Chapter 6

Certification of Tree Seeds and Other Woody Plant Materials

Robert D. Mangold and Franklin T. Bonner

Dr. Mangold is director of Forest Health Management for the USDA Forest Service' State and Private Forestry National Office, Washington, DC; Dr. Bonner is a scientist emeritus at the USDA Forest Service's Southern Research Station, Mississippi State, Mississippi

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Introduction

Seed certification is a system that provides assurance to buyers that the seeds being purchased are what they are represented to be by the producer or seller. This certification of identity (and sometimes quality) is typically provided by an independent third party for a fee that is charged to the producer and becomes part of the production costs. The system is simple and effective; it is used all over the world in various, yet basically similar, forms for agricultural, horticultural, and forestry seeds or other propagules. This chapter will briefly describe how seed certification developed in forestry and how it is practiced today with seeds of woody plants. More detailed historical accounts of agricultural and forest tree seed certification in the United States can be found in Hackleman and Scott (1990) and Rudolf (1974).

Certification in Agriculture

Certification of agricultural seeds has been practiced in the United States since the early 1900s (Copeland and McDonald 1995; Hackleman and Scott 1990) and has been a positive force in the development of modern agriculture. Certification in individual states is typically controlled by an agency that is authorized by the state to carry out the procedures. The agencies are commonly called crop improvement associations, but some carry other designations. The organizational structures of these agencies may vary, but their goals are similar and they act cooperatively through the Association of Official Seed Certification Agencies (AOSCA 1994). AOSCA establishes minimum certification standards for all types of plant materials. The member state certification agencies may develop their own certification standards for different materials, but their standards must equal or exceed those of AOSCA. Agricultural seed certification is an assurance of the varietal (genetic) identity of the material, but it is also normally a *de facto* assurance of genetic quality. Developers of improved varieties of agricultural species (state land grant universities or private seed companies) widely publicize the results of their field trials, and the expected performance of new varieties is well known and documented before they reach the market. Seed buyers want the assurance from certification that their seeds are really the variety that the producer says they are. The slightly higher cost required for this assurance is gladly paid.

Certification in Forestry

Certification of forest reproductive material has developed in a slightly different manner from that of agriculture in this country. Most forest landowners do not have ready access to the performance data from field trials of selected forest materials. There are two primary reasons for this. First, field trial results in forestry are not as widely published as those in agriculture, and the publication outlets that are used are not widely seen by the general public. Second, much of the genetic improvement in forestry has been done by large forest industries and the USDA Forest Service, all of which originally intended that the improved materials would be planted on their lands only and not sold on the open market. So other than technical reports in forestry journals and a few government publications, these results have not been widely disseminated, although they are available.

The first efforts in genetic improvement in forest reproductive materials in this country came about through recognition that some seed sources were more suitable for planting in certain areas than others. Application of this principle in the 1930s and 1940s led to the establishment of seed control policies and seed zones to ensure that seeds and seedlings for reforestation came from the best origins

Figure 1—Chapter 6, Certification of Tree Seeds and Other Woody Plant Materials: current tree seed zones for Douglas-fir in western Oregon (adapted from Randall 1996).

