



U. S. Department of the Interior
U. S. Department of Agriculture

Report to the Congress

April 2002

Interagency Program to Supply and Manage Native Plant Materials for Restoration and Rehabilitation on Federal Lands



Report to Congress

Interagency Native Plant Development Program

This report responds to the direction from Congress in the Fiscal Year 2002 Interior Appropriations House Report. Congress specifically directed *“the Secretaries of Interior and Agriculture to report jointly to the Congress by December 31, 2001, with specific plans and recommendations to supply native plant materials for emergency stabilization and longer-term rehabilitation and restoration efforts.”*

Executive Summary

Wildland fires in 1999 and 2000 were the worst in 50 years and burned millions of acres of public lands. A shortage of native plant materials substantially increased the cost of rehabilitation and restoration efforts on the burned lands. Ecosystem restoration with native plants, in many cases, is the best option for restoring land health for multiple resource values and minimizing the establishment of invasive weeds.

An interagency team, representing the Departments of the Interior and Agriculture, was formed in December of 2001 to address the native plant development issue and assess needs. Land management agencies represented on the team include the Forest Service (FS), the Bureau of Land Management (BLM), the National Park Service (NPS), and the Fish and Wildlife Service (FWS). Other participants include the Natural Resources Conservation Service (NRCS), the Agricultural Research Service (ARS), the Geological Survey (USGS), and the Office of Surface Mining (OSM). The BLM and the FS directed \$5 million and \$10 million, respectively, in FY2001 to the development of a long-term program to supply and manage native plant species. These funds were expended in accordance with an interagency strategy that identifies three elements key to the success of a long-term program:

- Support for Federal, State and Tribal Production, Development, Storage, and Research Facilities
- Public-Private Partnerships
- Education and Outreach

In the 1920s, the Forest Service began efforts to establish and implement programs to produce specific plant materials, primarily conifer trees. Early efforts had high failure rates, but by the mid-1980s average survival rates of native trees was better than 70 percent, with some species exceeding 90 percent survival. As a result of the Dust Bowl Era of the 1930s, the Natural Resources Conservation Service instituted a nationwide system of centers whose mission was to develop plant materials for natural resource conservation. Although these centers traditionally focused on both introduced and native plants, within the past two decades research emphasis has shifted predominantly to native species. The Agricultural Research Service has also played an important role in research and development of native and introduced grasses and legumes.

These efforts have yielded a great deal of information about the genetics and propagation of some tree species, primarily conifers, but substantially less about native shrubs and grasses. Relatively little is known about the native forbs which often comprise the most diverse component, in terms of species, of native plant communities. For

public land management agencies to achieve the goals of maintaining and restoring healthy, diverse ecosystems, it is essential that adequate resources be devoted to similar basic research on native shrubs, grasses, forbs, and selected native trees that are in short supply.

Federal land management agencies have different missions and even within a single agency there are a variety of land management objectives. These differences must be considered in both short- and long-term strategies for native plant materials development. Despite these differences, there are many areas where interagency coordination and integration can increase efficiency, reduce costs, and increase the probability of success. A comprehensive assessment of long-term plant material needs can only be accomplished through a focused and ongoing effort to gather information from the inventories, large-scale assessments, and project-level planning efforts which are the catalyst for defining and quantifying these needs. To be successful, federal land managers and researchers must coordinate their efforts with tribes, state and local partners, and private industry.

To ensure a stable and economical supply of native plant materials for rehabilitation and restoration needs, agencies need to implement measures that facilitate the development of a long-term program to supply and manage native plant materials for use on public lands. It is important to recognize, however, that the use of most native plant materials in restoration and rehabilitation efforts on the vast expanses of public lands is in its infancy. For this reason, many of our current recommendations pertain to a short-term focus on increasing the availability of diverse native plant materials and the efficient management of that supply. Much work remains to be accomplished before federal agencies can truly define a comprehensive and integrated strategy for a long-term program that will meet our plant materials needs for restoring and maintaining the health of public lands. The actions that the federal land management agencies intend to take include:

- Undertake a comprehensive assessment of the short-term and long-term need for native plant materials including an estimate of the amount of native plant materials needed and whether an adequate supply of these plant materials exists. Agencies also need the ability to identify and track this information.
- Make a long-term commitment to native plant materials production, research and development, education and outreach, and technology transfer. On-going financial and organizational support will be required to increase the variety and quantity of native plant materials.
- Expand efforts to increase availability of numerous species of native plant materials. Both increases in commercial field production and wildland seed collection are needed to meet public land needs. Annual seed purchases by federal agencies, or as a result of federal programs, vary greatly creating an unpredictable market. Multi-year contracting and increased storage capacity, could enhance market stability. Agencies can also facilitate a secondary, non-federal, market.
- Invest in partnerships with state and local agencies and the private sector. Identify restoration and rehabilitation efforts to conduct in partnership with other land managers and interested parties. Close cooperation and coordination with the private seed growing industry will help ensure their interests and concerns are addressed.
- Ensure that adequate science-based protocols for monitoring of restoration and rehabilitation efforts are established. To promote efficiency and economy, monitoring programs with consistent protocols for measuring success must be developed and implemented.

Additional funding needed to successfully implement the above actions will be evaluated in the context of future budgets and, where appropriate, included in future budget requests.

Introduction

Native plant materials are an important genetic resource essential to ecosystem rehabilitation and restoration efforts. Native plants are needed for a wide range of projects including hazard fuels reduction, rehabilitation after fire and noxious weed control treatments, mined lands reclamation, strategic initiatives, and large-scale habitat restoration and conservation efforts such as the National Fire Plan, the Conservation Reserve Program, and the Great Basin Restoration Initiative.

In the past, the Department of Agriculture has led efforts to establish and successfully implement programs in support of specific plant materials. Breeding programs for forest trees were begun by the Forest Service as early as the 1920s and have evolved into a comprehensive research program on the genetics and conservation of the coniferous forest tree resources of temperate North America. As a result, practices for collecting, processing, testing, and use of conifer tree seeds, have developed over many years. The Forest Service has also identified collection zones to ensure locally-adapted conifer seeds are available and used appropriately for forest restocking.

