

THE SEED COLLECTION PROCESS





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Introduction

Collection of native seed from wild populations is a vitally important step in producing native plants for habitat restoration. The seeds collected from wild populations provide the genetic foundation for native plant materials that can be grown, increased, and ultimately used to restore ecosystems across the landscape.

Healthy native plant communities provide numerous ecosystem benefits, support wildlife and pollinators, and contribute to the resilience of ecosystems and the species that depend on them. Native plant communities can also help ecosystems withstand and recover from disturbances such as fire, drought, flooding, invasive species, and a changing climate. As the need for restoration grows, so does the need for a reliable supply of genetically appropriate, diverse, and affordable native seed. A limited supply of these materials remains one of the major challenges facing restoration efforts across the United States.

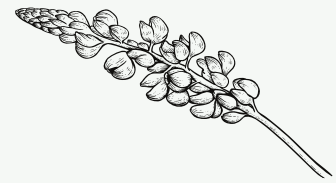
Wild seed collection can help address this challenge. Collecting seed from a diversity of healthy, well-adapted wild populations provides the starting material needed to develop native plant materials and increase seed supplies through agricultural production. In this way, a relatively small amount of wild-collected seed can ultimately support restoration at a much larger scale than wild collection alone could achieve.

This guide is intended for people with a wide range of experience, backgrounds, and familiarity with native plants—from those who are new to seed collection to those who have been collecting for years. We have not worked with every species or in every landscape across the Pacific Northwest, and there will always be questions that arise in the field that cannot be answered in a guide. Our goal is not to provide a recipe for every situation, but to give you the knowledge, tools, and framework to approach seed collection thoughtfully and confidently, and to help you find answers when you encounter something new.

Seed collection is both a science and a practice learned through observation and experience. We hope this guide helps you begin or strengthen your own seed collection journey, while encouraging curiosity, careful observation, and a commitment to collecting seed in ways that support healthy, resilient native plant populations.



Overview



1. SPECIES SELECTION



Species should be relevant to project needs

2. LOCATE COLLECTION/ SCOUTING SITES



Make sure sites are suitable in location, habitat type, and species population sizes

3. OBTAIN PERMISSION



Always get permission to be on and collect seed from a site

4. MONITOR PHENOLOGY



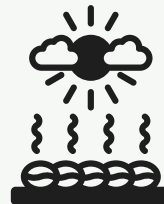
Check on target species often to catch when they go to seed

5. COLLECT RESPONSIBLY



Never collect more than 20% of available, ripe seed from a population

6. POST-COLLECTION CONSIDERATIONS



Does the seed need to be dried?
Treated with pest strips?

7. SEED CLEANING

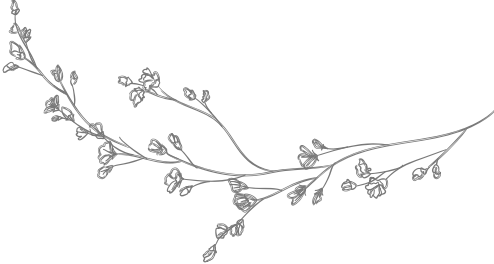


Cleaned seed stores better

8. SEED STORAGE



Shelf storage for short term, cold storage for longer



1. Species Selection

The first step in any seed collection is knowing which species you will be targeting. This information can come from many places and is dependent on your project goals. For example, you might be collecting across a wide range of sites throughout a species ecoregion for seed to be increased in production fields. Or, you may be collecting seeds from a site with the intention of spreading that seed to another area of that site. Thinking through the end use of your wild seed is essential. For us at the Institute for Applied Ecology, the request often comes from our restoration department that we work closely with, or with other project partners that have specific goals in mind. Although we don't often get to explicitly choose what species we collect for these projects, we do offer our expertise when considering various species.

What if I am able to choose my species to target?

In this case, we recommend common native species that are abundant in your targeted habitat types. This will allow you to get a feel for seed collection as you learn the process and how your actions may impact the habitats in which you work. If your goal is to restore a certain habitat type, collect seed of species that are “workhorse” species for that habitat. Also, if your goal is to start collecting for growing these species yourself, we recommend connecting with your local seed partnership such as the Puget Sound Seed Partnership, to help select what is the most desirable species for seed buyers in your area. Alternatively, you could check with local nurseries to see if they will pay for wild collected seed and what species they may be interested in.

What about threatened and endangered (T&E) species?

