

SEEDS



OF SUCCESS

BUREAU OF LAND MANAGEMENT

NATIONAL PARKS SERVICE

**U.S. FISH AND WILDLIFE
SERVICE**

**TECHNICAL PROTOCOL
FOR THE COLLECTION, STUDY, AND CONSERVATION OF SEEDS FROM
NATIVE PLANT SPECIES**

for

SEEDS OF SUCCESS

(Updated March 2024)

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1. Introduction

This protocol outlines the procedures for making seed collections for Seeds of Success (SOS), the national native seed collection program, led by the Bureau of Land Management (BLM) in partnership with the U.S. Fish and Wildlife Service (USFWS), USDA Agricultural Research Service (USDA-ARS), National Park Service (NPS), Tribal Nations, and many non-federal partners. The purpose of the Seeds of Success program is to establish a national, high quality, accurately identified, and well documented native plant species seed collection. All seed collections made following this protocol support the development of geographically appropriate native plant materials for ecosystem restoration, research, and germplasm conservation. Each seed collection should represent the range of the genetic variation within the sampled population. The national collection acts as the basis for increasing the quality and quantity of native plant materials available for restoring and supporting resilient ecosystems and off-site (*ex situ*) conservation.

1a. Program History and Partnerships

The Bureau of Land Management and Royal Botanic Gardens, Kew's Millennium Seed Bank originally participated in the Seeds of Success (SOS) program under the terms of a cooperative agreement signed by both parties in May 2000, with a renewed agreement signed in November 2005. In the first year of the program there were 23 different SOS collection teams in the United States. Since the original signing of the agreement, SOS has grown to include Chicago Botanic Garden, Lady Bird Johnson Wildflower Center, New England Wild Flower Society, New York Department of Parks and Recreation, Greenbelt Native Plant Center, North Carolina Botanic Garden, Center for Plant Conservation, and the Zoological Society of San Diego. To date over 2,500 people have been trained in the SOS protocol; this group plus the cleaning, storage, and funding organizations are collectively referred to as the SOS Partners.

In June 2008, a Memorandum of Understanding (MOU) was signed by the Bureau of Land Management, Chicago Botanic Garden, Lady Bird Johnson Wildflower Center, New England Wild Flower Society, New York City Department of Parks and Recreation, North Carolina Botanical Garden, and the Zoological Society of San Diego. The MOU ratifies Seeds of Success as a national native seed collection program in the United States coordinated by BLM. The MOU is available on the SOS website (<http://www.blm.gov/sos>).

Phase 1 of the Millennium Seed Bank (MSB) Project was completed in 2010, 10 years after it began. At that point, the nature of the Seeds of Success program changed as funding from Kew was no longer distributed to U.S. partners. Instead of sending seed collections to Kew, SOS continued its collection strategy of making multiple collections of restoration species to compile genetically representative seed from across the species range. **Making between 10 and 20 collections per species, per ecoregion or seed transfer zone, continues to be the focus of SOS today.**

In August 2023 the SOS program expanded as the National Park Service and U.S. Fish and Wildlife Service signed an interagency MOU with the Bureau of Land Management to collaborate on seed collections nationally. The MOU codified the cooperation and participation between these Federal agencies and provides an opportunity to leverage expanded SOS funding and coordination to collect and conserve seed to restore native plant communities across Department of Interior lands. The BLM still hosts the National Coordinating Office, which manages overall program data, infrastructure, training, and policies. Each agency manages their own SOS teams and plans collections to achieve their unique restoration goals while also collaborating with each other in their target regions.

1b. Membership

Today the SOS program is led by the BLM in collaboration with the NPS and USFWS. These agencies work

in close partnership with a variety of other federal agencies, Tribal Nations, and non-federal organizations who help with seed collection, cleaning, testing, seed storage, data management, processing voucher specimens, and more. SOS Partners are part of a network of experienced seed collectors, restoration practitioners, botanists, and researchers. If you wish to learn more about becoming a partner, and you are part of a federal agency, Tribal Nation, state or municipal government, botanical garden, or non-profit, please reach out to the SOS National Curator (see contact information in **Appendix A**). Working with organizations, rather than individuals, ensures that partnerships are sustainable, and that network support is in place to produce high-quality collections.

1c. Program Goals

As the first step in the native plant materials development process (NPMDP; Figure 1), the goal of SOS is to increase the quality and quantity of native plant materials available for restoring and supporting resilient ecosystems. SOS makes this possible by collecting wildland native seed for research, development, germplasm conservation, seed production, and ecosystem restoration. The goal of the native plant materials development process, led by the Bureau of Land Management, is to ensure a stable and economical supply of native plant materials for restoration and rehabilitation efforts on public lands. To achieve this goal, we aim to make between 10 and 20 collections per species, per ecoregion or seed transfer zone to develop genetically appropriate ecotypes needed in the seed supply.



Figure 1. The Native Plant Materials Development Process

2. Getting Started

2a. SOS Data Policy

SOS data is highly sensitive and is only shared with those that are directly involved with the program and require access to carry out role in support of seed collection activities. Both agency direct support staff and external partners who are collectors, supervisors, QC support are granted access to SOS data on a need-to-know basis. The National Coordinating Office and users of SOS data must take several steps to protect collection data.

The SOS National Coordinating Office:

- Ensures those granted access to SOS data understand the use and limitations of the data.
- Stores SOS related electronic data in a secure location where it cannot be accessed by anyone who is not directly involved with the SOS program.
- Does not leave data records in a publicly accessible location, either physically or digitally.
- Double checks that SOS collecting teams have removed location information from SOS photos before uploading them to Smugmug.
- Shuts down and deletes users from the GeoPlatform each season. Each year the National Office manually adds collectors and team leads who will be involved that season to the GeoPlatform group specific to their

collection region.

- Restricts GeoPlatform user's ability to export SOS data from their groups.
- Creates new unique passwords for the SOS data portal and sends new passwords to teams each season.
- Redacts all collections made on Tribally managed lands in the GeoPlatform groups unless explicitly granted permission to include it.

SOS Collecting Teams and data users must:

- Not discuss, disclose, release, reproduce or otherwise provide or make available any of these data (including geographic coordinates, maps, directions, site name/s, trail names, county location, nearby towns/cities, species name (scientific or common), associate species, and collection numbers), or any portion thereof **in any form** to any third party without prior, written consent of the SOS National Coordinating Office.
- Maintain plant population and location data (both electronic copies of data and physical data sheets) in a secure location. A secure location is one that is not publicly accessible and can only be accessed by people who are directly involved with the SOS program. SOS data should not be maintained on personal devices.
- Never share their data portal or GeoPlatform passwords with anyone.
- Disable/delete location information from all SOS related photos.
- Not post photos showing recognizable landmarks or formations on any social media platform, iNaturalist, websites, or personal blogs and newsletters without prior, written consent of the National Coordinating Office.
- Not post SOS data on any websites, databases, or publications without prior, written consent of the National Coordinating Office.
- Delete any downloaded SOS data from their machine once finished for the season and the data is no longer needed.
- **SOS data users will also have to sign and submit a copy of the SOS Data Privacy Agreement to their Agency Coordinator.**

2b. Communication

Regular communication between all parties involved in SOS collections is an essential part of the SOS program. The BLM hosts the National Coordinating Office, which manages overall program data, infrastructure, training, and policies. Each agency manages their own SOS teams and have a designated coordinator who serve as the direct point of contact for all SOS inquiries within that agency (Figure 2). Any questions, collection logistics, training, support, or other needs should be communicated to a team's agency coordinator. Agency coordinators (**Appendix A**) will be in communication with each other and the National Coordinating Office throughout the season to make sure everyone has the information and support they need to



Figure 2. Interagency Coordination

Any questions, collection logistics, training, support, or other needs should be communicated to a team's agency coordinator. Agency coordinators (**Appendix A**) will be in communication with each other and the National Coordinating Office throughout the season to make sure everyone has the information and support they need to

be successful. **See Appendix H.** for a list of 2024 teams and associated Agency Coordinators.