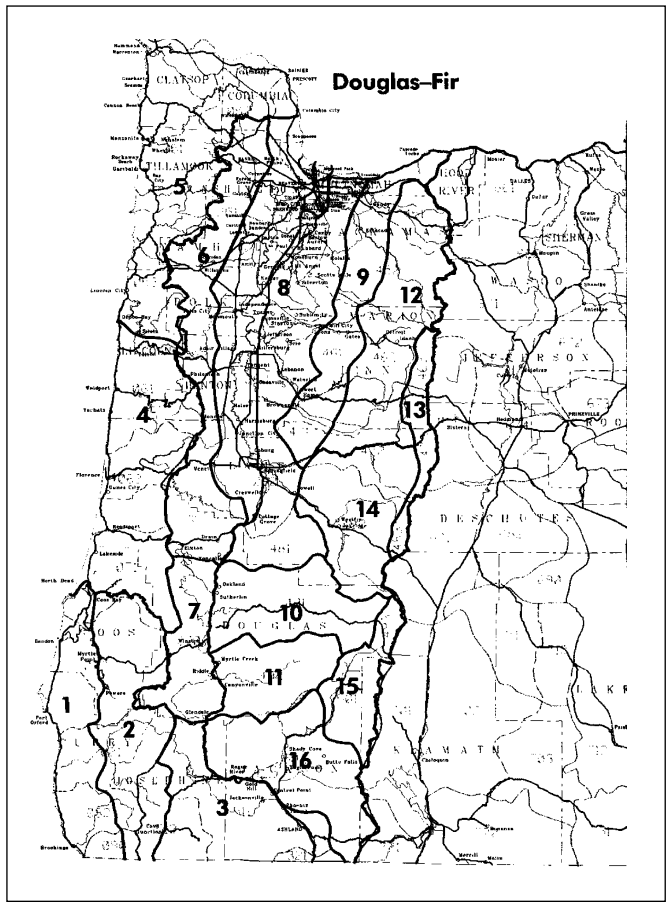


Figure 2—Chapter 6, Certification of Tree Seeds and Other Woody Plant Materials: current tree seed zones in use in Washington (adapted from Rudolf 1974).

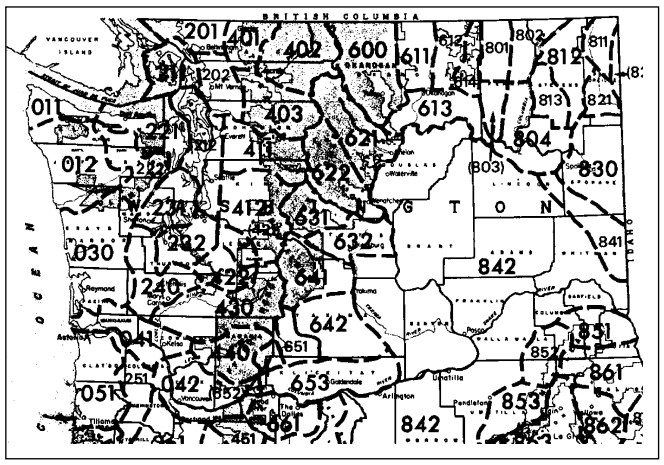


Figure 3—Chapter 6, Certification of Tree Seeds and Other Woody Plant Materials: geographic districts for source-identified certification of forest reproductive material in Mississippi (courtesy of MSIA 1979).

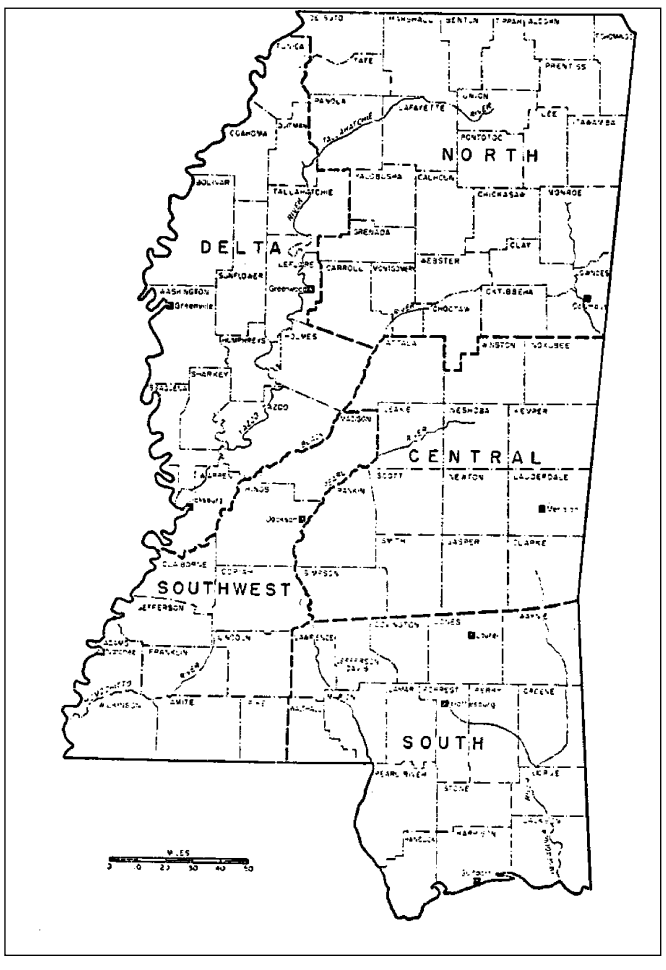
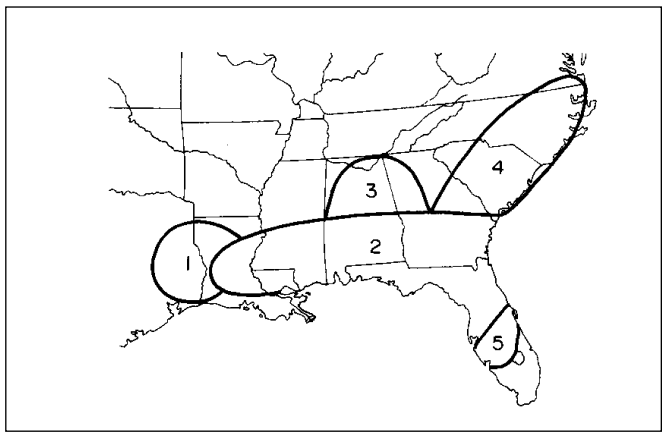


