



Prospectus

Seed Technology Support Services

FS National Seed Laboratory



Seeds are the beginning of the regeneration or restoration of plant communities. As one poet wrote, “All the food and all the flowers of all our tomorrows are in the seeds of today.” Likewise, the seeds of today contain all of tomorrow’s prairies and forests. The Forest Service National Seed Laboratory (FSNSL) has been a repository of knowledge within the Forest Service for seed technology for over 50 years. In recent decades the lab has assisted the FS and state nurseries in their growth into native plant production. Established in 1952 as a regional facility by the USDA Forest Service in the southern United States, it grew to be the Eastern Tree Seed Laboratory by 1958, the National Tree Seed Laboratory in 1979, and finally the Forest Service National Seed Laboratory in 2005. Each transformation took place to meet the emerging needs of the nation. Most early work was with commercially important timber tree species. Over the last 15 years, the Seed Laboratory did increasingly more seed work with non-timber native plants and rare, sensitive and endangered plants. This shift occurred as several needs became evident in caring for the land. The first was to propagate native plants for restoration of native plant communities following disturbance or invasion by exotic weedy plant species. A second was to preserve the limited genetic resources of the rare, sensitive and endangered species. An increasing need to preserve commercial tree germplasm also became evident. Recognizing these changes, it is appropriate that the lab adopt a new more inclusive mission and name. Therefore, assistance and services are now available with seeds of all native plants, both herbaceous and woody, and the name is changed to the Forest Service National Seed Laboratory. This prospectus covers the services available from the FSNSL.

Services are provided in five main areas:

Training

Technical Assistance

Seed Testing Services

Assistance with International Seed Exchange

Long Term Seed Storage for Preserving the Genetic Resources of Native Herbaceous and Woody US Plants

As members in the Association of Official Seed Analysts (AOSA) and the International Seed Testing Association (ISTA), the laboratory’s specialists work to develop the official seed testing rules for both woody and non-woody native plants. Additionally, personnel at the FSNSL possess a broad understanding of the seed world from their many interactions with numerous private and public seed testing laboratories, seed researchers world wide, seed certifying agencies in individual states, the Association of Official Seed Certifying Agencies (AOSCA), and the international marketing schemes of the Organization of Cooperation and Development. The FSNSL is the only US laboratory to be accredited by the ISTA to test forest seeds. The FSNSL serves the entire nation and is the only place the USDA Forest Service conducts seed technology activities in a service mode.



Training from the FSNSL

The Basics of Seed Technology

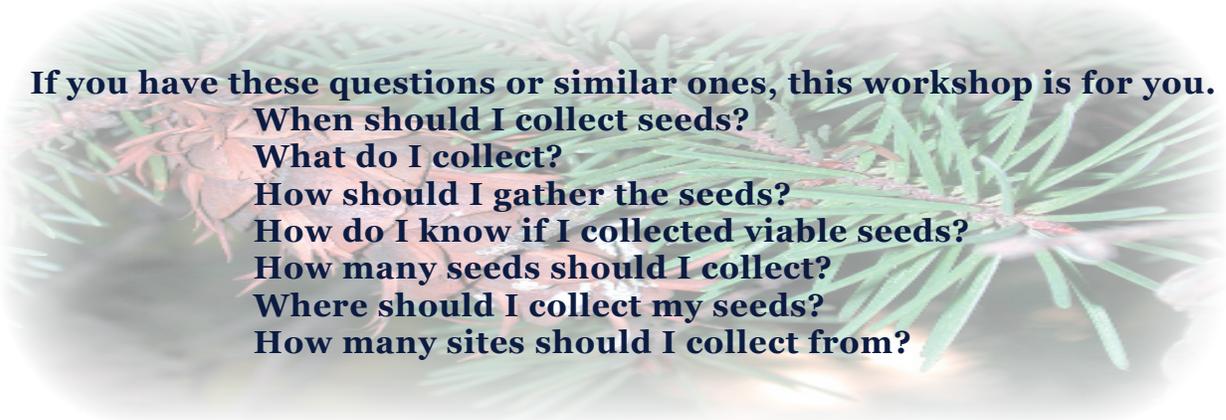
Persons taking these three basic seed technology workshops will receive the basic knowledge needed to begin work with native plant seeds, both non-timber and timber species, and learn how and where to find assistance with seed problems. These workshops identify what can be done with minimal equipment and what requires the investment found only in a seed laboratory or production seed cleaning plant.

Workshops are flexible and adapted to local conditions and species concerns as much as possible. Basic principles are presented and then local materials are examined. Participants are encouraged to bring the seeds with which they work in order to maximize the take home lessons. For many species of native plants there is no or limited experience. Therefore, workshops are expected to produce new protocols.