SOS uses the SOS website, SOS email list, and monthly Collectors' Call to communicate between the National Coordinating Office, Agency Coordinators, collectors, and other partners:

Web: The website may be viewed at <https://www.blm.gov/sos> and includes information about collection guidance, training materials, and contact information. The website also hosts a 'Getting Started' page which details the steps that teams and collectors must take each year to be onboarded:

<https://www.blm.gov/programs/native-plant-communities/native-plant-and-seed-material-development/collection/sos-getting-started>.

Email List: SOS has an email list for discussing the Seeds of Success program. You must be subscribed to the list to post or send a message out to all the subscribers. Anyone is allowed to subscribe to the group, so if you know of someone who is interested, feel free to tell them about the list.

To subscribe to the list, visit the website: <http://lists.plantconservation.org/mailman/listinfo> and select SOS, Seeds of Success List, or send an e-mail to sos-request@lists.plantconservation.org with the following information in the body of the message (not the subject):

SUBSCRIBE

You will then receive an e-mail that you will need to reply to confirm your subscription. After you confirm your subscription, another e-mail will be sent with instructions on how to use the list.

Monthly Collector's Call: On the first Tuesday of every month, collectors are invited to participate in the Collectors' Call, a Microsoft Teams meeting for all active SOS partners. At least one representative from every active collecting team is required to attend the meeting. This is a forum for discussion to raise issues and questions with other collectors, the National Coordinating Office, and Agency Coordinators. These calls take place on Microsoft Teams, however there is always a dial-in option for teams that may be in the field. Contact your Agency Coordinator for a meeting invitation or to submit agenda items. Reminders, cancellations, and agendas will be posted to the SOS listserv, but teams need to contact their Agency Coordinator specifically be invited to the Collector's Call.

Collectors' Call Time: 12 noon – Eastern, 11 am – Central, 10 am – Mountain, 9 am – Pacific, 8am – Alaska

Due to the time difference in Hawaii, HI teams will be able to watch a recording of the meeting and then follow up with their Agency Coordinator.

2c. Training

It is extremely important that those collecting seed for SOS are well trained so that plant populations are not harmed during the collection process and the protocol is followed to ensure data integrity. If you are starting an SOS team and need to train a collection crew, contact your Agency Coordinator for more information.

At least one lead agency staff person and crew lead are required to participate in a training course from the National Office each season. We strongly encourage all team members to receive training before making collections. External partners hired by the BLM, NPS, and USFWS, are responsible for ensuring their teams receive the proper training, including any additional training required under the contract/agreement outside the scope of the standard SOS Technical Protocol.

Several training options are available each year for SOS collection teams:

The BLM National Training Center

Each spring the BLM NTC offers an in-person a course to ensure comprehensive training for BLM employees and BLM collection partners involved with SOS. There is no cost to attend for BLM employees. BLM partners may enroll in this course at no cost but are responsible for their own travel and accommodations. NPS and USFWS employees and contractors may enroll and pay a tuition fee.

Virtual Training

Several free virtual trainings occur throughout the collection season and are open to all BLM, NPS, and USFWS staff and seed collection partners. Virtual trainings contain the same core content of the BLM in-person course, but do not have a hands-on or field component. If attending a virtual training, we strongly recommend teams get additional in person/on the ground training specific to the region they are working in.

The ‘Getting Started’ page of the website will have the most up-to-date information on available in-person and virtual trainings for each collection season. If there is not a training that meets your team’s needs, contact your Agency Coordinator.

2d. Workflow

Although seed collecting timing varies depending on phenology, all SOS collecting teams follow the same general workflow (Figure 3). There are a few small differences working with different agencies (Table 1).

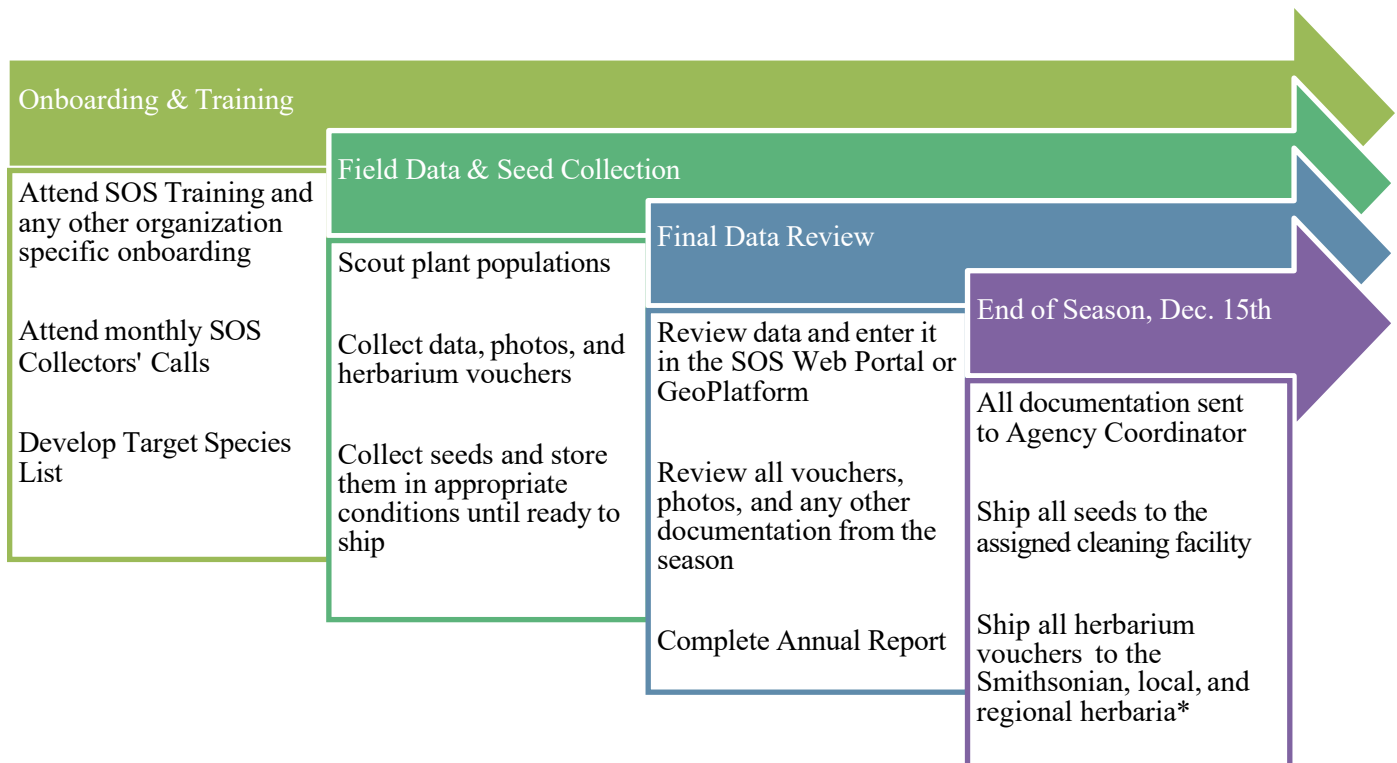


Figure 3. SOS Workflow

Table 1 Workflow differences for each agency

Activity	BLM	USFWS	NPS	DOI/Interagency
Monthly Collectors Calls (Section 2)	Attend general meeting, then BLM breakout session	Attend general meeting, then FWS breakout session	Attend general meeting, then NPS breakout session	Attend breakout session that corresponds to assigned Agency Coordinator
Herbarium Vouchers (Section 10)	Use BLM label template	Use USFWS label template.	Use NPS label template but do not send Smithsonian voucher copies. Keep labels with specimens until further notice*	Use the BLM label template, submit all collections including from NPS land
Treating Seeds (Section 13)	Use Hotshot No-Pest strips	Use Hotshot No-Pest strips	Use Terro Garbage Guard (EPA #5481-348-149), follow additional IPM instructions in Section 13.	Follow NPS protocol if seed is being treated at a Park. If treated on other lands, use either treatment protocol.
Seed Cleaning Facility (Section 14)	Teams will be assigned a specific seed cleaning facility. Contact your Agency Coordinator to ensure you are sending seed to the correct location.			