We advise against collecting any T&E species unless you are an experienced seed collector whose organization or agency is working to conserve and restore these species. T&E species require significantly more permitting and permission by both federal (USFWS) and state (ODA, WDFW, etc.) agencies, as well as conditions for growing, restoration site locations, and T&E species cannot be sold. To learn more about how to collect these types of plants, please refer to the Center for Plant Conservation rare plant collection protocols.



2. Locate Collection/Scouting Sites

Where you collect from will depend greatly on the parameters of your project and your overall goal. Some restoration projects only want to use seed collected from native species within that site itself, while others may be lacking such native seed sources and require all seed collections to happen outside of the site's boundaries. A majority of the time, projects will want to use seed collected in similar habitats and the same ecoregion or the same seed transfer zone, but some experimental projects may actually desire collections outside these normally established boundaries to explore ideas like assisted migration in the face of climate change. All this to say, know the goals of why you are making seed collections and let them guide the types of areas you should be looking into for seed collection sites, and don't be afraid to seek out and lean on the rich knowledge of the experts in your area.

I know what kind of sites I'm looking for, how do I find them?

The first option may sound obvious, but think of sites you may already know well and if they meet the requirements for the type of site you want to collect from! After that, other good options are to ask colleagues and project partners or organizations if they have any recommendations. Finally, you can also search online by utilizing websites like iNaturalist, Burke Herbarium, OregonFlora, and more. These sites have useful maps of points where species have been found in the field and can offer a starting point for where you may want to search.



How do I know if it's an acceptable site to collect from?

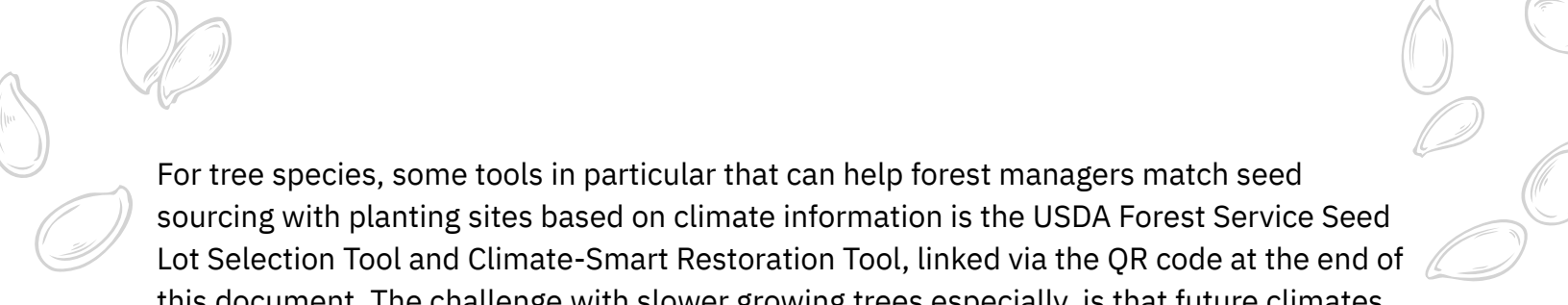
After reviewing a site to make sure it fits the criteria of being in the general region you desire, make sure the species you are interested in are present in robust enough populations to collect from. Note that depending on your site, you may need to obtain permission before scouting. Generally, spaces open to the public are okay to scout without obtaining permission as long as you stay on any established trails and follow posted rules for the area. Anything beyond this, you will need to obtain permission for.

Specifics may vary depending on project needs, but as a standard baseline it is best to avoid collecting from a population with less than 50 individuals. This means that scouting a site should involve a count of the number of individuals, not simply whether or not that species is present at the site. Scouting should generally occur while a species is in flower as it is easiest to spot and correctly identify at that time. We also recommend mapping the populations you identify in order to easily find them and come back to them later. We use ArcGIS Field Maps, but use the mapping software of your choice, there are several good free options out there such as QGIS. After assuring your target species is present in large enough quantities at your site, it is time to move on to the next step.

Climate change considerations

Climate change is altering the timing, abundance, and distribution of native plant reproduction, making seed collection increasingly variable and unpredictable. Drought, extreme heat, wildfire, altered precipitation, and other disturbances may affect flowering, seed production, maturation, and seed quality. Whenever possible, collecting across multiple populations and years can help capture genetic and environmental variation and reduce the dependence on any single seed source or collection year. Collection planning should also consider the future conditions where seed may be used, while maintaining broad genetic representation and avoiding excessive collection from small, stressed, or vulnerable populations.