Workshops last for two and one half days. Each day is mixed with about equal parts lecture/discussion session and hands-on work. We adapt the discussions and hands on work as much as possible to the needs of the participants. Each participant receives a workbook with notes and exercises for all topics presented. The workshops can be taken in any order. While previous botanical training is excellent preparation, it is not absolutely necessary for the basic workshops. A set of questions precedes each workshop description to help potential participants identify what workshop they need the most.

Workshop size is usually limited to about 12 persons to facilitate participant involvement. Most workshops can be presented at any location that has adequate light, electricity, and work tables. Some advanced features will be better taught at a seed lab or seed cleaning facility. These details can be worked out for each particular situation.

Seed Collection Workshop



If you have these questions or similar ones, this workshop is for you.

When should I collect seeds?

What do I collect?

How should I gather the seeds?

How do I know if I collected viable seeds?

How many seeds should I collect?

Where should I collect my seeds?

How many sites should I collect from?

Workshop content: What quantity of seeds to collect is determined by the magnitude of the regeneration project and survival estimates for the seeds. Unfortunately many seeds never produce a plant. Seeds need to be collected at physiological maturity. To estimate when this occurs, it is necessary to study embryo types and the seed maturation process. Embryo type and fruit structure are also very important in estimating the quality of the seed that is collected. Fruit structure will determine what plant part is collected, how seeds are obtained from it, and how seeds and fruits are handled as they are conditioned for storage or sowing. Genetic variation is always the backdrop on which seed collections are planned so this topic must also be addressed in the discussion of seed collection.

Seed Conditioning Workshop



If you have these questions or similar ones, this workshop is for you.

How must seeds be handled between collection and storage or sowing?



How do I get the seeds out of dry fruits and fleshy fruits?

What seed cleaning might I try myself, what should be done somewhere else?

Are there tools or machines to do what needs to be done?



How should I store seeds for maintaining high viability?

Is there anyway to quickly clean these seeds?

Workshop content: Storage conditions for seeds and fruits are determined by the fruit type, ability of the seed to dry or not dry, and the degree of dormancy. Fruit type and the strength of the seed coats determine what tools or machinery can be used to clean seeds. How quickly seeds must be used or put into controlled storage determines work schedules. There are techniques for cleaning seeds that will generally produce clean, pure seeds of high viability. This is true for herbaceous and woody native plants. High quality seeds greatly increase the chance of successful regeneration over that of using rough unconditioned seeds. Ideal storage conditions for preserving seed viability will be discussed.

Introductory Seed Testing Workshop

If you have these questions or similar ones, this workshop is for you.

How do I know I am purchasing live seeds?

How do I estimate how many plants will come from a given weight of seeds?

How do I compare the relative value between two seed lots?

How can I estimate the quality of seeds before and during seed collection?

How do I know it is o.k. to freeze my seeds?

How good a job did I do cleaning my seeds?

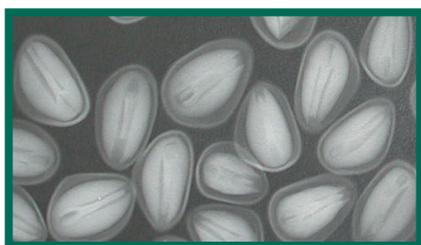


Workshop content: Seed testing is the guiding light for the management of all types of seeds. Seed tests are needed at all stages of seed use starting at evaluating potential seed harvests through storage and sowing into the ground. Tests provide accurate estimates of the potential number of plants from a given quantity of seeds, aid in determining the relative dollar value of seed lots, and are critical in maintaining high viability in stored seeds. Topics included in this workshop are seed lot sampling, germination (including some dormancy breaking procedures), purity, seed weight, moisture content, and variability among seed tests.

Advanced Seed Topics

These training opportunities are for those needing more in depth seed technology training or are involved in larger seed production projects.

Rapid Estimates of Seed Viability Workshop



If you have these questions or similar ones, this workshop is for you.

How do I test the viability of a seed that has very deep dormancy?



How can I know the viability of a seed lot within a day or two?

How can I estimate seed viability immediately?

What if no one knows how to germinate the kind of seed I work with?

Workshop content: Tetrazolium chloride staining of seeds to estimate viability (TZ test), excised embryo testing, and x-ray analysis estimate viability independent of dormancy factors in the vast majority of genera. These tests are, therefore, very useful with wild plants that frequently contain dormancy barriers to seed germination. They are very flexible techniques producing highly reliable results for the analyst willing to learn the procedures. They do require a commitment to detail. Participants will prepare testing solutions, learn to prepare seeds, and begin to learn to interpret the results.

Tz tests are made by cutting open the seed and staining it with a solution of tetrazolium chloride.

The excised embryo test is made by excising the embryo from the seed and germinating it under controlled conditions. Control of infection is very important with this test.