**For 2024, NPS agency teams should collect vouchers, make herbarium labels, and draft transmittal letters, but NOT send vouchers to the Smithsonian. DOI teams may submit vouchers collected on NPS lands. See Identification and Herbarium Specimens (Section 10) for more information.*

2e. End of Season Reporting and Data Management Requirements

When each collecting team has finished for the season, they must review all scouting and collection data, and submit all photos, data forms, permits, and an annual report to their Agency Coordinator by December 15th. An annual report template is available on the SOS website and will be circulated at the end of each collecting season. The annual report is intended to summarize the collecting season including collections, difficulties, and highlights, as well as improvements to be made for the upcoming year (see **Appendix E** for an example annual report). Additional comments may be submitted to your Agency Coordinator any time throughout the year. Failure to submit your end of the year data in a timely and complete manner may make your organization/office ineligible for hosting an SOS crew in the future. **You can find an end of the season checklist that details how to submit your end of season reporting materials In Appendix M. and on the SOS website.**

Additionally, all SOS teams and team organizers should understand the following data management requirements:

- All data is reviewed and complete by December 15th.

- Data needs to be in and reviewed before seasonal staff/collectors leave at the end of the year.
- Collections cannot begin unless all reporting from previous season is completed.
- ALL elements of a SOS collection (complete collection data, photos, vouchers, permits/permissions) must be completed (within 95%), if not you will have a 1-year grace period. If elements are missing again, team organizer must wait 1 year before arranging a collecting team in that location again.
- Keep copies of collection records, photos and annual reports at your local office
- Notify the National Office of any changes to species identification and location data ASAP if you have already shipped the seed to a cleaning facility or sent herbarium vouchers. If you still have the seed/vouchers, ensure that all the records (scouting, scouting, collection, photos, vouchers, data sheets) have been updated BEFORE shipping anything.
- If using digital data collection tools, use data management dashboard (found in your GeoPlatform group) to check for incomplete information and errors. For more information about GeoPlatform groups see Data Collection (*Section 11*).
- If using paper data sheets and the SOS data portal, do not enter collection data until you are certain it is SOS. Notify the National Curator ASAP if there is an error in the collection number or species identification.

3. Target Species

The focus of the SOS program is on species needed for restoration and rehabilitation projects.

Target species lists are developed by collecting teams and partners depending on the restoration needs of the geographic area and agency. Projects using SOS seed may include emergency fire rehabilitation and restoration, wildlife habitat, pollinator habitat, threatened and endangered species habitat, and roadside revegetation and waterway stabilization. Thus, we collect primarily common native workhorse species appropriate for restoration and stabilization. Additionally, SOS collections focus on areas that may be vulnerable to climate change and extreme weather events, such as hurricanes, floods, drought, and wildfire.

Agencies are continually identifying species of priority restoration value needed for native plant materials development. Teams collecting for each agency should coordinate with agency colleagues, such as State and Ecoregional Botanists or other Field Office staff to develop regional restoration target lists.

Target species lists should be sent to your Agency Coordinator by April 30th of each year. These lists help track which SOS collecting groups are making collections for different species, as well as gauge seed cleaning needs. You may also contact your Agency Coordinator to request historic collection data relevant to your area, which can aid in compiling a unique target list and building on existing collections. These data are also required to follow the proper SOS recollection protocols (see *Section 7b*). Additionally, a 2021 spatial gap analysis of BLM priority taxa showed that, more collections are needed for every target species to meet the SOS goal of 10 to 20 collections per ecoregion or seed zone. We suggest that all target species lists should be made with this goal in mind.

4. Species Excluded from this Program

The species excluded from Seeds of Success include:

- Any native plant species listed as Threatened or Endangered, under the *Endangered Species Act*.
- Any Candidate or any species Proposed for listing under the *Endangered Species Act*.
- Any species listed as G1 or G2 by a State Heritage Program.
- Any species listed as S1 or S2 by a State Heritage Program will not be collected in the state listing it as S1 or S2.
- Any species designated as a BLM State Director Sensitive Species that have been ranked G3 or S3 by a State Heritage Program and is included in the Center for Plant Conservation (CPC) network collection. (See *Appendix I*) BLM Field Office Botanists should carefully coordinate with the CPC Garden that collects in their region to make sure that G3 and S3 species are not overlooked in the collection by both groups and are not inadvertently collected by both groups.
- Any species included in Appendix I of the *Convention in the Trade of Endangered Species (CITES)*.
- Any species not native to the U.S.
- Any agricultural or food crop species.
- All species in the genus *Quercus*.
- All known recalcitrant seeds (seeds that do not store well in dry, frozen conditions. See <https://saveplants.org/best-practices/difference-between-orthodox-intermediate-and-recalcitrant-seed>).
- All known intermediate/sub-orthodox seeds, such as species in the genus *Salix*, *Populus*, or *Ulmus*.
- All cultivars or populations from a known vegetation treatment site.

In the U.S., the Center for Plant Conservation (saveplants.org) collects and stores the seeds of rare, threatened, and endangered plant species, and the National Laboratory for Genetic Resources Preservation in Fort Collins, Colorado, stores many accessions of crop relatives. Both organizations are cooperating with the Seeds of Success program.

5. Storage and Distribution

Collections are cleaned, tested, and processed at several different facilities. Cleaning and processing in the continental US occur at three government facilities. USDA-FS Bend Seed Extractory has been the primary cleaning facility since 2003 and the program established a new partnership with the USDA-FS Dorena Genetics Resource Center in 2023. In Alaska, seeds are cleaned at Alaska Plant Materials Center in Palmer, AK. Seed cleaning and storage facilities in Hawaii and Puerto Rico are still being developed, though those facilities follow the same standards and procedures as the rest of the program.

After cleaning and processing collections are divided into two portions: a long-term and a short-term storage portion (Table 2). Short-term storage needs are met by the cleaning facilities, while long-term and working collection storage needs are being met by the USDA Agricultural Research Service (USDA-ARS).

Table 2. Seeds of Success storage definitions

Long-term Storage Portion	The first 3,000 seeds from any Standard, Operational, or Recollection are stored in long-term storage conditions for research and conservation purposes with USDA-ARS. 2,000 seeds are designated as a “working” collection available through GRIN-Global. 1,000 seeds for “long-term” storage are conserved as a genetic resource by The National Laboratory for Genetic Resources Preservation.	3,000 PLS (Pure Live Seed)
Short-term Storage Portion	All seed left over after the long-term storage portion is sent to USDA-ARS is available for native plant materials development projects. Seeds are kept in short-term storage conditions by the cleaning facility until requested. The coordinating agency/office has the first right to the seed. Other SOS partners may use the seed by contacting the corresponding agency coordinator and getting permission to use the seed by the original coordinating agency/office.	PLS depends on initial collection size

The first 3,000 seeds of a collection constitute the long-term storage portion. Long-term storage portions are sub-divided and sent to two USDA-ARS Facilities: The Plant Germplasm Introduction Testing and Research Unit (PGITRU) in Pullman, Washington, and National Laboratory for Genetic Resources Preservation (NLGRP) in Fort Collins, Colorado. The remainder of the SOS collection is made available for native plant materials development projects and is known as the short-term storage portion, which remains at a designated cleaning facility. More about requesting seed for projects can be found in **Section 14e. Requesting Return of Seed.**

PGITRU in Pullman, Washington, serves as the processing center for Seeds of Success accessions entering the National Plant Germplasm System (NPGS). PGITRU has partnered with the BLM, Kew Millennium Seed Bank, and other Plant Conservation Alliance members for collection and conservation of native plant species in the United States. PGITRU receives a portion of seeds from each SOS collection cleaned at a government cleaning facility. From 2005 to 2021, PGITRU received 10,000 seeds for long-term storage. In 2022, the number of seeds for long-term storage changed to 3,000 seeds for standard and operational SOS collections, and 1,000 seeds for recollections. As of 2023, all collections regardless of collection type will have 3,000 seeds set aside for long term storage.