Local sourcing is an extremely important starting point, but not necessarily the only appropriate source. The right sourcing strategy depends on the species, condition of the source populations, the restoration objective, and the expected future environment. The scientific literature does not support a blanket recommendation, but rather seems to support having a range of sourcing strategies available. It's important to consider whether local seed alone will provide sufficient genetic diversity and adaptive potential for the species and restoration objectives, and where appropriate, can be combined with carefully selected regional or non-local sources to increase genetic diversity and potentially introduce adaptations relevant to future conditions. Appendix A has a list of various sourcing approaches and definitions.



For tree species, some tools in particular that can help forest managers match seed sourcing with planting sites based on climate information is the USDA Forest Service Seed Lot Selection Tool and Climate-Smart Restoration Tool, linked via the QR code at the end of this document. The challenge with slower growing trees especially, is that future climates are a moving target, which means seedlots must be adapted to the near-term climates as well as the climates of the mid-to late-21st century. This tool can be used to map current climates or future climates based on selected climate change scenarios.

3. Obtain Permission

Once you have established where you would like to target for your seed collections, you need to obtain permission to collect from that area. Obtaining permission may come in many different forms; sometimes it's as simple as an email saying you are allowed to collect seed from that site, other times it involves paying for and filling out a permit with requirements to report back just how much seed of each species you collected. The first step is to determine the landowner for your site of interest. Many public access areas will have signage with information about the landowner whether it be a federal, state, or local agency or organization. But if there is no signage, the next easiest option is to use your basic phone GPS application (Google Maps, Apple Maps, etc.) and click on the site for more information. There will often be a website linked to this information which will tell you more about who owns this site. If none of this lets you figure out who the landowner is, there are other mapping applications that can give you landowner information (such as onX), but these are usually paid services.

Why might a landowner require me to fill out a permit?

Areas that are owned by organizations like The Nature Conservancy, and most government owned properties will require you to fill out a permit in order to collect seed from their sites. This is so they can keep track of the activities happening on their land which will help them better manage it. For example, this will allow them to prevent multiple people or groups collecting the same species from the same site, to avoid overharvesting which can damage population numbers for that species.

For an example that you can modify to fit your needs, there is a copy of the Northeast Seed Network's Landowner Permission Template in Appendix B of this handout.





4. Monitor Phenology

Once you have permission and found your target population(s) for collection, now you have to keep an eye on them until they are ready to collect. This is by far the most overlooked part of seed collection! You have most likely scouted the area when your target species is in flower, which means you have some time before the species goes to seed. Depending on your species of interest, the duration in which your species is in flower before it goes to seed can vary. It is important to research this information and have an idea of how long this process will take and when to expect your plants to go to seed. Unfortunately things don't always go as planned, and factors such as weather, herbivory, and human impact can all influence when a plant produces seed. Because of this, it is important to visit your population of interest often to keep tabs on its phenology. If you'd like to learn more about what phenology is and the trends that have been happening across the country, there is a national-scale monitoring and research initiative focused on collecting, organizing, and delivering phenological data, information and forecasts to support natural resource management and decision-making, among other things, called the USA National Phenology Network. A link to their website is provided via the QR code at the end of this document.

5. Collect Responsibly

When your species finally goes to seed, it is time to collect! We use and recommend using the Bureau of Land Management's Seeds of Success Technical Protocol for seed collection. We have their website and protocol linked, and we highly recommend reading it. We usually follow these science backed guidelines, but there could be other ethical collection limitations put out by an organization you're working with or the owners of the land on which you're collecting.

Before Collection

The most basic considerations when collecting seed are that the population has at least 50 individuals (which is why we looked for this during the scouting phase!) and that we only collect 20% of available, ripe seed from the population at the time of harvest. Note that this means that when we are collecting seed, we only take 20% of what we see that is currently ripe, not 20% of all seed we see whether it is ripe or not. This is because we cannot assume that the unripe seed we see will eventually ripen. And thus we do not want to overcollect the ripe seed we see and potentially overharvest and jeopardize the population from reproducing. Collecting only from populations with at least 50 individuals in a population helps ensure some amount of genetic variability within the seed we collect.

How do we collect only 20%?

There are two main ways to collect only 20% of the available, ripe seed of a population. The first is to collect 20% of available seed from individual plants you collect from. The second is to collect all seed from 20% of the population, which means collecting all seed from every five plants of that population. Depending on your species, only one of these methods may be feasible.