Figure 4—Chapter 6, Certification of Tree Seeds and Other Woody Plant Materials: the 5 seed collection and planting zones for longleaf pine (from Lantz and Kraus 1987).



(Rudolf 1974). The use of seed zones (figures 1–4) has been very effective, and they are still widely used today. The major impetus for forest seed certification, however, came from the expanded reforestation programs and rapidly developing tree improvement programs in the 1950s and 1960s. Establishment of seed orchards of major species with selected phenotypes and the subsequent progeny tests with their offspring has led to wide-scale use of improved families and clones in forest regeneration. When foresters wanted certification of this material, they turned to the state crop improvement associations, because these agencies were the only ones legally permitted in most states to perform certification services. As these services were extended to forestry material, the mechanisms for implementation developed differently in different parts of the country.

South Dakota established the first forest tree certification program in 1952 for stock selected for shelterbelt use (Rudolf 1974). Georgia established the next program in 1959 with comprehensive certification standards for tree seeds (GCIA 1959). The AOSCA (then known as the International Crop Improvement Association) adopted almost identical standards also in 1959 (Rudolf 1974), with later revisions in 1962, 1966, and 1970 (Hackleman and Scott 1990). Other states were not far behind. In 1994, AOSCA widened the scope of its tree seed certification standards to allow certification of material from all native plants—trees, shrubs, vines, forbs, and grasses (AOSCA 1994). These standards were designated for pre-variety germplasm certification and will be explained in a later section.

Pacific Northwest

An organized effort to improve tree seed supplies in the Pacific Northwest came about in the mid-1950s with the formation of the Northwest Forest Tree Seed Committee at Corvallis, Oregon (Edwards 1981). This group later became the Western Forest Tree Seed Council in affiliation with the Western Forestry and Conservation Association. The bumper cone crop of 1966 underlined the need for certification programs (Hopkins 1968), and the council and the Western Reforestation Coordinating Committee of the Western Forestry and Conservation Association took action. Through their efforts, the Northwest Forest Tree Seed Certifiers Association (NWFTSCA) was formed in 1966 to promote seed certification. This organization developed seed zone maps for Washington and Oregon and the framework for a seed certification system (Edwards 1981).

Certification was jointly administered by the Washington State Crop Improvement Association and the Oregon Seed Certification Service, a division of the Department of Crop and Soil Science at Oregon State University. The NWFTSCA provided review and advice to the agencies. Their system recognizes the following categories of reproductive material, which are indicated by standardized color-coded labels affixed to seed containers.