The impetus for this initial focus in the early 20th century was to better assure reforestation success following large burns occurring on recently acquired public land. The history of these early efforts provides insight into the key areas that will require a sustained commitment in order to successfully expand these programs to provide for a broader mix of native grasses, forbs, shrubs, and tree species to optimize biodiversity. Early efforts to reestablish native tree species had very high failure rates. Survival rates of plantings in the first half of the 20th century seldom exceeding 50 percent even for the hardy, easy-to-grow native trees. Many areas had to be replanted, sometimes requiring 3 or 4 plantings before native trees were successfully reestablished.

As timber harvest levels increased on Federal lands after WWII, Federal agencies instituted programs to improve reforestation success. These programs involved investments in research, infrastructure, equipment and personnel. Since 1985, the Forest Service has consistently reported 3rd year survival of about 70 percent for all tree species; survival commonly exceeds 90 percent for hardy, easy-to-grow tree species.

Key to this improved success was a sustained commitment through research to better understand the:

- Ecological characteristics of species and site characteristics that support their successful establishment.
- Seed production characteristics of species and conditions for successful germination and establishment.
- Genetic characteristics of populations to better understand evolutionary adaptations.
- Life histories of species and insects, diseases, and other biotic and abiotic factors that influence survival.
- Operational factors and cultural techniques that allow for nursery production of desired species.

The Natural Resources Conservation Service instituted a nationwide system of centers whose mission was to develop plant materials for natural resource conservation in response to the Dust Bowl Era of the 1930s. Although these centers have traditionally focused on both introduced and native plant materials, research emphasis within the past two decades has shifted predominantly to native species. Agricultural Research Service research centers have played an important role in research and development of native and introduced grasses and legumes. The Forest Service's Reforestation, Nurseries, and Genetic Resources team has also made significant contributions to the development and use of native plant materials, including the publication of the Native Plant Journal in collaboration with the University of Idaho, and the establishment of the Native Plant Network, a website on which to share information about propagation techniques for native plants. Both the Fish and Wildlife Service and the National Park Service have led successful partnerships to collect, clean, and store plant materials for use in their restoration efforts on lands they manage. These efforts can provide valuable guidance to other Federal agencies in developing strategies to meet their native plant materials needs.

Although these efforts have increased our knowledge about the genetics and propagation of many native trees, especially conifer trees, much remains unknown about many native shrubs and grasses. Even less is known about the native forbs which often comprise the most diverse component, in terms of species, of native plant communities. For public land management agencies to achieve the goals of maintaining and restoring healthy, diverse ecosystems, similar basic research on native shrubs, grasses, forbs, and selected native trees that are in short supply is essential.

Again, early Federal agency efforts to reestablish native tree species provide a useful context for what needs to be done. Successful reestablishment of native tree species through reforestation programs has required the following elements:

- Ecoregional and local assessments to identify and quantify both critical and desirable plant material needs.
- Stable funding levels to build and maintain programs to establish desired native plant materials.
- A trained workforce that can integrate knowledge of local conditions, ecological characteristics, and cultural techniques to successfully grow native plant materials to achieve resource management objectives.
- Seed transfer guidelines and seed zones.
- Strict tracking of seed from local sources to project sites.
- An assured source of plant materials in needed quantities at economical prices.
- A system to facilitate information sharing among Federal and State agencies, and the private sector.
- Seeding equipment designed for use with a wide variety of native seed and often rough terrain.
- Adequate storage capacity for seed.

To ensure a stable and economical supply of native plant materials, agencies need to implement measures that facilitate the development of a long-term program to supply and manage native plant materials for restoration and rehabilitation efforts on public lands.

This report provides a specific interagency plan and recommendations to advance this program. It is important to recognize, however, that the use of most native plant materials in restoration and rehabilitation efforts on the vast expanses of public lands is in its infancy. For this reason, many of our current recommendations pertain to a short-term focus on increasing the amount and variety of native plant materials available and the efficient management of that supply. Much work remains to be done before federal agencies can truly offer a comprehensive and integrated strategy for a long-term program that will be successful in meeting future plant materials needs for restoring and maintaining the health of public lands.

Close coordination among researchers, land managers, and the private sector producers of native plant materials will be critical to the success of a long-term program. Researchers must understand the needs of land managers and the economic and technological constraints on plant production. Land managers must effectively communicate their plant materials needs to both researchers and native plant suppliers. Land managers must also appreciate the value that research on plant genetics and plant adaptation can add to the success of their restoration and rehabilitation efforts.

Purpose and Need

The use of native plants for rehabilitation and restoration efforts on public lands has received increasing emphasis throughout much of the past century. The importance of reestablishing native shrubs to improve wildlife habitat, recognized as early as the 1930s, was included in policies developed in the 1960s. Legislation passed in the 1960s and 1970s broadened public land management from a primary focus on consumptive uses to include more emphasis on wildlife habitat and recreational uses. Passage of the Surface Mining Control and Reclamation Act (SMCRA) of 1977 initiated a notable increase in demand for, and use of, native plants. The provisions of SMCRA required that a “diverse, effective, and permanent vegetative cover of the same seasonal variety native to the area of land to be affected and capable of self-regeneration and plant succession” be established.

Agencies in Departments of the Interior and Agriculture have policies on the use of native plants. Policies differ among agencies according to their missions, and within agencies depending on the management objectives for any given rehabilitation or restoration project. For example, principles for managing biological resources on National Park Service land include directives to preserve and restore “the natural abundances, diversities, dynamics, distributions, habitats . . . of native plant populations and the communities and ecosystems in which they occur.” In contrast, the objectives of the BLM Emergency Stabilization and Rehabilitation program are to “mitigate the adverse effects of fire on the soil-vegetation resource in a cost-effective and expeditious manner and to minimize the possibility of wildland fire recurrence or invasion of weeds. The purpose of rehabilitation is either to emulate historical or pre-fire ecosystem structure, function (including the reestablishment of the natural fire cycle) or if that is infeasible, then to restore or establish a healthy, stable ecosystem in which native species are well represented.” BLM policies do, however, require a site-specific evaluation of the use of non-native plants in all activity plans, including both normal and emergency fire rehabilitation projects. Both the BLM and Forest Service have a variety of policies related to various specific actions, but neither has a comprehensive policy on the use of native plants.

Federal land management agencies lack comprehensive data on their non-tree native plant needs, largely because most needs are identified and met at the field level and no system is in place to consolidate these data. The severe fire seasons that the nation experienced over the last few years, however, have highlighted the need for more comprehensive information about these needs.