Safe Seed Fraction

While there is a benefit to simple, consistent guidelines like the SOS protocols listed above, some conservationists are increasingly concerned that these fractions may be too low for some species, and too high for others. In other countries, the ranges are specific to life cycle type and are generally more conservative. For example, Germany has set the limit at 2% for annual species. Considering this, managers may choose to adjust the permissible amount (i.e., safe seed fraction) for certain species (or types of species) during certain years. Some general guidelines for setting these fractions are included below:

- Collection sensitivity decreases with population size. Small populations (<50 individuals) are most sensitive to overcollection, followed by medium size populations (50-500 individuals), and large populations (> 500 populations).
- Short lived, sensitive species that rely heavily on seed for persistence (i.e.: annuals and biennials) are more sensitive to overcollection than perennial species. Perennial trees and shrubs may be more resistant to overcollection than perennial forbs and grasses.
- Seed production can vary with several factors including resource availability and environment. Managers may wish to lower seed collection limits during or following drought, or if seed production is observed to be lower than usual.

Collection Intervals

Historically, collection intervals have ranged from 3-5 years, with the higher end applied to more sensitive species. Growing evidence suggests that it may be more appropriate to customize intervals for different species and contexts. The section below includes some general guidance for managers who choose to set their own collection intervals:

- Low-intensity, frequent harvests (i.e., low safe seed fraction and low collection interval) are generally safer than infrequent, high-intensity harvests (high collection interval and high safe seed fraction)

- Whenever possible, avoid collecting from the same population year after year. Encourage collectors to locate multiple populations of the target species within your management area so collection activity can be distributed among them over time. This will allow for “rest years” where no seed is being collected from a particular population.
- The appropriate number of rest years will vary by species, population, and year. Annual and biennial populations may require the longest rest period between collections as compared to perennials.
- Longer lived perennial species (trees and shrubs) may require a shorter rest period between collections and may be dependent on the cyclical nature of masting (heavy seed production years), as compared to shorter lived perennial forbs and graminoids.
- Making multiple visits to collect from the same population in a single year is often recommended for the purpose of capturing more genetic diversity. If repeat collections are planned, managers may wish to reduce the safe seed fraction for each visit.

Collection Methods

The method of collection will also depend on your species. In general, you should wait until the seed is brown and hard. Green, soft seed means that it is immature and not ready to harvest. You may need to open fruits to check the maturity of seeds. For most species, you simply grab and pull the seed from the plant, and place it in a paper bag. We use paper bags most often, but you can also use cotton or anything breathable. You should not use plastic bags unless you are collecting fruits like strawberries, in which case you then need to clean it quickly so it doesn't mold.

Special Cases

Some species produce seed pods that may dehisce, or split open and drop the seed as soon as it is ripe. The most commonly collected species we see this happen for is lupines. In this case, we use mesh bags that we can tie onto the plant with the pods inside, so that when they drop their seed it will fall into the mesh bag that we can later collect.





Collect data, as well as seed

When we collect seed we always also gather information about our collection. Exactly what information we gather may vary depending on the project and its requirements or goals, but we always recommend recording the date of the collection, the species collected, and the coordinates of the collection. The data you compile can be highly useful for managers looking to make informed decisions about seed collection limits. Over time, managers can more easily look at stands and populations that may be overharvested and adjust collection limits accordingly.

If you are a land manager interested in figuring out how to manage seed collection permissions on your landscape, please refer to Appendix C. Guidelines for Managing Permissions

Minimizing Site Impacts

In addition to overharvesting, there are also other potential impacts that seed collectors can have on the landscape. Consider the following guidelines to decrease your impact on the landscape when out scouting or collecting seed:

- Avoid trampling native vegetation and creating unauthorized trails.
- Minimize the impact of collection activities on the plants being harvested from. Collection of vegetative material is only permissible if necessary for collecting seed, or for plant identification or preparing a voucher specimen.
- Avoid disturbance of nesting birds and sensitive species.
- To reduce the potential for spread of invasive species, collectors should inspect their clothing and remove all plant material prior to moving to new collection areas.

Collection Guidelines Recap

- Only collect pre-approved taxa in pre-approved amounts, unless permission is granted for opportunistic collections.
- Focus collections on large populations with many individuals.
- Collect fewer seeds from more individuals rather than many seeds from fewer individuals.
- Collect no more than the agreed upon “safe seed fraction”
- Do not collect seed from any restricted areas (if applicable). Restricted areas may include known restoration sites, recently burned areas, highly eroded areas, sensitive habitats, or areas where listed species are known to occur.
- Minimize the incidental collection of unripe seed.



6. Post Collection Considerations

It's vitally important to protect the seeds you have now collected from excessive heat, freezing, and humidity. To do this, we recommend keeping the seed in paper bags or cloth bags or containers to allow airflow and quickly get the seed to a facility or place where you can begin processing the seed. Don't forget to keep all labels that are on your seed bags with your seed during each step of your post collection process.