PGITRU enters collection data into NPGS and keeps 2,000 seeds for the working collection for distribution to researchers working on projects related to native plant materials development through GRIN-Global and maintains a small back-up for long term storage at 4°C. PGITRU sends 1,000 seeds to the National Laboratory for Genetic Resources Preservation (NLGRP) in Fort Collins, Colorado, for long-term storage at -20°C, and research on seed storage and long-term (Table 3).

Table 3. Seeds of Success germplasm proportioning for long-term storage

SOS long-term storage portion	Ratio to long-term storage at NLGRP (Fort Collins) -20°C	Ratio to working collection for PGITRU & GRIN-Global (Pullman) 4°C
< 3,000 seeds	1/3	2/3
> 3,000 seeds	The first 3,000 seeds will be partitioned as in the row above. The remaining balance is then available for native plant materials development projects (short-term storage portion).	

6. Permission to Collect

Permission is required for all seed collected for the Seeds of Success program. Careful planning will ensure collections are taking place in the appropriate area, and that collectors do not unintentionally wander onto land where they do not have permission to collect.

6a. Collecting on BLM Lands

Collecting seeds for Seeds of Success on public land managed by the Bureau of Land Management is categorically excluded (CX) in the National Environmental Policy Act (NEPA). Department of the Interior (DOI) 516 Manual is the official guidance for determining the level of NEPA required. BLM's CX list is incorporated into the DOI NEPA manual at 516 DM 11, Section 11.9 (effective 12/10/2020). In the Forestry program section of the BLM Categorical Exclusion list there are five categorical exclusions. The fifth exclusion applies to seed collection as follows: *(5) Disposal of small amounts of miscellaneous vegetation products outside established harvest areas, such as Christmas trees, wildings, floral products (ferns, boughs, etc.), cones, seeds, and personal use firewood.* Thus, SOS collectors do not need to fill out additional paperwork when collecting on BLM managed lands. Additionally, non-commercial seed collecting, such as SOS, is allowed in Wilderness areas.

BLM may give permission to other volunteer groups to collect for the Seeds of Success program on BLM managed lands. To comply with DOI privacy standards, individuals acting in a personal capacity may not be listed as a collector on the data form. Team leads should be listed when no other collector names are available.

Additionally, speak to your local BLM Field Office or BLM contact to ensure you are following any specific local guidance when on BLM lands.

6b. Collecting on NPS, USFWS, and other Non-BLM Lands

Collection may take place on private lands or lands managed by another federal agency (e.g., National Parks Service, Fish and Wildlife Service, USDA Forest Service, Department of Defense) or state, county, or municipal agencies, if landowner permission is provided. Document landowner permission on the field data form associated with the seed collection. Keep written documentation of permission to collect in your office's files when collections are made on lands other than those managed by BLM.

If the landowner does not provide a collecting permit, a template for an Authorization Letter for SOS Collecting is available on the SOS Website.

All permissions and permits for collecting on non-BLM lands must be sent to your Agency Coordinator as part of the of the end-of-season reporting.

7. Assessing Populations for Collection

It is essential that a knowledgeable botanist leads the collection team and is involved in identifying the most suitable population(s) for sampling. Choosing target populations will be up to the BLM ecoregional, state, or field office lead botanists or plant ecologists, NPS ecology and restoration specialists, and USFWS science leads at USFWS offices and Refuges. There are three different types of SOS collections, as outlined in Table 4.

Table 4. Seeds of Success collection definitions

Collection	Definition	Estimated PLS
Standard SOS Collection	Under 80,000 estimated PLS. The first 3,000 PLS are conserved in long-term storage. Anything over 3,000 PLS is kept in short-term storage and is available for restoration and research.	3,000 - 80,000 PLS (3,000 minimum, ideally 10,000+ PLS)
Operational SOS Collection	Over 80,000 estimated PLS (weight can vary). The purpose of these collections is for restoration, particularly for increasing through the seed production IDIQ or other grow-out. Anything over 3,000 PLS will be kept in short-term storage and is available for use in restoration and research.	80,000 + PLS
SOS Recollection	A seed collection made from a population that has previously been collected from following the SOS Protocol. The first 3,000 PLS of these collections will be sent to long-term storage. Anything over 3,000 PLS will be kept in short-term storage and is available for use in restoration and research.	3,000+ PLS

An ideal collection will be from more than 100 individuals (minimum 50) and will contain more than 10,000 viable seeds. 3,000 viable seeds are the minimum SOS collection size, with all the material going towards long term storage. Collections larger than 10,000 viable seeds are preferred as this size allow for:

- Sufficient seed for germination and viability testing.
- Substantial seed available for restoration and native plant development projects
- Seed available for educational and/or scientific purposes
- Seed that is conserved as a long-term safeguard against loss of the wild population.

7a. Preliminary Site Visits

Preliminary site visits are often necessary to assess the populations, confirm the species identification with the collection of herbarium voucher specimens (see **Section 10**), and estimate the likely harvesting date and potential seed production. Historic SOS collection data can be used to help estimate when a species may be ready for collection in a certain region. Where populations are suitable and the quality and quantity of seed is adequate, it may be possible to make collections of several different species from the same site. If you notice a non-target species population at the same site, speak to your local botanist or science lead about making an opportunistic collection.

The following points should be considered before harvesting takes place:

- Ensure that the population is of wild origin, not planted or cultivated. For example, do not collect seeds of native species that were included in a seed mix as part of post-fire management in areas that were burned and seeded. Native species that were not seeded in those areas could be collected.
- Small populations (less than 50 individuals) or those that will yield less than 10,000 viable seeds should not be collected.
- Seed development can vary within and among populations of the same species. Use cut test to monitor seed maturation and assess insect damage and empty seeds throughout the population

before making the seed collection.

- It is strongly encouraged that seed collectors return to a population throughout the seed dispersal period to maximize the genetic diversity of samples. Collections taken from the exact same population may be combined into one accession (SOS Collection Reference Number) during a single collecting season. Collectors must ensure that no more than twenty percent of the viable seeds are collected on any given day, and that all combined material is from the same population and uses the same seed collection reference number or accession number. Please note on the SOS field data form that the material was collected on multiple dates.

7b. Recollecting from Previous Populations

SOS recommends identifying new populations to collect from each field season. However, revisiting previous collection sites is occasionally necessary to meet restoration goals, such as bulking seed for large seed increase projects. It is essential that a knowledgeable botanist leads the collection team and is involved in deciding when to recollect, and if the population is still suitable (e.g., has the population been under drought conditions in the previous years and possibly experienced a decline?).