Data from BLM consolidated buys are the best available information on the overall trends in seed purchase by federal agencies. These consolidated seed buys began in the mid-1990’s due to the large quantities of seed needed for Great Basin emergency fire rehabilitation and a need to reduce competition for seed among field offices. In general, the proportion of native seed to non-native seed, both in terms of pounds of seed and dollars expended, increased over the six year period between 1996 and 2001 (Figures 1, 2). This trend was broken during 1999 when supplies of native grass seed, in particular, were inadequate to meet the demand created by widespread wildfires.

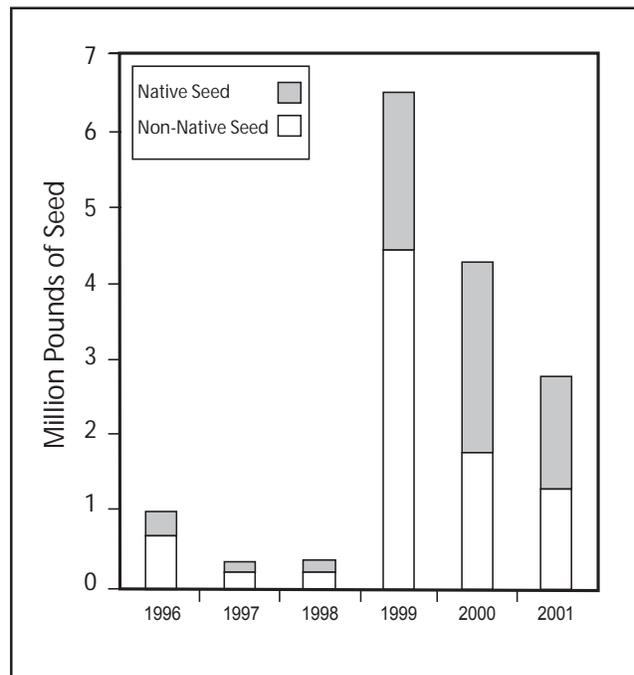


Figure 1. Quantities of seed purchased in BLM consolidated seed buys from 1996 to 2001.

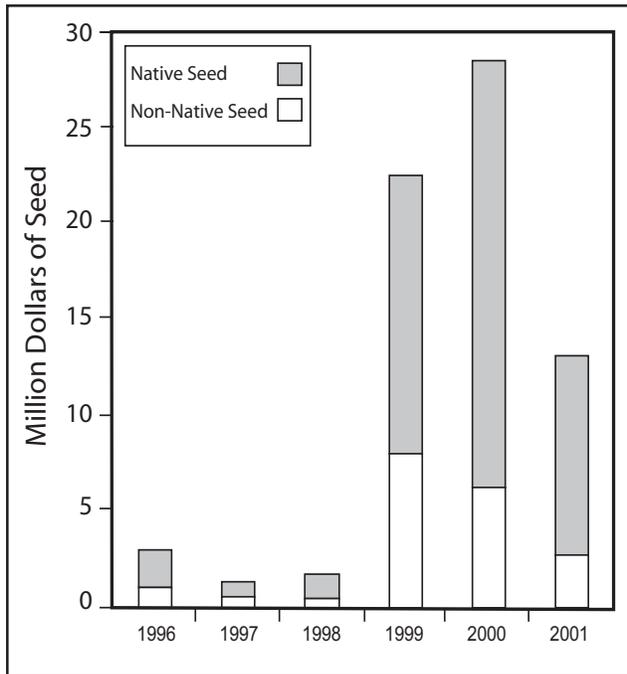


Figure 2. Dollar expenditures on seed purchased in BLM consolidated seed buys from 1996 to 2001.

Several other patterns can be seen in the BLM consolidated seed buys. During the three years prior to 1999, the total amount of seed purchased in these buys ranged between 500,000 and 1,000,000 pounds (Figure 1). The demand for seed for emergency fire rehabilitation in the Great Basin peaked in 1999 when over six million pounds of seed were purchased by the BLM. In subsequent years when wildfires were less severe, the demand for seed has decreased but still remains higher than pre-1999 because under DOI policy seed may be purchased for emergency rehabilitation for up to three years after an area has burned.

Overall expenditures for seed show a pattern similar to that shown by quantity. The peak in expenditures in 2000 is due to lingering high prices resulting from supply shortages that began the previous year (Figures 2, 3). A greater proportion of dollars was spent on native plant seed even during 1999 when native seed comprised only about one-third of the overall seed purchased. Field grown native grass seed remains more costly than non-native grass seed, although the disparity is becoming less as field production of native grass seed increases.

The inadequacy of native seed supply to meet the demand in bad fire seasons is reflected in the price trends for native grass seed paid during the BLM consolidated seed buys (Figure 3). The average price paid per pound for native grass seed nearly tripled in 2000 compared to 1996. This trend was also reflected in many individual grass species. In 2001 prices were lower, but remained at prices more than twice those paid in 1996. Native grass seed is field produced, so a major goal of the interagency strategy is to increase field production of species in short supply in order to bring prices into a range that is affordable yet provides a reasonable profit to growers. Lower prices for native seed grass will also encourage more use of native seed which remains higher priced than the traditional non-native grass cultivars. The use of native grasses allows land managers to address a broader range of resource values than the typical monoculture plantings of non-native cultivars.

Also reflected in the higher expenditure for native seed (Figure 2), is the high cost of wildland-collected seed. Most native shrub seed is manually harvested by field

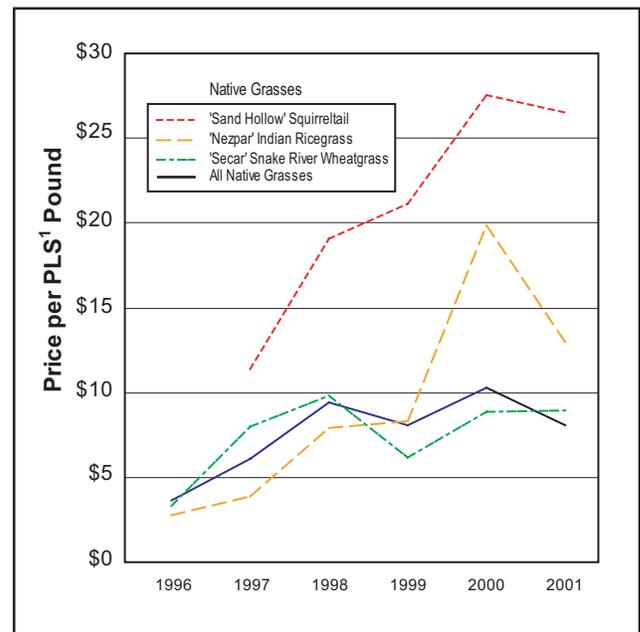


Figure 3. Price per PLS Pound of native grass seed purchased in BLM consolidated seed buys from 1996 to 2001.