If the seed is unable to be processed and stored immediately, it is important to keep it from experiencing extreme temperatures. For collecting while on longer hikes away from an office or storage site, you will want to make sure you don't leave harvested seed in a hot vehicle for a long period of time. Some options to get around this are leaving the seed in a bag outside underneath your vehicle or in another shady, safe spot, or to use a cooler in which to store your bags of collected seed.

Seed Dormancy and Considerations

Orthodox seeds are adapted for long term survival in dry environments. As they mature, they undergo a natural drying process, reducing their moisture content to very low levels (often below 10–12%). Because of this physiological adaptation, they can be dried further and stored at freezing temperatures for years without losing viability. This makes them ideal for seed banks and conventional agricultural practices. Most seed that is targeted for collections is Orthodox seed.

In contrast, recalcitrant seeds (some oaks, Pacific madrones, etc.) never undergo a desiccation phase. They are shed from the parent plant at high moisture levels (often 30–50%). These seeds are highly sensitive to water loss, so if their moisture drops below a critical threshold their metabolic processes are disrupted which will lead to cell death. Consequently, they cannot be dried or frozen for storage and must be planted shortly after dispersal, making them much more challenging to preserve in conservation efforts.



Drying seed – Orthodox Seed

After collecting, we will want to dry our seed to make sure that it doesn't mold. If collecting in particularly hot and dry climates, this step may not be necessary. But we tend to always dry our seed, just in case. We have our own dedicated drying room where we control the temperature and humidity, but if you don't have access to a climate controlled space, simply make sure the seed is spread out and turned every few days so mold doesn't have a chance to form. You can also place seed on paper to help draw any moisture out.

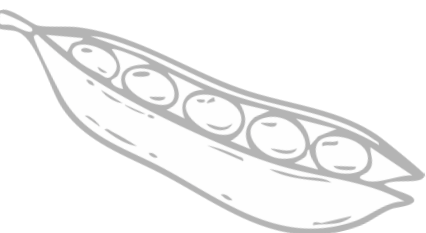
The best option to determine how dry your seed is would be to use a seed moisture meter. However, if you will be storing your seed in a dehumidified space in porous containers, it is less of an issue. We do not have a moisture meter, so at our facilities, we typically spread out our collected seed into containers in our drying room for at least 48 hours. We will keep checking the seed after that time until it seems dry enough to process through our seed cleaning machines or hand cleaned with sieves and screens. Then, the seed will either go to our seed cooler which is refrigerated and has a desiccant dehumidifier to control the humidity, or to our greenhouse manager to start the stratification process for propagation.

Treat seed if necessary

Sometimes, we may also treat collected seeds with pest strips. We do this when during collection we notice the seed to be particularly buggy or it is required by the project. For example, the Seeds of Success Protocol requires seed be treated with Pest Strips prior to shipping to their approved seed cleaning facilities, like the Bend Seed Extractory.

This treatment will kill bugs in the collection, preventing them from further damaging the seed as well as preventing them from spreading to other seed lots in our seed shop. We place a pest strip in a tote or other large, closable space and place our seed inside with it. We close the container and let the strips work.

USE CAUTION WHEN HANDLING PEST STRIPS. Pest strips are toxic, if you choose to use them, follow the directions on the packaging. Make sure everyone who may come in contact with the strips or the area being used to treat the seed is aware that the pest strips are there. For safety, we open bins that have had pest strips outside and leave them to offgas before we handle the material within them. Then, pest strips are put into sealed plastic bags for reuse.





7. Seed Cleaning



Before we start cleaning our seed, we always weigh it to get a “dirty weight” for our collection. This is followed up with a “clean weight” when we weigh the seed lot again after thoroughly cleaning it. This information can be useful for different reasons, including that it may be necessary to report the clean weight to landowners if they specified they desired that information when you obtained collection permission. It can also be a helpful metric for future collections of the same species. Looking at the dirty weight vs the weight of that collection once it has been cleaned to pure seed, you can have a better understanding of how much is needed to be collected in the field in order to hit a target weight of pure seed.

Once the seed is dry, you can use sieves or other seed cleaning machinery to help separate the seed from the chaff. We aim for as little chaff as possible, but for your own operations you may have different thresholds of acceptable cleanliness for your seed. If you are planning on storing your seed, either short term or long term, you want to remove all of the chaff possible to help prevent mold or other contamination concerns. However, if you are planning on using that seed to go straight to propagation or being thrown back out on a site, you might not need every piece of chaff removed. Cleaning also helps to separate out any sneaky weed seeds that may have accidentally found their way into your collection. Ultimately, the level of chaff and cleanliness depends on the goals for that collected seed.