Recollecting is only acceptable when adhering to all aspects of the SOS protocol detailed throughout this document, including:

- Training, Communication, Workflow, and Annual Reporting (***Section 2***)
- Permission to Collect (***Section 6***)
- Assessing Populations for Collection (***Section 7***)
- Sampling Strategy (only collecting 20% of available seed) (***Section 8***)
- Identification and Herbarium Specimens (***Section 10***)
- Data Collection (***Section 11***)
- Photos (***Section 12***)
- Post-Collection Seed Care (***Section 13***)

Recollecting must also adhere to the following guidelines and adjustments to the original SOS protocol:

- Populations may not be recollected more than 2 years in a row, preferably allowing 3 years in between collections. While collecting two years in a row is not ideal it can be done under some circumstances, such as needing to bulk seed for production, or there are two years in a row with good precipitation and yield. Here are some examples of how to implement SOS recollections:
 - Ideally, if you make a collection in 2021 you will not collect again until 2025.
 - If you make a collection in 2021, you may collect again in 2022 but not a third time in 2023.
 - If you collect in both 2021 and 2022 you must wait 3 full years until 2026 to collect again.
- Seed Collection Reference Number Format
 - The collection shall be assigned a new SOS Collection Reference Number, following the traditional format and numbering (see 11a)
 - The collection shall be linked to the original SOS collection by selecting **YES** in the “Re-collection” field on the data sheet. Teams will also record the original Seed Collection Reference Number in the “Original Seed Reference #” field.
 - For example, if a team is recollecting NM930-86 they will assign it a new number, following the sequential format, e.g., NM930-555 (new collection number), and include NM930-86 in the “Original Collection Number” field.
- Field Notes Section
 - Teams should begin the “Field Notes Section” of the SOS data sheet with

“RECOLLECTION”

- Annual Report
 - Any recollection should be identified as such with both the original SOS Collection Reference Number and the new SOS Collection Reference Number listed on the annual report (e.g., NM930-86/NM930-555).

8. Sampling Strategy

It is important to maximize the number of alleles (variants of a gene) present within a collected sample by capturing the greatest proportion of alleles represented in the field population. According to Brown and Marshall (1995), at least one copy of 95% of the alleles occurring in the population at frequencies of greater than 0.05 can be achieved by sampling from:

1. 30 randomly chosen individuals in a fully outbreeding sexual species, or
2. 59 randomly chosen individuals in a self-fertilizing species.

The reproductive biology of most native plant target species has not been studied, and the capture of rarer alleles would require a markedly increased sample size. Therefore, for each target species, collectors are advised to sample from a single population with more than 50 individuals, and to look for populations with larger numbers of plants. Without genetic testing, in the field it can be difficult to say precisely where one plant population ends, and another begins. Thus, collectors should use their best judgment, as well as guidance provided by local botanists and ecologists when determining the point at which one collection becomes two. Geographic features such as roads, ridges, and rivers inhibit gene flow between populations, and thus are useful indicators of separate populations. For long, continuous stands of a species, such as in a prairie, separation of at least one kilometer is necessary before being considered a separate population. For clonal or rhizomatous species collections should be made by collecting at widely spaced intervals to increase the chance of sampling from genetically distinct individuals within the population. This can be accomplished by collecting all seeds from every fifth plant, instead of twenty percent from every plant to meet the collection goal of collecting no more than twenty percent of seeds from a population.

As previously mentioned, developing genetically appropriate ecotypes requires between 10 and 20 collections per species, per ecoregion or seed zone. For SOS, each of those collections must be a unique population and should contain more than 10,000 seeds.

9. Seed Collection Techniques

All seed collections that are a part of SOS should follow the protocol outlined in Table 5. If your team is also making non-SOS seed collections, take care to ensure you are following the proper protocol for those collections as laid out by your contract, agreement, or Agency.

Table 5. Seeds Collection Techniques

	Method	Rationale
1.	Assess the target population and confirm that enough individual plants (> 50) have seeds at natural dispersal stage.	To ensure that adequate genetic diversity can be sampled from the population, and that the seeds are likely to be at maximum possible viability and longevity.

2.	Carefully examine a small, representative sample of seeds using a cut test and for smaller seeds a hand lens.	Estimate the frequency of empty or damaged seeds and confirm that most seeds are mature and fully formed.
3.	Collect mature, dry seeds in either cloth or brown paper bags. Large collections can be made using plastic buckets and then transferred into bags. Tape the corners or seams of bags if collecting extremely small seed to prevent losing material.	Ensure the highest possible viability at collection and maximize the potential storage life.
4.	Detailed cleaning, such as removing petals, chaff, and leaves, should be left to the processing staff at the cleaning facility. However, please remove large stems or any woody material.	Maximize the use of available field time and clean and prepare seeds in controlled laboratory conditions. However, balance this with the knowledge that excess material can reduce the longevity of the seed.
5.	Fleshy fruits should be collected directly into plastic bags. Specific advice on ripening and cleaning fleshy fruits is in Section 13 or contact Bend staff if specific guidance is needed.	Fleshy fruits decompose rapidly, and poor storage can lead to mold-infested seed collections.
6.	Sample equally and randomly across the extent of the population, maintaining a record of the number of individuals sampled.	Capture the widest possible genetic diversity from the plant population sampled. Where the population exhibits a pattern of local variation, use a stratified random sampling method to ensure sampling from each microsite.
7.	Collect no more than 20% of the viable seed available on the day of collection.	Ensure that the sampled population is not over collected and is maintainable.
8.	Collect seeds from a population throughout its dispersal season. Seeds from a population collected in the same year can be combined as one collection, using the same seed collection reference number. Note the multiple dates of collections on the SOS field data form.	Maximize genetic diversity in the collection, capturing early, mid, and late bloomers.
9.	Collect more than 10,000 viable seeds, if possible, though the minimum collection size is 3,000PLS. The smaller the collection, the less utility it has. Regardless of size, the entirety of the seed should be submitted to ensure the associated data reflect what is put in storage.	Enable maximum use and study of the collection. 3,000 viable seeds are allocated to long-term storage in the SOS National Collection. Anything over 3,000 can be requested back by the coordinating agency/office or shipped to a partner organization for research, development, or increase.
10.	Send collections to designated government facility for cleaning. Collections larger than 3,000 seeds can be sent back to collectors if they are needed for native plant materials development research or a restoration project. See Section 14 for details on requesting material from a cleaning facility.	Cleaning prolongs the life of the seed and ensures the purity of the collection. Seed cleaned at Bend, Dorena, or the Palmer PMC is then sent to the NLGRP in Fort Collins, Colorado for long-term storage and the PGITRU in Pullman, Washington for long-term storage and working collections.

11.	For each collection, estimate the viable seed production per fruit, per individual and per population, and note these on the field data form. The equation used to calculate this is: (# of viable seeds per fruit) * (# fruits per plant) * (# of plants in the population) * 0.2 = > 10,000 seeds (to ensure at least 3,000PLS are collected)	Document species seed biology, better assess the influence of collecting on the population, and gather information to better document if we are meeting <i>Standards for Rangeland Health</i> for native plant communities. Prevent collection from unhealthy, small, inbred, or unripe populations.
12.	Clearly label all bags (inside and out) with the appropriate collection number. No other data needs to be included on the label. Do not write on cotton seed bags with permanent marker; the bags will be reused.	To ensure that this unique identifier is attached to each sample of a collection. All other data will be recorded on the field data form.

10. Identification and Herbarium Specimens

It is critical to the value of the seed collections that the species is accurately identified. Identification to the species level is required, though identification to subspecies or variety is preferred. Collections cannot be submitted to the program if identification is to genus only. Voucher material is essential to enable the accurate identification of seed collections. Vegetative material and close-up photographs can occasionally help with identification, but the most useful voucher material for this program is a set of quality herbarium specimens (pressed, dried plant specimens) for each collection. Therefore, collectors are **required** to collect at least three herbarium voucher specimens for all Seeds of Success seed collections and to enter comprehensive identification notes on the field data form including where each specimen was sent and any additional identification notes. **Do not mount the voucher materials on an herbarium sheet.** The voucher specimens will be sent to three locations (one voucher per location): The collection office, a regional herbarium, and the US National Herbarium at the Smithsonian*.