¹PLS = Pure Live Seed (Bulk weight minus non-viable seed and non-seed impurities).

crews. In addition to the expense of manual seed collection, additional costs are incurred because of the long distances that must be traveled in search of seed collecting sites. Because environmental conditions vary regionally in any given year, potential collection sites must be identified on an annual basis. In addition, these sites must be revisited to monitor seed development so that seed can be collected when it reaches optimum ripeness in order to maximize germination success. Since agencies adjust the prices they pay for seed based on germination testing, under-ripe seed will lower profits. Further adding to the overall expense of wildland collected seed is the fact that different species may have divergent optimal harvest times, and thereby necessitate repeat collection trips.

While the cost of field grown seed can be lowered by increasing production, reducing the cost of wildland-collected seed poses a greater challenge. Although some increased production may be possible through special management of wildland collection areas, increased storage capacity will enable federal agencies to constrain costs for wildland-collected seed by allowing seed to be purchased in years when natural seed production levels are high and prices are lower. As with field seed production, it is important that a balance be struck between the necessity for land managers to be able to obtain seed at affordable prices and for the wildland seed collector to earn a reasonable profit if the native seed industry is to remain economically viable.

These data illustrate several aspects of native seed demand and expense, but it is important to understand that they reflect the short-term needs of a single federal agency primarily for fire rehabilitation in the Great Basin. A comprehensive assessment of long-term plant material needs can only be accomplished through a focused and ongoing effort on information gathering from the inventories, District and Forests assessments, and project-level planning efforts which are the catalyst for defining and quantifying these needs. Nevertheless, the BLM consolidated buy data are useful in conveying an appreciation of the size of the demand for native plant seed for landscape-scale needs related to fire rehabilitation.

Interagency Strategy

An interagency team, representing the Departments of the Interior and Agriculture, was assembled in December 2001 to address the native plant development issue and begin a preliminary needs assessment. Land management agencies represented on the team include the Forest Service (FS), the Bureau of Land Management (BLM), the National Park Service (NPS), and the Fish and Wildlife Service (FWS). Other participants include the Natural Resources Conservation Service (NRCS), the Agricultural Research Service (ARS), the Geological Survey (USGS) and the Office of Surface Mining (OSM). The BLM and the FS directed \$5 million and \$10 million, respectively, in FY2001 to initial development of a long-term program to supply and manage native plant materials. These funds were expended in accordance with an interagency strategy that identifies three elements key to the success of a long-term native plant materials development program:

SUPPORT FOR FEDERAL, STATE AND TRIBAL PRODUCTION, DEVELOPMENT, AND RESEARCH FACILITIES

Federal and State governments have existing facilities and infrastructure critical to the testing, development, and production of native plant materials for use in restoration. For example, the NRCS Plant Materials Program, a network of 26 Plant Materials Centers (PMCs) nationwide, develops plants and plant science technologies to address natural resource conservation. The Forest Service also operates six nurseries, one of which has attained national recognition for its work on native plant species. Many States and some Tribes also have similar facilities, often associated with universities. Together the Federal, State, and Tribal facilities provide an infrastructure that can facilitate the development of a viable native plant materials industry. Adequate storage facilities for plant materials must be constructed or leased, and new equipment specifically designed to accommodate the wide variety of native plant materials must be acquired and maintained.

PUBLIC-PRIVATE PARTNERSHIPS

While public agencies play a basic role in the development of materials and technologies, the private sector, including non-governmental organizations (NGO's), is essential to the long-term success of a native plant materials program. The private sector is particularly suited to the large-scale seed increases that are required to meet Federal demands for rehabilitation and restoration. The private sector can also provide a workforce with skills that are not available in some Federal land management agencies, conduct research to fill information voids, and organize partnerships to address resource issues that cross land management boundaries. Smaller private enterprises play a significant role in native plant material development by providing both local knowledge and local genetic stock for specific restoration project needs.

EDUCATION AND OUTREACH

Education and outreach serve to inform the public on the purpose and needs for a native plant development program and to clarify for them its goals and objectives. Done effectively, education and outreach helps to leverage non-federal resources by building a constituency within the public for land management actions that enhance ecosystem health by conserving or restoring natural diversity, mitigating the effects of wildfires on the land, and reducing the threat that exotic weeds pose to our native ecosystems. The Plant Conservation Alliance (PCA), of which the authors of this report comprise the Federal technical committee, is well-positioned to assist agencies in this regard. The PCA, established by federal agencies to identify priority conservation needs for native plants and their habitats and coordinate programs addressing those needs, includes 200 non-Federal cooperators.

Project Scale and Time Considerations

Once quantitative needs for native plant materials have been identified, meeting these needs depends upon the scale of the specific rehabilitation or restoration project being addressed (Figure 4). For small projects, up to about 100 acres, it may be possible to let the area recolonize on its own, or collect seed locally and seed it directly into the project area. At the other extreme lie large-scale projects like the Great Basin Restoration Initiative (GBRI), where over 25 million acres have been invaded by cheatgrass. In between these extremes of scale lie rehabilitation and restoration projects to restore native plant communities and native ecosystems. Although the private sector can play a role in seed collection even for the smallest projects, their potential contribution increases rapidly as the scale of the project increases.

Time is also an important factor in meeting the demand for native plant materials and also relates to project scale (Figure 4). For small projects, wildland seed can be collected and used to restore native plant communities in a relatively short timeframe. Wildland-collected seed is also used for many shrubs, such as sagebrush. Ecosystem and landscape scale rehabilitation projects, however, usually require large amounts of field grown seed which may require several years to increase to adequate amounts if supplies are unavailable in storage.