Hand Cleaning

Hand cleaning is a simple, low-cost method for processing small quantities of native seed. Depending on the species and the type of material being removed, cleaning by hand may involve rubbing, threshing, winnowing, screening, or gently separating seed from chaff and other plant material. Hand cleaning is not only cost effective, but also minimizes damage to seed, which is particularly important when you don’t have large harvests. While this can be more labor intensive, it can be a very effective method for small collections, species that are difficult to clean mechanically, or situations where you want to keep as much seed as possible and achieve the highest possible seed quality and variety. Some examples of equipment we use are various sets of sieves or screens, seed boats, sand paper, a blender with dulled blades, fans, etc.



8. Seed Storage

Once the seed is dried and cleaned, you can next store the seed if needed. We store our seed in a dedicated seed cooler, but you can simply store it short term in a cool, dry room, and even use a refrigerator if needed. One big caveat with storing your seed in a refrigerator: it is very humid! Moisture is a killer of seed viability when it's exposed for even a short period of time. If a refrigerator is your only option for very short term storage, we highly recommend putting it in a sealed bag with a desiccant pouch or desiccant beads.

We like to store our seed in breathable packages, usually seed bags for larger collections and brown coin envelopes for smaller collections since we have a dessicant dehumidifier in our cooler. Once again you want to avoid using plastic bags unless the oxygen has been completely removed through something like vacuum sealing.

Even in the best of conditions, most short term stored seed still experience a big drop in viability after 5 years. Seed stored short term should really be used as soon as possible. And reminder that recalcitrant seed can't be stored!

The Society for Ecological Restoration has a Seed Information Database that can be a useful tool to check if a species has information about storage behavior, germination data, and seed weights, among other valuable seed information. This link can be found via the QR code at the end of this document.

Now What?

Finally, you can start prepping the seed for planting in the spring or for any other next steps it may be involved in! If prepping for planting, think about the seed germination requirements. Will it need a cold or moist stratification period before it can germinate? Will the seed need specific stratification like nicking or being rubbed on sandpaper? If you are unsure, a great resource is the Corvallis PMC USDA Native Seed Production Manual for establishing seed amplification fields or the Reforestation, Nurseries, and Genetic Resources website for a variety of production/storage goals. There are probably even more local resources that the Puget Sound Seed Partnership can direct you to as well. Your wild collection is now ready for whatever comes next!

If you are going for propagation, some great resource links can be accessed via the QR code at the end of this document, under the Propagation Resources section.



Glossary



Accession Number: A unique identifying code given to a seed collected from one species, at one location, in a single year. The number is used to link seed back to its original collection data.

Adaptive Management: A flexible approach to land or seed collection management that adjusts decisions based on monitoring, new data, and observed outcomes.

Annual: A plant that completes its life cycle in one year and relies entirely on seed for regeneration.

Biennial: A plant that completes its life cycle in two years.

Collection Interval: The minimum number of years that must pass before collecting seed again from the same population to allow recovery.

Collection Protocols: Standardized methods collectors follow to ensure ethical seed harvesting and consistent data collection.

Conservation Seed Banking: Long-term storage of seeds for biodiversity preservation, research, and future restoration.

Ecological Impact: Any change—positive or negative—to a natural ecosystem as a result of human activities such as seed collection.

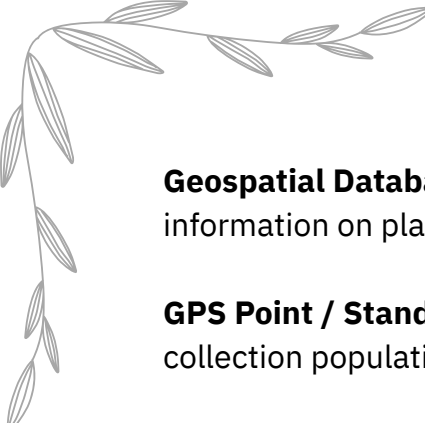
Ecoregion: A broad landscape area defined by shared climate, geology, hydrology, and ecological processes. Ecoregions help identify where plant populations have evolved together and where seeds will perform best if used locally.

Ecoregional Seed Sourcing: Using seed collected within the same ecoregion as your restoration site to maintain genetic adaptation and ecosystem resilience.

Ecotype: A genetically distinct, locally adapted population of a species shaped by the specific environmental conditions of its home region.

- Example: Red maple from Florida is adapted to a different environment compared to red maple from New England — they are different ecotypes.

Genetic Diversity: The amount of genetic variation within a population. Higher diversity increases resilience to pests, disease, and climate shifts.