Audit class. Certifying authorities have reviewed records indicating seed lot origin and collection documentation on where and when the seeds were collected. Origins are usually less specifically identified than those in the source-identified class. ***Labels placed on the seed containers are brown and white.***

Source-identified class. Reproductive material comes from a seed zone defined by a legal description and from within a 154-m (500-ft) elevation band. The seed zones were defined on the Tree Seed Zone Map issued by the Western Forest Tree Seed Council in 1973. They are based on physiographic and geological provinces of Washington and Oregon as defined by Franklin and Dyrness (1973). Two subclasses are recognized: (a) *personally supervised production*—both the producer and the certifying agency have personal knowledge of the seed zone from which the seeds were collected and (b) *procedurally supervised production*—only the buyer and not the certifying agency determines if the collections are properly identified. ***Labels for both subgroups are yellow.***

Selected class. Reproductive material comes from trees that were selected for a specific character(s). Two classes are recognized: (a) *reproductive material obtained from selected trees* recognized to be superior for any number of traits, such as volume, form, or disease resistance and (b) *material from untested seed orchards and from seed production areas, and open-pollinated seeds* from individual selected trees. In this class, only the female parent is known. This class of material has promising traits that may be superior in the offspring, but such superiority has not been determined by testing. Details of the parents must be recorded. ***Labels are green.***

Tested class. Reproductive material comes from selected trees that have been tested for performance of specific characteristics, as determined by progeny or other applicable tests under specified conditions. The material from this class that performs best in the tests is presumed to be the ultimate in promised genetic superiority and is similar to the agricultural class "certified seed," indicating the highest degree of improvement. ***Labels are blue.***

To be able to sell certified material, the producer or collector must submit an application to the appropriate seed certifying agency, along with a fee, stating what material is to be certified. The application must spell out how the material will be produced or collected. The certifying agency will then notify the applicants if their plans are acceptable or in need of modification. The agency performs field and seed plant inspections, seed storage inventory audits, and whatever additional steps are necessary to ensure that the materials meet the agency's standards and can be tagged with the official agency labels. Cone collectors and buyers have slightly different registration and inspection procedures than seed orchard producers, but the agency controls are comprehensive. Procedures may be amended from time to time, so interested parties should check with their respective state certifying agencies to get the current regulations.

The species of greatest interest for certified collections have traditionally been Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), western white pine (*Pinus monticola* Dougl. ex D. Don), ponderosa pine (*P. ponderosa* P. & C. Lawson), sugar pine (*P. lambertiana* Dougl.), and lodgepole pine (*P. contorta* Dougl. ex Loud.). Another dozen or more species, both hardwoods and conifers, are occasionally certified.

Most of the tree seeds sold in the Pacific Northwest are exported to countries in northern Europe that are members of OECD (Organization for Economic Cooperation and Development), a United Nations–based international economic development organization that has set up the Scheme for Control of Forest Reproductive Material Moving in International Trade. European countries that import tree seeds from the Pacific Northwest are required to have OECD certificates on their seeds; consequently, procedures were established in the Northwest to implement this scheme

(which varied only slightly from the standards already in place). The major importers have been Germany (Douglas-fir), the United Kingdom (Sitka spruce, *Picea sitchensis* (Bong.) Carr.), and Sweden (lodgepole pine) (Piesch 1977), with total presently somewhere around 4,500 kg/year (Pfeifer 1997). Because tree seeds are not covered under the Federal Seed Act, there are no officially collected data on the total amount of tree seeds exported from the United States. Details of the OECD Scheme and how it operates in the United States are provided in a later section of this chapter.

Southeast

Standards for tree seed certification in the Southeast began in the late 1950s as more and more attention was focused on seed source and the potentially superior material that could come from the newly established seed orchards. Much of this interest was in response to the results of a seed source study of southern pines established by Phillip Wakeley of the USDA Forest Service. His early results showed that these species could be greatly improved by careful selection of seed source (Wells and Wakeley 1966). Later results showed still more potential for genetic improvement programs (Wells 1983). Some seed zones for selected species were established within states (figure 3), and regional zones for the southern pines were established later (figure 4) (Lantz and Kraus 1987).