Some cultivars of native grasses have been around for many years and are usually available at a reasonable cost. But many of these older varieties were developed from very narrow selections and may not perform well, or even survive, on a particular site. Common garden studies allow for rangewide comparisons to be made on variability in key characteristics such as germination rate, seedling establishment success, and ability to compete with invasive weeds. Modern genetic techniques allow for the rapid assessment of genetic diversity. In combination, common garden studies and genetic analysis allow for the development of seed transfer zones to provide guidance on the maintenance of diverse plant populations well-adapted for long-term success. Testing and development of new materials, however, is a multi-year process. Test fields must be maintained under strict rules to maintain genetic integrity and weed and pest control.

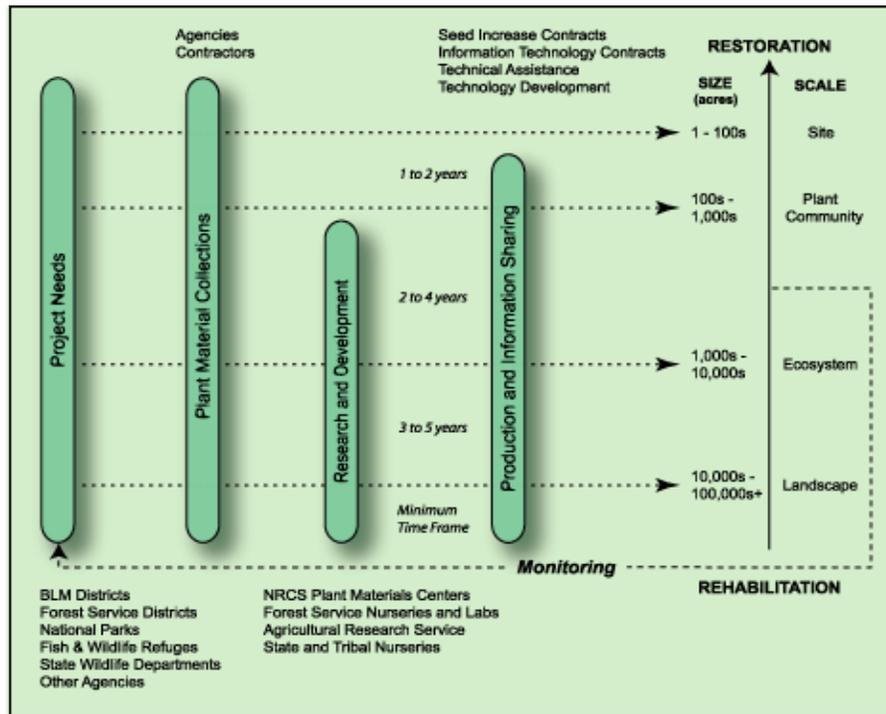


Figure 4. Conceptual diagram of the relationship between the Interagency Native Plant Materials Development Program Strategy, project scale, and time considerations.

Federal and State agencies play a critical role in the selection, testing, and development of new native plants for ecosystem rehabilitation and restoration. They can conduct field evaluations and genetic studies, and can provide guidance on seed transfer zones within which these plants can best be used to meet land management objectives and project needs. Public facilities can also guide the development of new technologies, including equipment, needed to produce native plants and cultural techniques for ecosystem restoration. Some Tribes also have extensive experience in the propagation of native plants. Finally, public agencies play a key role in developing and applying methods for monitoring the effectiveness of rehabilitation and restoration treatments in advancing conservation and resource management objectives.

Other public entities that play important supporting roles include universities, agricultural extension services, seed testing laboratories, and seed certification agencies. The Association of Official Seed Certifying Agencies has published “Pre-Variety Germplasm” and “Woody Plant and Forbs” Certification Requirements and Standards for the maintenance of genetic identity and purity of native plant materials as they are collected, developed, and produced. Seed testing laboratories evaluate seed germination and presence of contaminants such as inert matter, other species’ seed, and weed seed. The genetic tracking and seed analysis provided by these agencies and laboratories are vital to native plant restoration efforts because using seed of known genetic origin, purity, and germination greatly reduces risks inherent in stand establishment and survival.

Public agencies can also work to facilitate the development of a viable native seed industry. Federal agencies, including programs such as the Conservation Reserve Program, are the primary market for native plant materials. Actions that may foster a predictable demand for native plant materials, such as the development of a secondary native seed market, increased storage capability, multi-year grower contracts, and better integration among fire rehabilitation and hazardous fuels reduction projects and other habitat restoration programs may help to ensure that plant materials are available when needed.

Specific Actions

Public land managers find themselves facing the cumulative threats of increasing wildfire frequencies, drought, and invasive plant species, potentially compounded by global climatic changes. To counter these threats, public agencies need to expand their efforts beyond emergency stabilization and rehabilitation of burned areas to the restoration of native plant communities. Doing so will help combat invasive species, decrease wildfire frequency, and also address broader goals of conservation of native biological diversity. The interagency team has identified five specific actions that land management agencies can take to develop a long-term program to supply and manage native plant materials:

ACTION ITEM 1: UNDERTAKE A COMPREHENSIVE ASSESSMENT OF THEIR NEEDS FOR NATIVE PLANT MATERIALS

As noted previously, Federal land management agencies lack comprehensive information on their native plant needs. A number of reasons for this can be identified. Among the most important are:

- Relatively recent recognition of the importance of native plants to ecosystem processes and functions including their ability to resist invasion by alien plant species.
- Increasing emphasis on the importance of going beyond rehabilitation focused on erosion control and forage production to native plant community restoration that addresses a broad range of ecosystem services.
- A trend toward larger and more frequent wildland fires resulting as a consequence of past fire suppression and invasion by alien plant species.

Federal land management agencies now recognize the need to undertake a comprehensive assessment of their ecoregional and local short-term and long-term needs for native plant materials. In order to do so, each agency will examine their past use of native plant materials as well as their anticipated future needs based on actions identified in their land use plans and other relevant decision documents. Specific areas to be addressed include an estimate of the amount of native plant materials needed and whether an adequate supply of these materials exists. In addition, agencies will develop the ability to identify and track this information.

ACTION ITEM 2: MAKE A LONG-TERM COMMITMENT TO NATIVE PLANT MATERIALS PRODUCTION, RESEARCH AND DEVELOPMENT, EDUCATION, AND TECHNOLOGY TRANSFER.