**For 2024, NPS teams will not send any vouchers to the Smithsonian, as the agreement for accepting this material is still being developed. NPS teams SHOULD still collect and make labels for the vouchers, write a transmittal notice, and keep them at their park unit to be shipped in the future. DOI teams collecting on NPS land can send associated voucher specimens using the BLM label template.*

Keep the following in mind when collecting specimens for the Seeds of Success program.

Herbarium specimens are valuable outputs from the collecting program, and collectors should take three to four representative herbarium specimens for each seed collection made. These specimens can be held at the most appropriate local, regional, or national herbaria where they will be available for study or classification by visiting taxonomists. Close-up photographs, especially of flowers or organs that may be damaged by pressing and drying, are welcome and should be sent to the herbarium coordinators with the collection number clearly written on the reverse or, in the event of digital files, cited in the file name.

Collectors wishing to learn the correct technique for herbarium specimen preparation should accompany an experienced botanist taking specimens in the field. SOS program collectors should also attend an SOS training session (see **Section 2**). Literature available to consult includes Radford et al. (1974), Ross (1994), and Bridson and Forman (2010) (see **Appendix J**).

For those species that will not be in bloom during seed collecting time, it is suggested that an herbarium voucher specimen be taken during a preliminary trip to the population or from the same population the following year. Herbarium specimens must be taken from the exact population earlier in the

season for the purposes of identification and population monitoring. If a preliminary trip is not made and material for an herbarium voucher specimen is inadequate at seed collection time, collectors should record a representative individual of the population with GPS so that herbarium specimens can be taken from those individuals in the following season when vegetative and reproductive (e.g., flowers, fruits, seeds) material would be available.

Collection: The standard Smithsonian herbarium sheet is 11 ¾ inches wide by 16 ½ inches long. If your specimen is larger, please consider dividing or folding the specimen so it will fit comfortably on a sheet. If you are using newspaper in your field press, cutting it to the size of an herbarium sheet will ensure your specimen will fit later. An ideal specimen displays all parts of a plants – vegetative, reproductive, and roots. However, take care to remove as much soil as possible from any forb or grass collections. A specimen that requires more than one sheet is acceptable if the label data indicates there are multiple pieces to be mounted on separate sheets. Please be aware though that these separated pieces still belong to a singular collection. Additionally, remember to leave space for a label when arranging your specimen on the sheet for pressing.

Do not mount the voucher materials on an herbarium sheet.

Pressing: For the majority of vascular plants species no special consideration is made when pressing specimens in the field except to attempt to display the specimen in such a way that all taxonomic features of the specimen can be examined easily. There are a few exceptions of which to be aware, and they include ferns, large bulky fruits, grasses, seeds, and large leaves.

Ferns: If only a few leaves are collected it is important that one or a few of the leaves are reflexed so that when mounted upon a sheet a researcher will be able to examine both the top and bottom surface of the leaf. This is most important because key taxonomic characteristics (spore producing structures) are typically located on the lower surface and if the leaf is not reflexed before pressing than an attempt should be made to collect multiple leaves so upon mounting all surfaces can be observed.

Large Bulky Fruits and Cones (e.g., pinecones): Inevitably, fruits and the point of fruit attachment are some of the most fragile parts of a herbarium specimen and almost always break away from the specimen either during preparation or during examination. Please indicate on the label, presence of bulky fruits and contain them in a paper or plastic envelope labeled accordingly, while shipping to the herbarium. This is a great way to assure that they do not become separated and lost during processing. This consideration would also apply to cactus specimens which typically become very brittle during the drying process. In this case the entire specimen could be placed in a plastic bag during shipping to both contain any separated pieces and to protect the processing technician that could unknowingly become injured from the spines of these specimens.

Grasses: Because of the tuft-like growing nature of grasses it is sometimes necessary to harvest a large specimen for pressing. In this case it is important to remember the dimensions of a herbarium sheet and arrange accordingly, first by folding, and then by cutting if too large. Once dried, it is virtually impossible to arrange the specimen to fit on a sheet and the specimen may have to be cut into pieces to fit on a sheet which can compromise the scientific and physical integrity of the specimen.

Seeds: The primary objective of the Seeds of Success program is to maintain a seed bank for the conservation and development of native plant materials for restoration and rehabilitation of U.S. lands. As such, it is preferable that some seeds stay with the voucher collection. After pressing and drying, a collection may begin to shed seed. If this occurs the seed may become separated from the specimen during shipment and processing. Once separated, unless witnessed directly by the processing technician, this seed will not be placed back with the specimen because it cannot be assumed that this is the specimen to whom the seed belongs. To prevent this, place the loose seed in a paper or plastic envelope labeled with the collection information so that it can be included with the mounted collection.

Large Leaves: Some of the same concerns regarding grass collections apply here. Remember that a herbarium sheet has a finite size and plan accordingly when collecting such plants by taking into consideration the dimensions of your herbarium pages.

Labeling: Labels play a huge role in the utility of an herbarium specimen. Without a label or with poor/inaccurate label information a specimen is useless as a scientific or historical artifact. A future researcher should be able to use a specimen label to connect the specimen to the place and time of its collection along with the original collector.

A typical label is approximately a 4 x 4 inch square (the ideal, but not set in stone) and is printed on acid free paper. The label should, at minimum, contain the identification (family, genus, and species), collection location (country, state, county, name of area, and GPS coordinates), the date of collection, the name of the collector(s), and the collection number. Although the data sheets are a valuable resource, a traditional specimen label is the convention. **Do not ship SOS data forms with herbarium specimens.** Place labels with the corresponding specimen when shipping. **You may find specific labeling instructions and an example template on the SOS website. The original font size on the template is what is preferred by the Smithsonian. There are three versions which have a different agency listed at the bottom of the template. Please use the one that corresponds to the agency you are collecting for.**

Shipping: Please keep in mind that it is a long way to the Smithsonian and the U.S. Postal Service is not known for delicate handling of parcels. Specimens should be interleaved between newsprint (cheap and widely available), the stack of specimen-newsprint layers sandwiched between two pieces of cardboard tied at each end with string, and the whole bundle wrapped like a present in newsprint or craft paper (this prevents loose pieces from ending up in the bottom of the box). The Smithsonian is a great supporter of recycling, but when reusing boxes try to find ones that will hold the bundle(s) as snugly as possible (less movement = less damage) or add extra newspaper for padding. This is a cheap, easy, and effective method for shipping specimens over great distances.

Finally, when shipping to the Smithsonian, remember to put a notice of transmittal in the packaging that indicates who (which institution or agency) is sending the specimens and the number of specimens in the shipment. The document should also clearly state the intention of the sending institution. If from a Bureau of Land Management office or affiliate, the transaction is considered a ‘transfer’ of material. If the collecting institution is a private entity (botanic garden or university) the transaction is considered a ‘gift’ to the Smithsonian. Scanned and emailed communication indicating the same is also welcome; this is cheaper, faster, and better for the environment. Please remember though that we require a signature from the depositing agent on any documentation received. **You may find a notice of transmittal template on the SOS website. Shipping contacts and addresses can be found under 14d.**

You can find a perfect example of an herbarium specimen at: <https://collections.nmnh.si.edu/search/botany/>
Select: Keyword Search
Genus: *Achnatherum*
Species: *wallowaensis*
Click on the image to enlarge.

10a. Verification by a Local Taxonomist

If you have colleagues at local or regional herbaria that are willing to verify your specimens, please indicate on the field data form that you intend to pass a duplicate set of herbarium specimens to a local taxonomist (together with a copy of the field data form) for verification. Do not assume that all herbaria are willing to provide this service. However, if the specimens are of good quality, and it is explained that the transferred set

of specimens can be incorporated into the herbarium, many taxonomists are willing to help by confirming or updating the collector's identification. If the taxonomist verifies the specimens, it is the collector's responsibility to share the verification results (collection number and complete scientific name together with the month verified and the name of the verifying taxonomist and herbarium) with the SOS National Coordinating Office for dissemination to all other parties holding that Seeds of Success collection.