Instead of a collective effort, individual states developed their own standards, usually through committees of state, federal, and industrial interests under the aegis of state chapters of the Society of American Foresters. These committees then turned to their respective state seed certification agencies to administer the systems. Georgia and Florida were the first states to develop standards. Other states followed, basing their standards and procedures primarily on those of the states that had gone before. The following 3 classes of certified material were recognized by all states.

Source-identified material. Reproductive materials that can be from (a) *natural stands*, including seed production areas with known geographic origin or (b) *plantations of known provenance*. This class is equal to the source-identified class of the Pacific Northwest. ***Labels are yellow***.

Selected material. Reproductive materials must be from rigidly selected trees or stands that have promise but not proof of genetic superiority; progeny tests to supply the proof are not complete. This class is equal to the selected class of the Pacific Northwest. ***Labels are green.***

Certified material. These reproductive materials must be of known genetic identity obtained from trees of proven genetic superiority. This material must have proven its genetic superiority through progeny tests. This class of material is the same as the tested class in the Pacific Northwest system. ***Labels are blue.***

Most states wrote their standards to apply to seeds and seedlings of southern pines only, but Mississippi and Alabama also included sweetgum (*Liquidambar styraciflua* L.), sycamore (*Platanus occidentalis* L.), and eastern cottonwood (*Populus deltoides* Bartr. ex Marsh.). Standards for cottonwood were for unrooted cuttings only (ACIA nd; MSIA 1979). The demand for certified material varied among states in subsequent years but was particularly strong in Georgia, where the state forestry commission vigorously promoted the use of certified seeds and seedlings of southern pines. Like the system used in the Pacific Northwest, certification in the Southeast requires application to the certifying agencies, fees, inspections, and possible audits. Most state systems in the Southeast are very similar, but details may vary. For more information, contact the respective state certification agencies.

Overseas sales of southern pine seeds were brisk in the 1950s and 1960s, but few, if any, of the lots were certified. In the 1980s the export market for southern pine seeds had decreased somewhat; however, new customers who wanted more assurance of quality were coming on the scene. This development stimulated interest in certification of these exports. Following the lead of the Pacific Northwest, producers and government officials in the Southeast turned to the OECD Scheme for Forest Reproductive Material, which was becoming a certification model acceptable throughout most of the world. Under the aegis of AOSCA, a committee comprising state and federal officials, seed producers and merchants, and university researchers was formed in 1986 to produce uniform regional standards that would meet (or exceed) both AOSCA and OECD standards of certification of forest materials. This action would also remove differences in state standards, thereby making cooperative action easier. In some cases, southern pine seeds were produced in orchards in one state, extracted and cleaned in another, and sold in still another. State certifying agencies had reciprocal agreements that allowed inspectors in one state to approve practices for seeds sold in a neighboring state, but differences in small details could cause problems. After 5 years of deliberations, agreement was reached on uniform standards, but apparently none of the states implemented the new standards. Certification in the Southeast continues to be carried out on demand by the respective state agencies, according to the standards adopted 20 or 30 years ago. Because the anticipated large demand for OECD-certified

material from the Southeast did not develop, seed producers and merchants have not been adversely affected by the lack of uniformity.

Organization for Economic Cooperation and Development

The United Nations Organization for Economic Cooperation and Development (OECD) was organized in 1960 to facilitate economic development in member countries. Membership included most of western Europe, Canada, the United States, Japan, Australia, and Turkey (Piesch 1977). The OECD Scheme for Control of Forest Reproductive Material Moving in International Trade was first published in 1967 and amended in 1974 (Hoekstra 1976). Additional revision is currently underway. The unit of approval for reproductive material is 1 of 7 kinds of "basic material": seed source, stand, seed plantation, seed orchard, parents of family(ies), clonal mixtures, and clone. All materials are tagged and accompanied by a certificate of provenance. The scheme describes the following 4 categories of certification possible for the materials.