Biological and ecological characteristics of many native plant species are poorly known. This information gap includes data on genetic variability within individual plant species, transfer guidelines for native plant materials, information on cultural techniques and seeding/planting methods for successful germination and seedling establishment, and the effects of individual species and cultural techniques on ecological processes and species interactions. Each of these factors can significantly affect both short- and long-term success of restoration efforts as has been shown in the tree development programs. Sustained funding is needed to fill these information gaps and to facilitate sharing of data among agency land managers, researchers, and plant production specialists. In addition, substantial initial investment is needed to produce foundation seed for release to the private sector for the many species needed for rehabilitation and restoration. Funding provided by Congress for FY2001 and FY2002 allowed agencies to provide critical short-term support to ongoing programs in several ecoregions and initiate new plant development programs in fire-prone ecosystems where they were lacking. In FY2003, continued support of these proactive efforts to develop native plant materials will help ensure that agencies are better prepared to meet their future needs.

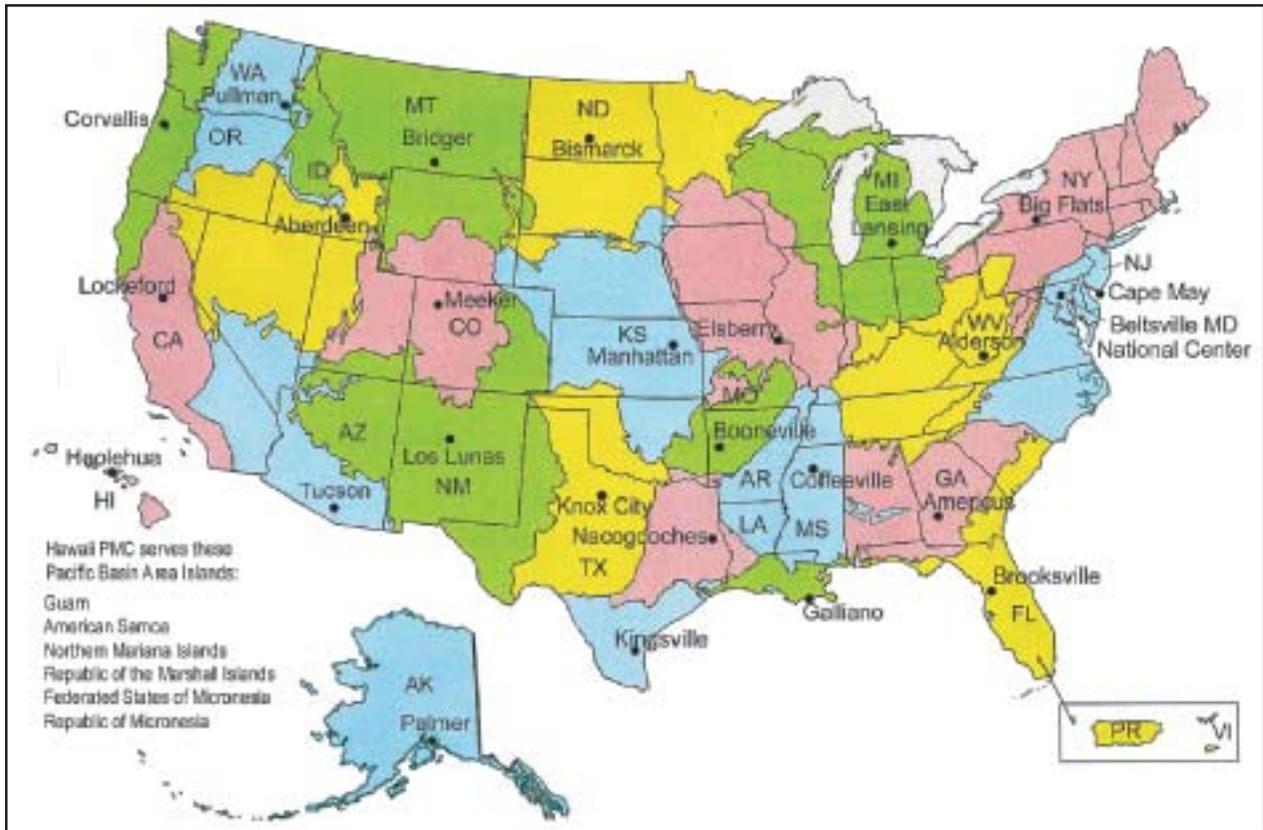


Figure 5. The 26 Plant Materials Centers and their geographic areas of responsibility

The Plant Materials Centers

Born of the Dust Bowl Era of the 1930s, the Plant Materials Centers (PMCs) were created to meet the conservation demands of the last century. The 26 PMCs have released over 500 plants, 350 of which are still in use today. Annually the PMCs produce 18,000 pounds of seed and 15,000 plants valued at \$90 million. They have traditionally emphasized both native and introduced plants, but over the past five years all but 6 of 123 new releases have been native plants.

The Beltsville, Maryland PMC is the national center and a regional center for the central eastern states. In the late 1980s, the PMC was nearly closed. Subsequently, it developed a funding relationship with the National Park Service to produce native plants for restoration needs in the region and is now a thriving enterprise and a national leader in the development and production of native plants for ecosystem restoration.



The Beltsville, Maryland, Plant Materials Center.

The current challenge to our Nation's wildlands is not unlike that posed to the agricultural lands of our Plains States during the Dust Bowl era of the 1930's. Like soil erosion and loss, the loss of wildland habitat and native ecosystems from wildfire and invasion by exotic species is an issue that crosses land management boundaries. To meet the Dust Bowl challenge, the Federal government responded by establishing a nationwide network of Plant Materials Centers (PMCs) to lead the development of plants for conservation uses. In meeting the challenges of soil erosion and loss over a half century ago, the PMCs, in cooperation with State and local partners, provide a successful model for addressing the issues of today. Success in meeting today's challenges, however, will require the PMCs to work closely with land managers and partners to ensure their needs for ecologically and genetically appropriate native plant materials are met.

The mission of the 26 PMCs (Figure 5) is to develop and transfer plant science technology to meet resource conservation needs. The PMCs are an established infrastructure that can and should play a critical role in restoration efforts. They have traditionally emphasized both introduced and native plant materials, but over the past five years all but 6 of 123 new plant releases have been native plants. A national Task Force was formed in August of 1999 to examine the current status of the Plant Materials Program and provide a business strategy on plant materials operations consistent with available resources. The Task Force prepared a report and briefed the NRCS Chief in April, 2000. Based on this briefing, an action plan was selected to expand the financial resources of the Plant Materials Program so that staffing, workload, and infrastructure needs can be met. Among the actions in the plan is a specific recommendation to integrate PMCs in the implementation of all plant-related initiatives, including those with a native species and invasive species focus.