10b. Nomenclature

USDA PLANTS Database is the taxonomic standard used by Seeds of Success and can be accessed on the web at <https://plants.usda.gov/home>. Identify collections to the subspecies and/or variety level. One goal of the program is to identify the varieties of widespread species that are found in each ecoregion. If you cannot find your taxa on the USDA PLANTS Database, contact the SOS National Curator (**Appendix A**). If the accepted name in USDA PLANTS does not correspond to the accepted name in the flora you are using or is otherwise incorrect, add the preferred accepted name in the field notes section of the data form.

11. Data collection

11a. Data Forms and Digital Data Collection

Detailed documentation is an essential element of a good SOS seed collection. As of 2024, all SOS data collection is being conducted through a BLM GeoPlatform group via tablets with Survey123/Field Maps. See **Appendix L** for information about device requirements. Partners collecting seeds from tribally managed lands are provided an exemption from using the digital data tools and may use paper data sheets and the old SOS data portal to enter collection data directly into BGBASE.

Digital data collection users must submit at least three forms for each collection (scouting, collection, and seed tracking). A rescouting form should also be submitted when checking on populations before collection. If scouting for the first time at the time of collection, a rescouting form does not need to be submitted. The digital data forms contain the same data fields as the paper Field Data Form (**Appendix C**). Collectors must keep backup paper copies of the Field Data Form and Scouting Form with them to use if their tablets fail during a collection. Once a collection is ready to be shipped to its designated cleaning facility collectors must fill out a Seed Tracking Form indicating which facility materials are being sent to. The seed tracking form is available through Survey123 on the tablets, or through the desktop GeoPlatform group.

Access to digital data collection tools and the SOS Geoplatform group is granted for ACTIVE SOS Collectors and direct support staff at the beginning of the collection season, and users are removed when collections have finished for the year. Visit the "Getting Started" page on the SOS website and contact your Agency Coordinator for more information about GeoPlatform access. GeoPlatform and digital data collection training occurs alongside the national SOS trainings at the beginning of the season. **Many help documents exist within the GeoPlatform groups, and you can also find a "Digital Data Collection Quick Guide" on the SOS website.**

GeoPlatform users must export a copy of the Field Data Form for each seed collection. Keep one copy of the completed form for your records. Send one copy whenever you ship seed related to the collection and submit a third digital copy to your Agency Coordinator with the rest of your end of year reporting documents. It is the collector's responsibility to enter these data into the SOS web portal or review data collected digitally by the end of the season (December 15th at the latest).

11b. Non-SOS collections

Do not enter non-SOS collections into the SOS Field Data Form or the SOS web portal.

Collectors who are collecting both SOS and non-SOS collections may use the non-SOS collection form in Survey123 if they follow these guidelines:

- **Non-SOS collections CANNOT use the same collector number as SOS collections.** They must have a separate and unique method for naming.
- **Teams must write NON-SOS on the outside of the box when they ship.** This will ensure the cleaning facility does not process non-SOS as SOS.
- **The non-SOS form is only for groups doing both SOS and non-SOS collections.** If you are ONLY collecting non-SOS seed for the season, you cannot be added to the GeoPlatform group and cannot use the Survey123 form.
- **You cannot make a non-SOS collection from a historic SOS population.** Once a population has been collected for SOS, it must stay an SOS collection site
- **The National Coordinating Office will not be doing any QC or data management.** Data integrity for these collections is up to the collectors and their supervisors. The National Office will simply export the data that is there and send it to an appointed person at the end of the season. Non-SOS collections entered through the non-SOS form will be visible as static points on the map in future season to avoid overharvest, but will not interact with any other SOS data, forms, dashboards, or reporting.
- **This form is only for pre-determined non-SOS collection work.** It is not a substitute for populations that are just too small for SOS that you want to collect anyway.
- **Non-SOS collections are not covered by the National Coordinating Office's cleaning estimates or agreements with cleaning facilities.** The SOS program will not be covering their cleaning or storage costs, you must make prior arrangements for seed to be cleaned outside of the SOS program.

11c. Seed Collection Reference Number Format and Collector Codes

One of the most important parts of SOS collections is assigning a unique identifier to each collection. The Seed Collection Reference Number will include two parts: the SOS collector code (office mail stop, NPS state, USFWS region, or organization acronym; see **Appendices B and G**) and collection number; for example, **OR020-26** for the BLM Burns District Office's 26th collection and **CBG-25** for the Chicago Botanic Garden's 25th collection. Seed collection reference numbers should be unique and sequential from year to year and should never be repeated. If the last collection of the previous year was 34, the next year's collection numbering should start with 35. **Please do not add leading zeros** (e.g., 035).

For BLM teams associated with a Field Office:

Collector codes are determined by the BLM field office where the team is based. Regardless of who is funding the team or where the team is collecting, the code will be based on the geographic location of the Field Office. For example, if there is a team collecting in the Mojave ecoregion and they are based out of the Ridgecrest field office, they will use CA650 as their SOS collector code. There may be instances where a team is working out of multiple field offices. If this is the case, teams will alternate codes depending on within which field office boundaries they are collecting. Please consult with the SOS National Curator about the appropriate field office codes.

BLM teams not associated with a Field Office:

If a team is not based in or associated with a BLM field office, then a collector code will be determined by the SOS National Coordinating Office using the acronym of the organization. For example, if the team is based out of a botanical garden or university, the acronym for the organization will be used for that team (ex.

Chicago Botanic Garden = CBG, Southern Utah University = SUU).

NPS Teams

Teams will be assigned a unique number associated with the state they are collecting in. For example, a team collecting a national park in California could have the code NPSCA00, while a different team also in California would be NPSCA01.

USFWS Teams:

Teams will be assigned a unique number associated with the USFWS region the team is collecting in. For example, a team based in Region 2 would have the code FWS0201. A second, separate team in that region would have the next sequential number, FWS0202.

DOI/Interagency Teams:

Some SOS collection teams collect material which will be shared across several Department of Interior agencies: the BLM, NPS, USFWS and BIA. If these teams are based out of an area with a historic SOS code, they will use the letter “D” in front of the established agency code. For example, DNV030, would be a DOI team based in the BLM Carson City Field Office. If a DOI team is collecting across a broader area than historic codes, they will be assigned a code representing the state that collections are happening across, and a unique number. For example, DUT00 would be a DOI team collecting across Utah, while DUT01 would be a different DOI collection team covering a different part of Utah.

For continuity, all current collecting teams will use their historic codes even if they do not match the above guidelines. See **Appendix B.** for collector codes and **Appendix G.** for a list of all BLM Field Offices, NPS codes, and USFWS codes. Please contact your Agency Coordinator if you are a new team and need a code, or if you are continuing collections and need to know on which number to start.

12. Photos

Photos of landscapes, plants, and seeds are critical for confirming collection’s identification. Digital photos of the species being collected should always be taken while in the field. At the end of the season, SOS photos are also uploaded to a public Smugmug site and serve as important source of training material for future collectors. You can see historic SOS photos at <https://seedsofsuccess.smugmug.com/>.

At least three photos should be taken for each collection, though additional photos are encouraged:

1. Landscape Level/Population
2. Individual Plant
3. Material Collected (seed)

The following naming convention should be used for all SOS photos and each photo should be given a unique letter (A, B, C, etc):

PLANTS Code_Collection Number_Unique Letter

For example, Chicago Botanic Garden’s collection of *Symphyotrichum lanceolatum* would have photos named the following:

SYLA6_CBG-419_A.jpg
SYLA6_CBG-419_B.jpg, etc.