Source-identified materials. Basic requirements are (a) the region of provenance where the material is collected and the origin of the basic material (indigenous or non-indigenous) shall be defined and registered by a Designated Authority and (b) the seed shall be collected, processed, and stored, and plants shall be raised under the control of a Designated Authority. This category is equal to the source-identified class of systems in the United States. ***Labels are yellow.***

Selected materials. Selected materials must conform to the 2 requirements above, and also they will be derived from basic material that conforms to certain requirements and has been approved and registered by a designated authority. The requirements pertain to selection criteria, uniformity, quality, isolation, and origin. This category is similar to the selected class of the systems in the United States. ***Labels are green.***

Materials from untested seed orchards. This material consists basically of seeds that are produced by a seed orchard of selected trees (category 2) for which progeny tests are not yet complete. These materials are potentially more valuable than those from category 2 because the mother trees are pollinated (it is hoped) by other selected trees. The original systems of the Pacific Northwest and Southeast did not contain this class but included these materials in the selected class. ***Labels are pink.***

Tested materials. This material is the same as class 3, except that progeny testing has been completed and (a) *the genetic superiority of the material is proven by the tests* and (b) *the results of the tests shall be registered by a designated authority.* This class generally corresponds to the tested class of the Pacific Northwest system and the certified class of most state systems in the Southeast. ***Labels are blue.***

The OECD scheme is virtually identical to the standards established in the United States except for class 3, the material (seeds) collected from orchards of selected material prior to completion of progeny tests. Oregon and Washington, wishing to continue export sales to OECD countries, added class 3 to their standards for the purpose of issuing OECD certificates. The USDA Forest Service has been appointed as the designated authority to implement the scheme in the United States. Because tree seeds are not covered in the Federal Seed Act, the Forest Service re-delegated its authority to implement the scheme to the states of Oregon and Washington under cooperative agreements with their seed certifying agencies (Hoekstra 1976). California, Ohio, and perhaps other states now have similar agreements in place (Karrfalt 1998). The same procedure would have been followed in the Southeast with the uniform regional standards if an agreement had been reached among all parties. This pathway is still open, of course, to individual states that wish to pursue separate cooperative agreements with the USDA Forest Service.

The OECD scheme is widely used as a model for certification standards in many non-member countries. It is currently being revised again; interested parties should contact the Cooperative Forestry Office of the USDA Forest Service in Washington, DC, for the latest information on the scheme.

European Union

The European Union (EU) also has a certification requirement for forest seeds imported into the member countries. All of these countries also participate in OECD and require both OECD and EU certificates and labels. Although the United States is not a member of EU, its seed dealers are affected when seedlots are exported to EU countries. The EU scheme differs from both OECD and North American systems in that only 2 categories of certification are recognized: selected and tested materials. The EU scheme does not recognize source-identified and audit classes from the Pacific Northwest system or source-identified class from the southern systems. Because the United States is not a member nation and because source-identified seed is the most common export from this country to Europe, these

seeds must receive a derogation (special exemption) and a special white label to signify their classification. Seed exports from the United States to Europe would be greatly simplified if the OECD and EU schemes were the same. Discussions are currently underway to revise the EU scheme, so there is hope that this harmonization will be realized in the near future.

Native Shrub and Grass Seeds

In the 1980s and 1990s, a surge of interest in rehabilitating rangelands arose in the western portion of the United States. The majority of the plant materials used in these projects are grasses and shrubs, not trees. Although some selection programs are underway to produce genetically superior materials within a limited number of species, practically all of the material being planted at present comes from general collections from natural stands. Because good results are obtained with local ecotypes, there is now a strong demand for source-identified certification of this material (Young 1994, 1995). Young (1994) listed 34 commercial seed dealers that were interested in collecting or producing certified grass or shrub seeds for reclamation and restoration plantings.

Although shrub seeds could conceivably come under certification standards for tree seeds, native grasses do not make a good fit in this regard. To meet this growing demand for certification, AOSCA has replaced their old tree seed certification standards with new pre-variety germplasm certification standards (AOSCA 1994). These standards allow certification of material from all natural plant populations of indigenous or non-indigenous species before any varieties that are developed in improvement programs are released. The standards recognize the following 3 types of materials.