Plant Materials Centers could contribute to the native plant materials development program in at least six ways:

- Collect, select, and evaluate native plant materials for new releases.
- Provide foundation seed to commercial growers for increase and distribution to end-users.
- Develop and transfer technology for establishment and management of native plant species.
- Provide key plant species information for use in land restoration.
- Help develop valuable biological information about plant species.
- Provide for improved technology transfer of successful propagation techniques to state and private growers.

The Forest Service produces over 150 species of native grass, forbs, and shrubs in addition to tree seedlings at six nurseries. It also operates seed extractories for the extraction and cleaning of seed, and acquires native plant materials from State nurseries and commercial growers. Reforestation programs have declined markedly on National Forests due to sharp reductions in the timber sale program, a decline projected to continue over the next 3-5 years. The Forest Service convened a core review team in July, 2000, to provide an estimate of traditional and non-traditional plant materials needs through 2005 and to provide management options and recommendations to support continued operation of the nurseries and facilitate the integration of Forest Service research with land management needs.

Based on their review, the Forest Service is now implementing an action plan that will:

- Develop infrastructure at FS nurseries and support Research Stations which focus on the development of native plant materials.
- Initiate internal reviews to assess the effectiveness of native plant materials programs.
- Expand the role of the National Forest Genetics Electrophoresis Lab to investigate the genetic characteristics of non-tree plant materials.
- Improve coordination of FS research on native plants with the needs of Federal land managers.

Forest Service nurseries were initially established to be a reliable source of seed and seedlings of native tree and range forage species on Federal lands. Explicit direction authorizing the use of these facilities to facilitate the development of other native plant materials for use on Federal lands, to ensure coordination with other agencies in establishing priorities to reach conservation and management goals, and to assist landowners and growers through the technical transfer of this information would be beneficial.

The Agricultural Research Service (ARS) is the research agency for the Department of Agriculture. Its programs in plant genetics, plant materials, plant germplasm, and pollination biology provide a scientific infrastructure for development of new knowledge about native plant materials. The ARS has major plant development programs in place for cool and warm-season grasses. The agency's National Plant Germplasm System (NPGS) curates and distributes seed sources (called accessions) via a network of 32 units throughout the nation. The NPGS preserves a wide range of plant material including many native plants. Seed is preserved and distributed through the system with security back-up of accessions provided by the National Center in Fort Collins, Colorado. The Germplasm Resources Information Network database documents accession availability, taxonomy, and other information about this collection. Many ARS locations have excellent facilities and motivated personnel that are positioned to pursue research-based solutions to problems associated with native plant material development.

Other specific ways in which ARS facilities can assist land management agencies in developing supplies of native plant materials include:

- Development of both broadly-adapted and local ecotypes of native grasses and forbs that readily establish, are adapted to stressful environments, and are amenable to seed production.
- Research on patterns of genetic variation in native plant species and the preservation of representative germplasm.
- Research on the physiology of seed preservation, maintenance of genetic integrity during seed collection and increase, and characterization of plant population diversity.
- Research on effective pollination and pollinator management practices for native forbs.

J. Herbert Stone Nursery

Since its establishment in 1977, the Forest Service's J. Herbert Stone Nursery in Central Point, Oregon, has become a nationally recognized leader in the production of native plants for public lands. Their staff includes experts in seedling physiology, soils, and plant pathology. The 311-acre nursery serves the Forest Service, Bureau of Land Management, Tribes, and other Federal, State, and local agencies in the western United States. Although they do not grow native plant materials for sale to the public, they serve the public by providing a valuable source of knowledge and expertise.

The nursery has grown over a hundred species of evergreen and deciduous trees and shrubs for reforestation and watershed restoration. It began its native grass program in 1991 with 15 species on less than an acre of land and today produces over 12 tons of seed a year representing over 40 grass species and dozens of forbs native to the western United States. Grass and forb beds must be kept weed-free and separated from other collections of the same species to avoid cross-pollination. The nursery is also a leader in propagation of wetland plant species.

In March of 2001, the Bureau of Land Management recognized the contribution of the J. Herbert Stone Nursery to native plant materials development with an award presented at the 65th annual North American Wildlife and Natural Resources Conference.

ACTION ITEM 3: EXPAND EFFORTS TO INCREASE THE AVAILABILITY OF NATIVE PLANT MATERIALS.

Efforts to increase the availability of native plant materials needs to address two basic means of supply: wildland seed collection and field seed production. Most, although not all, shrub seed is collected from wildlands, much of it from public lands. Management activities related to wildland collection have largely focused on the permitting process. Equally important to the sustainability of wildland collection, however, is the identification and management of wildland seed sources; both are areas that have received less attention. To ensure adequate supplies of wildland seed, agencies will undertake the identification of critical source areas and implement management that furthers yields sufficient to meet the anticipated demand. Since many wildland sources representing local genotypes have already been lost or diminished by wildfire, efforts must be made to reestablish stands of native plants in high demand. Management of seed sources may require adjustments in season of use, fencing to reduce herbivory, and such cultural practices as pruning to increase yield. Opportunities may exist for contract management and seed harvest within specified areas. The highly variable nature of annual wildland seed production, however, will require development of seed storage facilities in anticipation of actual demand.

Field seed production, largely driven by market demand, is difficult to forecast because of the unpredictability of the number, size, intensity, and geographic location of wildfires, and enrollment in voluntary large-scale habitat conservation programs like the Conservation Reserve Program. Field seed production is also complicated by delay between the time the field is established and when it comes into full production, which may take several years. Nevertheless, a more stable and predictable market is in the best interests of the buyers, growers, and sellers of native plant materials. Multi-year or “forward” contracting for seed has proven successful in meeting small scale needs and is particularly useful where management objectives prescribe the use of local genotypes. Forward contracting has not been used to meet large-scale needs for broadly adapted plant materials, but there are no obvious reasons why it could not be successful. A more critical question is whether forward contracting would be a disincentive to growers without contracts and thereby have the unintended effect of lowering overall seed production. Agencies need to buy and store seed in advance of their anticipated need in order to avoid large seed purchases when supply is limited and prices are high. The longevity of seed of native species in storage is highly variable. Some species have seed with very short shelf-lives with viability beginning to decrease within weeks of harvest. Other species may produce seed that remains viable for decades or longer. In most cases, the period of seed viability can be extended by storage under cool, dry conditions. Much research remains to be done on this important aspect of native plant materials.

