecific hybrids)
FS	Full-sib family, sharing both parents
G	Growth, i.e., height or volume growth
HS	Half-sib family, sharing one parent
HYB	Interspecific hybrids, i.e., hybrids between different species
IFG	Institute of Forest Genetics, Placerville, Calif.
Investigator	Person responsible for a particular material
M	Marker gene, i.e., genetic stock with a visible mutation
NCR	Needle-cast resistance
OP	Open-pollinated family, sharing at least one parent
Orchard	Living collection of material of known source or parentage
P	Parents are available for comparisons
Plantation	Any living collection of material of known source or parentage
PROV	Provenance material, i.e., material of known source
Q	Wood quality, i.e., specific gravity, fiber length, etc.
Range	In provenance material: the portion of the natural distribution range represented
SF	Self-pollinated family
T	Test material from parental species is available for comparison
WVR	Sitka-spruce-weevil resistance

KEYWORDS

Arboretum, clone, clone bank, controlled cross, gene resources, hybrid, plus trees, provenance, provenance test, seed orchard