Geospatial Database: A digital mapping system (e.g., ArcGIS) that stores spatial information on plant populations, collection locations, and restricted zones.

GPS Point / Stand Point: A mapped location representing the center or extent of a seed collection population.

Incidental Harvest (Incidental Collection): Accidentally collecting unripe, damaged, or unwanted seeds during harvest; should be minimized.

Invasive Species Spread: Movement of seeds or propagules into new areas due to clothing, gear, tires, or tools; requires hygiene protocols.

Intermediate Seeds: seeds that tend to age faster than orthodox seeds and may only have a 5 year lifespan when stored at -20 degrees Celsius.

Large population: more than 500 individuals.

Local Adaptation: When a plant population evolves traits suited to the specific conditions of its local environment.

Medium population: 50–500 individuals.

Monitoring: Tracking plant population changes over time through counts, photos, data sheets, or mapping to detect impacts of collection.

Orthodox Seeds: Seeds that can tolerate being dried and being in freezing temperatures, either short term or long term.

Perennial: A long-lived plant that persists for multiple years, often with deeper or more resilient root systems.

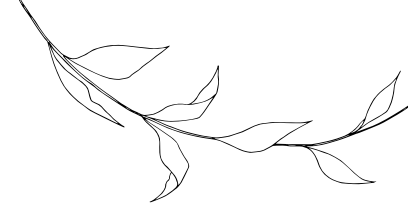
Phenology: The study of cyclic and seasonal natural phenomena - for plants, we observe and record when it's vegetative, flowering, has green seed or ripe seed, etc.

Plant Population: A breeding subset of a species occupying a shared geographic area.

Plant Stand: A subset of a Plant Population that land managers oversee and have access to.

Population Density: The number of individuals per unit area — used to assess population health and stability.

owed to be collected from any population in a season (often 10–20%, but may be lower).



Provenance: The geographical origin of a seed or plant population.

Recalcitrant Seeds: Seeds that do not tolerate drying or long-term storage (e.g., many tree species); must be used fresh.

Rest Years: Planned years without collection to allow population recovery.

Safe Seed Fraction: The percentage of mature seed allowed to be collected from any population in a season (often 10–20%, but may be lower).

Seed Increase: Growing a small quantity of wild-collected seed under cultivation to produce larger volumes for restoration.

Seedling Recruitment: The process by which new plants establish from seed in a population

Small population: fewer than 50 individuals

Source-Identified Seed: Seed whose location and ecological origin are documented (e.g., county, watershed, ecoregion, GPS point).

Voucher Specimen: A pressed plant sample collected (sparingly!) to verify species identity and document occurrence.

Workhorse Species: A plant species widely used in ecological restoration because they are hardy, adaptable, can outcompete invasive species, and/or are effective at establishing in disturbed or degraded sites.



Appendix A



Approach	What it means	Potential Benefits	When it may be appropriate	Key Considerations
Local Sourcing	Collect primarily from populations near the restoration site.	Maintains locally adapted material; preserves local genetic identity; generally lower risk of maladaptation.	Species with strong local adaptation; relatively intact local populations; projects where maintaining local genetic identity is a priority.	Local populations may have limited genetic diversity or may be poorly adapted to future conditions.
Regional / broad local sourcing	Collect from multiple populations within a defined geographic, ecological, or seed-transfer region.	Increases genetic diversity while retaining regional relevance.	When greater genetic diversity is desired without moving far beyond the local environment.	Define "regional" based on species ecology, geography, and environmental similarity rather than distance alone.
Composite provenancing	Combine local seed with smaller amounts of seed from more distant but potentially appropriate populations.	Retains local adaptation while increasing genetic diversity and adaptive potential.	When climate change or other pressures may make local material alone insufficient, but maintaining local material remains important.	Determine appropriate proportions and source populations; avoid introducing poorly adapted material.
Admixture provenancing	Combine seed from a broader range of populations across the species' distribution.	Maximizes genetic diversity and may increase evolutionary potential.	Highly variable environments, degraded sites, or projects where maximizing adaptive potential is a major objective.	Greater distance may increase risk of maladaptation or loss of locally important genetic characteristics.
Climate-adjusted provenancing	Retain local sources while incorporating seed from populations experiencing environmental conditions similar to projected future conditions at the restoration site.	May increase the likelihood that restored populations contain traits suited to future climate conditions.	Long-lived species or long-term restoration projects where climate change is expected to substantially alter site conditions.	Climate projections are uncertain; climate similarity does not necessarily equal genetic or ecological similarity.
Predictive / climate-matched sourcing	Source substantially from populations whose current climate resembles the projected future climate of the restoration site.	Directly targets potential future climatic suitability.	Where there is strong evidence of climate-related adaptation and a clear long-term climate-resilience objective.	Evidence of effectiveness remains limited; should not automatically replace local sourcing.
Assisted gene flow / migration	Deliberately move genetic material beyond traditional geographic or seed-transfer boundaries.	Can introduce genetic variation or potentially beneficial adaptations where natural movement is unlikely to keep pace with climate change.	Isolated or declining populations; fragmented landscapes; species unlikely to naturally migrate quickly enough to track changing conditions.	Requires strong ecological/genetic justification and careful consideration of risks to local genetic integrity.