Federal land management agencies can help facilitate the development of a secondary market for native plant materials. The use of native plants is becoming increasingly common among state and local agencies, and in private habitat restoration efforts. Although these individual efforts may be relatively small, their cumulative effect could help ensure that growers remain economically viable in years when federal demand is low. In addition, the emerging market for native species for invasive species control is likely to continue to grow.

Finally, missions and needs differ among and within agencies. National Park Service needs are typically for small volumes of locally-adapted plant materials for small-scale restoration projects focused on preserving genetic diversity. Genetic diversity should be a concern of all land management agencies, but the volume of seed needed for large-scale restoration often precludes the use of local genotypes. Moreover, for some needs, such as that for native plants effective against invasive exotic weeds, highly-competitive and/or broadly-adapted plant selections may be better suited than local genotypes. For these reasons, multiple strategies and approaches are needed to address land management objectives and the practicalities imposed by project scale and time considerations.

ACTION ITEM 4: INVEST IN PARTNERSHIPS WITH STATE AND LOCAL AGENCIES AND THE PRIVATE SECTOR.

Many opportunities exist for Federal agencies to work collaboratively with state and local agencies and the private sector. Doing so not only builds production capacity and enhances skills and expertise necessary to the viability of a long-term native plant materials program, but also demonstrates the commitment of agencies to work with partners to address issues that cross land management boundaries.

State agencies that can make significant contributions include not only land management agencies, such as wildlife and natural resource departments, but agricultural agencies including extension services, seed testing laboratories, and seed certification agencies. State agricultural agencies play a particularly important role in the sharing of information and technology with the private sector and the development of a local seed industry.

State nurseries and universities will be integral partners in native plant materials research and development. There are about 75 state nurseries nationwide, many of which have been producing a wide variety of native plant materials for years and could contribute to restoration needs on public and private land. Many state nurseries already receive some federal funding. Increased coordination and integration between federal agencies and state nurseries provide significant benefits. Research cooperatives between federal agencies and state universities and nurseries will be established on a regional basis, possibly through the Cooperative Ecosystems Studies Units, of which many universities are already member institutions.

Other potential collaborators include partners in existing and new ecosystem restoration projects. Such projects provide land management agencies opportunities to team with groups with a broad array of interests to work together in furtherance of an agreed upon set of common goals. Because of the high incidence of wildfires and the threats posed by exotic weeds to the Great Basin, the BLM and Forest Service have initiated a multi-year project focused on developing a wider variety of native forbs for use in rehabilitation and restoration projects (see box below). This project exemplifies the coordinated and collaborative approach needed for success in native plant materials development.

The Great Basin Native Forb Selection and Increase Project

The Great Basin presents many challenges to Federal and State land management agencies and will be a major focal area for native plant material development in the Western United States for many years to come. The Great Basin Native Plant Selection and Increase Project is a collaborative approach to increase the variety and supply of native plants through an integrated approach to applied science.

- Four components have been identified:
- ✓ *Increase native plant materials available for restoration.*
 - ✓ *Manage or reestablish wildland seed sources.*
 - ✓ *Technology development and transfer.*
 - ✓ *Genetic research and garden trials.*

Cooperative studies with commercial growers are proposed to increase the availability of newly developed plant materials and to facilitate the transfer of production to the private sector.

Cooperators

Federal Agencies

- BLM in Utah, Idaho, and Nevada
- National Forest System
- Forest Service Shrub Sciences Lab, Utah
- National Forest Genetics Laboratory
- Agricultural Research Service, Utah
- Natural Resources Conservation Service, Idaho
- Lucky Peak Forest Service Nursery, Idaho

State Agencies

- Utah Division of Wildlife Resources
- State Seed Certification Agencies
- State Seed Testing Laboratories
- Utah State University
- Lone Peak Utah State Nursery

Others

- Brigham Young University
- Association of Official Seed Certification Agencies
- Additional cooperators will be added as needed.

ACTION ITEM 5: ENSURE ADEQUATE MONITORING OF RESTORATION AND REHABILITATION EFFORTS.

Adaptive management requires detailed scientific data from carefully designed monitoring programs. About 10 percent of gross native plant development funding will be set aside for monitoring the ecological success and economic costs of seeding and restoration efforts. New monitoring methods and protocols need to be developed to supplement those already in existence. In particular, methods are needed that assess the maintenance of biological diversity, including genetic diversity. While expert opinion differs regarding the need for locally-adapted ecotypes versus plant materials selected for broad adaptability, very little data exists on which decisions can be based even for the most common native species. Failure to monitor the genetic and ecological effects that result from the initial selection, field production, and use of plant materials could affect the success of rehabilitation and restoration projects, or even lower the fitness of native populations into which restoration species are introduced. Such unintended consequences could affect the long-term success of restoration efforts.

Conclusion

To ensure a stable and economical supply of native plant materials, agencies will implement measures that facilitate the development of a long-term program to supply and manage native plant material for restoration and rehabilitation of public lands. This report provides an interagency plan that identifies specific actions to further this goal. It is important to recognize, however, that the use of most native plant materials in restoration and rehabilitation efforts on the vast expanses of public lands is in its infancy. For this reason, many of our current recommendations pertain to a short-term focus on increasing the amount and variety of native plant materials available and the efficient management of that supply. Much work remains to be done before federal agencies can truly offer a comprehensive and integrated strategy for a long-term program that will be successful in meeting future plant materials needs for restoring and maintaining the health of public lands. Close coordination among researchers, land managers, and the private sector producers of native plant materials will be critical to the success of a long-term program. It is imperative both for public land managers to be able to obtain adequate supplies of native plant materials at affordable prices and for seed growers and collectors to make a reasonable profit if the native plant materials market is to be economically viable over the long-term.

It must also be recognized that land management agencies have different missions and that even within a single agency there exists a variety of land management objectives. The specific needs of one agency, for example the need for the BLM to purchase seed in large consolidated seed buys or to have available large storage facilities, are not necessarily shared by other agencies. These differences must be taken into consideration in both short- and long-term strategies for native plant materials development. Despite these differences, however, there remain many areas where interagency coordination and integration will increase efficiency, reduce costs, and increase the probability of success.