X-ray analysis requires the use of an x-ray machine. Although usually not found outside a seed laboratory or seed processing plant, access to this equipment can be obtained and is a great help in rapidly assessing seed quality. It provides a rapid inside look at the seed structures which is important to assess viability.

Resident Training at the FS National Seed Laboratory

Persons needing extended experience in seed analysis are welcome to visit the seed lab and work with the laboratory staff. Visits can last from one to multiple weeks depending on the visitor's needs and availability of laboratory staff.

On site training

On site evaluation and training is available upon request. Training specific to your operation can be provided. We will train your staff, on your equipment, and with your seeds so that you can realize the seed quality you need for successful seed collections and regeneration activities.

Technical Assistance

If you have any of the needs given below or similar ones, these services are for you.

I have a new species to clean and do not know what to do.

I did not get the results I thought I should from some seed lots.

I need help learning to germinate a new species.

My seed drying is not going well.



Technology Adaptation

The seed lab is at the forefront of developing and adopting new seed technology for use with all types of native plants, both non-timber and timber types. The latest equipment and techniques for seed conditioning and seed testing are evaluated and researched. Cooperative studies are conducted with nursery and regeneration personnel to develop and improve seed handling protocols for conservation nurseries and other producers of both timber and non-timber native plants. Presently the lab is cooperating with the Great Basin Restoration Initiative to develop seed testing protocols for numerous native plants in the Great Basin. The lab desires to participate in similar projects in other regions.

Troubleshooting

Seed users are assisted in solving their collection, conditioning, handling, testing, and other seed related problems. Short term studies are conducted to determine corrective or new courses of action.

Overall reviews of seed handling operations are available. A report on recommendations for improvements can then be made. Planning assistance is another service of the laboratory that can help when a new seed operation is being conceived and established. Some expert guidance early in a process can save heartbreak later on. Many conservation and forest seed plants in the United States have received assistance from the seed lab in selecting and learning to operate seed cleaning equipment. Most recently this assistance has been provided for the shift to shrubs, grasses, and forbs from a total focus on trees.

Seed Testing Services

If you have any of the needs given below or similar ones, this service is for you.

The need to accurately estimate the number of pure live seeds in a seed lot.



The need to know if the seed you are purchasing is high quality seed.

The need to know if the seed stored from previous years is still good.

The need to place a fair and accurate dollar value on a seed lot.



Seed testing services are provided when they are otherwise not available. State and private laboratories may also test the species you work with. Therefore, local services from these labs can be sought. The FSNSL can also provide assistance in locating a lab near you. The tests offered are germination, purity, seed weight, moisture content, tetrazolium and excised embryo for quick estimates of viability, and x-ray analysis of internal seed structures. Each year the FSNSL tests approximately 180 different species of seeds. The lab is the only seed laboratory in the US accredited by the ISTA to conduct seed tests on forest seeds. This accreditation assures that the test results are as reliable as possible by requiring a rigorous quality assurance program. Users of the seed testing services will benefit greatly from attending the basic seed testing workshop describe previously. This workshop will give a strong understanding of the data reported by the laboratory.

International Seed Exchange

If you have any of the needs given below or similar ones, this service is for you.

I need to send seeds to a researcher in a foreign country.

I have an international request for seed and do not know what to do with it.

I need to regularly exchange seeds with a cooperator in another country.



International seed requests received by National Forests or FS research stations are sent to the FSNSL. Assistance might be needed from you to acquire seeds to fill the request, but the paper work, seed inspections, and shipment will be handled by the seed lab. Assistance in filling a seed request directly can also be provided. Researchers intending to regularly exchange materials should exchange directly with their foreign contacts and not use the lab as an intermediary. Assistance is available to establish this direct relationship.

Gene Conservation

If you have any of the needs given below or similar ones, this service is for you.

As a land manager I need to protect the gene resources of a rare plant.

As a tree breeder I would like to save early selections.



Exotic diseases (sudden oak death, white pine blister rust, chestnut blight), insects (emerald ash borer, woolly adelgid), invasive weeds (cheat grass), fires and changing land use patterns threaten the existence of many native US trees and other native plants in the wild. Some native grasses, forbs and tree species are undergoing domestication in advanced breeding programs and commercial seed production. These events mandate that the US adopt a gene conservation program to preserve wild sources of all plant germplasm. Long term seed storage will be an important part of this preservation program. In cooperation with the USDA Agricultural Research Service (ARS), National Center for Genetic Resource Preservation (NCGRP), the FSNSL provides long term seed storage for gene conservation. Seeds are received at the NSL for germination tests and then packaged and transferred to the NCGRP for long term storage in disaster proof freezer vaults. These seeds can then be used for future restoration of plant populations lost in the wild due to various disturbances. All entries into the NCGRP storage will be traceable on the ARS Genetic Resource Information Network (GRIN) data base system over the internet.