Appendix B

Landowner Permission Template from Northeast Native Seed Network

Landowner name
Date
Landowner address

Collector or Institution name
Collector or Institution contact info

Dear Landowner Name,

This letter is an invitation to partner in environmental stewardship. We are seeking permission to respectfully gather seeds from native plants growing on your land during the *(insert year)* season (April-November).

Insert description of Institution or group or seed collector wants to increase the availability of source-identified plants and seed for sale in the region. Seed collections will be cleaned and stored for production use in farm plots and a nursery setting (*change end use if appropriate*). The wild seed collected on your land will not be sold. However, the seed may be used for seed increase, and subsequent generations of seed may be sold commercially.

Seed collection will be done by hand with no more than 2-3 people onsite at one time with 1-2 vehicles parked in designated parking areas. Collection and scouting days will be planned in advance with your permission to enter the property. We will use traditional, respectful gathering methods to ensure the health of the plant population. We will only gather from common native plants and ensure enough seed remains for the wildlife, the natural seed bank, and the plant community itself. No rare plant species will be collected under this permit. To further protect these populations from overcollection, we respectfully ask that for the duration of this agreement, minimal persons or organizations will be granted permission to collect seeds on your property.

Plant surveys will be conducted in the spring season to create a target species list for the season. Any additions to the list will be approved in advance. If any collections are made onsite during the *(insert year)* season, a collection report will be generated and delivered for your own records. In exchange for permission to collect seed on your property, we would include a list of the dominant plant species surveyed and any unique habitat or species that are found.

Seed collectors in receipt of this permit are self-insured, and the landholder is void of any responsibility for all and any personal injury, claims, or losses that may occur while onsite.

Please indicate your consent to this request by signing below.

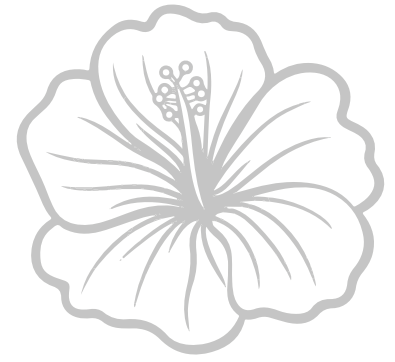
Requestor Signature

Date: _____

Landowner Signature

Date: _____

Appendix C



Guidelines for Managing Permissions

- Permit one collection team per species at a time. This will reduce the potential for overcollection.
- Prioritize requests from collectors that have experience, expertise, and a clear end use for the seed they will collect (nursery production, seed increase, conservation seed banking, etc.). Collection teams should have at least one member with experience identifying plant species in the field and at least one member with experience following established collection and data management protocols.
- Require collectors to submit a list of target species. Managers are encouraged to inquire about the amount of seed collectors seek to harvest (e.g., number of seeds, ounces, lbs.). Consider each target species on a case-by-case basis.
- Require collectors to scout target populations in advance and map the populations they plan to collect from.
- Require collectors to seek approval for any opportunistic collection of non-target species they might wish to collect.
- Request a list of collection protocols that will be followed. Compare them against the Collection Guidelines section and revise as needed.
- Identify species with recalcitrant seeds (those that do not retain viability well in storage) and confirm that they will be used in the near term.
- Restricting collections from rare or threatened species unless part of a formal conservation program and they have proper permits and permissions
- Consider maintaining a geo-spatial database (ArcGis Pro or similar). Data layers can be established for known plant occurrences, collection activity, restricted areas, etc.
- Require collectors to map each stand that they collect seed from. A center point from the middle of the stand is usually sufficient.
- Require collectors to record the following data for each collection:
 - Collection location (mapped at center point of plant stand/population)
 - Estimated total number of individuals in the stand/population
 - Number or percent of individuals sampled

Ask collectors to scout species prior to harvesting. If maps of proposed locations are submitted to managers in advance, they can review the collection history for each target species and approve or deny on a case-by-case basis.

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More information about IAE? If you'd like to reach out to us, our contact info is:
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