Source-identified seeds:	***Labels are yellow***
Selected seeds:	***Labels are green***
Tested classes:	***Labels are blue***

All of these types are defined very much like the corresponding classes in tree seed standards that were described earlier. To satisfy OECD export standards, AOSCA will allow a pink label to go on Selected material if it is equal to the OECD class untested seed orchard. This class of material is collected from orchards for which progeny tests are not yet complete. Even though the current demand is for source-identified materials, the mechanism now already exists for certification of any improved native plant materials when producers are ready. For information on certification of native plant materials, including trees, consult the AOSCA Certification Handbook (AOSCA 1994) or state certification agency.

Federal Seed Act and Labeling Laws

The Federal Seed Act of 1939 is basically a truth-in-labeling law that governs interstate commerce and importation of agricultural seeds (Copeland and McDonald 1995). Movement of seeds within state boundaries is not covered under the act, therefore all states have their own seed labeling laws to govern intrastate sales. Presently fewer than 20 states include tree seeds under their labeling laws, and in most that do, enforcement is not strict. Because tree seeds are seldom, if ever, sold over the counter at retail stores, the public does not demand stricter enforcement. Laws do exist in some states, however, providing legal recourse for buyers who feel wronged. Label requirements differ; some states require only the species and date of collection, whereas others require germination test results and provenance data.

There has always been some confusion among foresters about the differences between certification and labeling (Zobel and Talbert 1984). Many believe that correct labeling is all that certification will deliver. Under labeling laws, seed officials normally step in to correct wrongs *after* they have caused damage to the buyer. The mere existence of inspections and penalties, however, promotes honesty in labeling. In certification programs, officials are on the scene to confirm identity and production of the material *before* it is delivered to the buyer. This certification activity has a cost, which is passed along to the buyer; it is, however, the best assurance that a buyer will receive what is being paid for.

Outlook for Certification

The outlook for certification of tree seeds, other forestry materials, and native shrubs and grasses is uncertain. Demand for tree seed certification in the Pacific Northwest formerly fluctuated with the size of the cone crops; large cone crops meant heavy demand for certification services. Currently, greatly reduced timber harvests on federal lands in the West have sharply cut the demand for seedlings from federal agencies and therefore for seeds. Demands for planting increase when large areas were denuded by wildfire, but this factor is not predictable. Forest industries are, for the most part, meeting their needs from their own seed orchards and are not applying for certification. The export market to Europe for seeds of western conifers would decline if European seed orchard production increases or if European environmental groups continue to effectively pressure foresters to plant only species native to Europe.

Tree seed certification in the South is quite dormant at the present. Export markets for southern pine seeds still exist, although not to the extent as in the 1960s, but most of these customers are not members of OECD or EU and do not require those certificates. Many of the pine seeds now sold overseas come from overseas seed orchards, primarily first-generation orchards that now produce excess seeds surplus to the producers' own needs. Among private forest landowners in the South, very little demand for certification is evident. The USDA Forest Service and forest industries that use most of their own improved seeds for planting are infrequent customers for certification services, and the Southern Region of the Forest Service's National Forest System is undergoing a reduction in timber harvest and replanting, much the same as the western regions.

The best potential for future certification of tree or other native plant seeds is in restoration or reclamation planting programs. These programs require relatively small seedlots from an extraordinarily large number of species, many of which have not been grown in nurseries before. There is also a trend toward wanting only local ecotypes for restoration planting (Young 1995) and source-identified certification to provide the assurance that proper seed sources are being used. The large number of shrub and grass seed dealers that are willing to get their products certified for source (Young 1994) and the increasing number of seed dealers that are selling tree seeds (at least 58 offering over 1,800 species) (USDA FS 1995) indicates that commercial sources are ready and willing—customers simply have to ask for certified materials. State certification agencies now have the standards and procedures to certify any or all of this material. From this perspective, there appears to be a promising future for certification of seeds and other materials from trees and other native plants.

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