

National Seed Laboratory

USDA Forest Service

National Reforestation, Nurseries, and Genetic Resources Team
State and Private Forestry



Background: The Forest Service National Native Plants Policy promotes the use of native plant materials for the revegetation, restoration, and rehabilitation of native plant communities to provide for the conservation of ecosystem diversity (Forest Service Manual 2070.3). Most native plants used for ecosystem conservation and restoration are propagated exclusively from seeds. Sufficient quantities of seeds are needed to restore and sustain native plant communities that are increasingly affected by invasive species, pest infestations, wildfire, and climate change. Successful seed production requires knowledge of seed development, cleaning, germination, and storage procedures, known collectively as seed science and technology. Each species has its own



unique seed production and germination protocols. The study of adaptive genetic variation for native plant species requires that plants be grown from seeds in gardens. Suitable seed storage is becoming increasingly important for preserving the genetics of endangered species and other plants being lost in large numbers in the wild. Strategies are needed for storing and germinating seed for future plant reintroduction to the wild.

The National Seed Laboratory (NSL) is currently addressing these complex challenges and is serving as the primary national strategic resource for forest ecosystem seed science and technology. The NSL originated in the 1950s to support southern pine restoration work and has undergone several evolutions. The latest occurred in 2005 when the Chief of the Forest Service expanded the NSL's mission to include all native plants with an emphasis on gene conservation through long-term seed storage.

Key Issues:

- Successful restoration and conservation of native plant communities requires substantial investment in new seed technologies.
- An increasing number of Forest Service (FS), industry, and partner agency land managers must be trained to adequately understand and use appropriate seed technologies.
- National and international rules and procedures are needed to ensure that the domestic and international production and trade of native plant seeds is both profitable and consistent with sound conservation objectives and principles.
- The NSL is the only remaining laboratory in the United States dedicated to development and transfer of seed science and technology for native plants.

Program Description: The NSL is cooperatively funded by the Forest Service's National Forest System, Research and Development, and State and Private Forestry deputy areas and administratively attached to the Cooperative Forestry Unit in the Southern Region. The NSL develops protocols for seed handling, germination, and storage of a variety of native forest plant seeds, ranging from commercial timber species to herbaceous understory plants. The NSL provides training materials, workshops, and customized individual training programs to United States and international seed workers, and collaborates with research and production facilities nationwide.

Some native plant species are at risk in the wild because of insects, disease, invasive weeds, overuse by humans, and/or inherent biology. Seeds from these species can be conserved for decades in freezer storage at the NSL and in security backup vaults maintained by Agricultural Research Service (ARS) in Fort Collins, CO. The NSL provides seed samples for domestic and international research. NSL personnel enter all seed lots into the Genetic Resource and Information System (GRIN) database so all information resides in a central, well-maintained database.

The Laboratory performs seed tests for private industry, state governments, and federal agencies. Results are used in forest and conservation nurseries to make efficient use of seeds, to evaluate seed quality in processing plants, and as the basis for seed price determination.

The NSL is the only U.S. facility accredited by the International Seed Testing Association (ISTA) to test forest seeds. The NSL represents the U.S. Government to the Organization for Economic Cooperation and Development (OECD) with respect to forest issues within the Forest Reproductive Materials Scheme. The NSL also works closely with the Agricultural Marketing Service and Foreign Agricultural Service.

Accomplishments:

- **Protocol Development**—NSL personnel have developed numerous nationwide seed cleaning protocols for a diversity of native plant species. NSL recommendations were followed in establishment of seed extractories for federal (Bend, OR; Midewin Tallgrass Prairie, IL) and state (Havana, IL; Macon, GA) use. The NSL is developing germination protocols for 10 species from each of the Great Basin and longleaf pine ecosystems. About one-third of all seed tests conducted at the Laboratory are for protocol development.
- **Training and technology transfer**—The NSL hosts several annual workshops at various locations and several individual trainees at the laboratory. It also participates in several national and international conferences every year. Preliminary testing procedures are posted on the NSL Web site and staff members regularly respond to telephone and email queries from seed producers and nurseries. NSL staff members also served as authors and co-editors of the Woody Plant Seed Manual (Agricultural Handbook 727) that was published in 2008 in cooperation with Research and Development.
- **Genetic Conservation**—The NSL helped organize a gene conservation workshop in 2008 at the Dorena Genetics Center in Oregon. In 2009, the NSL led a collection of *Fraxinus* in response to the emerald ash borer and, with 20 collaborators, secured more than 500 seed lots. Through a cooperative ARS-FS agreement, these seed lots were entered into the GRIN and a sub-sample was placed into security backup at the disaster-proof ARS facility in Fort Collins, CO. The NSL can provide samples of most lots for research purposes. Sugar pine from California and historic genetic research samples from Lincoln, NE, are also being entered into the system. Initial arrangements have been made to receive several threatened and endangered species.



School teachers sow paintbrush and yucca seeds in the new Cultural Plant Propagation Center at the Moencopi Day School in Tuba City, AZ. Photo by Jeremy Pinto.

- **International Work**—In 2006, the NSL worked with European Union countries in the Organization for Economic Cooperation and Development to develop a new standard to label tree seeds, based on genetics, for international trade. This resulted in increased European demand for tree seeds from the Pacific Northwest United States. Specifically, Germany seeks Douglas-fir, which is more drought resistant than the country's native spruce that suffers from climate change. The NSL implements this agreement through U.S. state seed certification agencies. NSL staff participate on the International Seed Testing Association forestry committee to ensure that international testing standards are in place for U.S. seeds exported to other countries.
- **Fee for Service Seed Testing**—The NSL annually conducts 3000 to 6500 seed tests for nurseries and seed dealers as part of its historic mandate. Results are provided to customers through password-protected Internet accounts in collaboration with a private company.

Future Direction: As the national center for technical expertise on native plant seeds, the NSL will continue and expand its current efforts to address the increasing demand for restoration seeds in response to climate change, invasive pest and weed infestations, and habitat loss and degradation. These factors threaten the genetic integrity of native plants and the NSL is well positioned to support Forest Service efforts to conserve genetic material by storing irreplaceable germplasm. Not only will new seed lots need testing, but stored seed lots will require periodic testing to monitor their viability.

Because only a limited number of laboratories are willing to test tree and other native plant seeds, the NSL will continue its fee-for-service testing program. This service fosters ongoing relationships with restoration professionals that allow the laboratory to stay current with technology needs and problems and facilitates technology transfer, especially to public agencies.

Karl R. Dalla Rosa, Program Manager, Forest Stewardship
USDA Forest Service, CF
400 Independence Avenue, SW
Mailstop Code: 1123
Washington, DC 20250-1123
202-205-6206
kdallarosa@fs.fed.us

Robert Karrfalt, Director, National Seed Laboratory
National Seed Laboratory
5675 Riggins Mill Rd
Dry Branch, GA 31020
478-751-4134
rkarrfalt@fs.fed.us