Send images to your Agency Coordinator electronically via a Google Drive folder or a zipped folder in an email. If possible, remove GPS coordinate information before sending photos. **DO NOT SEND PHOTOS IN INDIVIDUAL FOLDERS**, please submit all photos together in one large file without subfolders. Instructions for removing location information from photos and additional information can be found in the guide “Taking Quality Photos for Seeds of Success” on the SOS website.

13. Post-Collection Seed Care

In general, **keep the seed collections in a cloth or paper bag in a cool, dry place** prior to sending to the cleaning facility. **Do not freeze seed.** Do not allow collections to overheat, and do not leave them in a vehicle in full sun. Exposure to sustained high temperatures can badly damage the seed collections. Always maintain ventilation around the collections and try to park the collecting vehicle in the shade, or at the very least, try to shade the windshield. Damp collections should be spread out on newspaper to dry naturally, either outside in the shade or in a well-ventilated room, as soon as possible, before shipping the material. Dry material is warm to the touch, damp material is slightly cool. Any green herbaceous material, flower heads, or capsules should be dry. The collection should be dry enough that it can stay in its bag and shipping box without molding during shipping and can stay in the box for up to a few weeks when it reaches the cleaning facility. Depending on the time of the year and how busy the cleaning facilities are, they may not process the seed immediately.

13a. Treatment with No-Pest Strips

All SOS collections must be treated with an insecticide before sending to the cleaning facility to minimize insect predation on seed and protect staff and contractors that may be handling seed post collection. **There are different protocols for teams working with each agency.**

BLM/USFWS

Use Hotshot No-Pest strips. Even collections that exhibit no presence of insects may include larva stage pests that could damage seed, so all collections should be treated. No-Pest strips emit a harmful vapor that kills insects. Pets and children should not play or sleep where strips are in use, nor should the strips be used in any room where humans are likely to spend more than four hours a day. Please do not fumigate seed collections in an occupied room at your field office!

Place seed in an open paper bag or box and seal it in a plastic bin for at least 48 hours or until no more insects are seen alive in the seed. Use precautions when opening the bin, do not breathe the whiff of the fumes. Minimize exposure to less than 4 hours per day. We recommend moving the bin outside to open and take out treated seeds. Do not over-apply. One 16 gm strip is sufficient for treating 100 to 200 cubic feet. Please use gloves when handling the pest strips! Do not use in kitchens or food prep or storage areas where unwrapped food may be exposed. Kitchen utensils should not contact the strips.

NPS

Collections that are being held at NPS units until shipment to the seed cleaning facility will need to be treated using Terro Garbage Guard (EPA #5481-348-149) and no other. Seed should be treated for a minimum of 72 hours. Place the product and seed in an outdoor garbage can (not a Rubbermaid tote), and store outside in a non-natural area (preferably, in a developed area like the maintenance yard or immediately adjacent to a building) to limit its potential impact on native insects. After treatment, open and "air out" the garbage can for at least 2 hours before reaching in to retrieve the seeds. When a park has completed its use of this product (once they have no more seed to send to the seed lab), immediately dispose of the product.

Parks must ensure additional processes are followed closely to comply with IPM policies. Since the sealed product is only valid for 2 years, a park should only purchase an amount of this product equal to the number of garbage cans they plan to use for prepping seed (if only 1 garbage can, purchase only a 1-pack of this product each year). Do not stockpile this product. Each park that will be using this product is required to send an email to IPM@nps.gov each year after submitting the required PUP, stating that they will follow these requirements and that they understand that all liability for using the product will fall to them. They are also required to keep track of any instances of non-target mass die-off. If any listed T&E species of insects reside in the park, they are to consult with USFWS regarding the use of this product in the park.

13b. Fleshy Fruits

Fleshy fruits require careful handling and quick shipping. **Notify cleaning staff that fleshy material is coming, ship immediately after collecting, and never on a Friday.** If you must make more than one trip to complete a collection, fleshy fruit can be held in a refrigerator for up to a week until the collection is complete. Time fleshy fruit collections so that enough material can be harvested to complete the collection while avoiding shipping late in the week. To ship fleshy fruit pack the whole fruits in strong plastic bags and wrap bags with cold packs and newspaper. The bags should then be placed in a rigid container. Shipping cold and wet ensures the fruits are not squashed and do not get too hot and ferment too much during their journey.

14. Packaging and Shipping

All collections made for Seeds of Success shall follow the protocol section below for packaging and shipping. When shipping seed, data sheets, and herbarium specimens, please remember the following:

- **Collectors will be assigned to a designated cleaning facility. Do not send seed to a specific facility for cleaning unless you have been instructed to do so by your Agency Coordinator.**
- Senders are responsible for all shipping costs related to seed and voucher transport.
- Data sheets shall accompany all seed (but not herbarium shipments), as well as being sent to the Agency Coordinator.
- If your team is also making non-SOS collections as part of your contract, please label the boxes for these collections as “NON-SOS.” **The cleaning and processing costs for these collections are *not* covered by the National Coordinating Office.**

14a. Packaging of Seed

In general, **it is critical to the successful conservation of the seed that it is sent to the designated cleaning facility once seed is treated for pests and reasonably dry.** Seed shipments must include the completed field data forms.

Ship each seed collection in one bag whenever possible. Make sure that the seed bags are clearly labeled with the unique collection number. Additionally, if a collection needs to be shipped in more than one bag, clearly label whether the bag is bag “1 of 3”, “2 of 3”, etc. As an additional precaution, place a second label

on top of the seed inside the bag. The labeled bags should be securely packaged for shipping. We recommend placing cotton or paper seed bags in a sturdy cardboard box or shipping seed in woven PVC or nylon air freight sack if appropriate for the seed type.

Do not use:

- Any non-breathable bags or containers
- Any bags made from solid plastic or from PVC backed fabric (unless ship fleshy fruits in PVC bags as part of a shipment, see *Section 13*).

14b. Shipping Seeds for Cleaning

Some cleaning facilities require you notify them when you ship seed, see the cleaning facility contact list below to review shipping notification details. **Always send the seeds overnight or two-day via USPS or FedEx.** Only ship seed early in the week, never on a Friday or weekend. **Include a copy of the completed field data forms** documenting the collection with all shipments of seed; material will not be cleaned without this documentation. If shipping multiple boxes, field data forms should be in the box with the corresponding collections. Additionally, if collecting seed over multiple days for one collection, do not ship material until the collection is complete. All seed is due to the designated cleaning facility by December 15th.

14c. Cleaning Facility Contact Information

Bend Seed Extractory – Notify when shipping fleshy fruit or collection over 50 pounds.

Shipping Address:
USDA USFS - Bend Seed Extractory
63095 Deschutes Market Road
Bend, OR 97701

Contact:

Sarah Garvin, sarah.garvin@usda.gov
cc Malcolm Howard, malcolm.howard@usda.gov
Phone: (541) 383-5646

Dorena Genetics Resource Center – Notify when shipping all collections.

Shipping Address:
Dorena GRC
Attn: Haley Smith
34963 Shoreview Rd
Cottage Grove, OR 97424

Contact:

Haley Smith, haley.smith@usda.gov
cc Lisa DeWeese, nicole.l.deweese@usda.gov
Phone: (541) 767-5708

Alaska Plant Materials Center – Notify when shipping fleshy fruit only.

Shipping Address:
Alaska Department of Natural Resources

Division of Agriculture
Plant Materials Center
5310 S. Bodenbug Spur
Palmer, AK 99645

Contact:

Lyubomir (Lubo) Mahlev, lyubomir.mahlev@alaska.gov
Phone. (907) 745 8782

14d. Shipping Herbarium Vouchers to the National Herbarium and Elsewhere

Unmounted, labelled herbarium vouchers should be sent to the following locations, along with a notice of transmittal to Smithsonian included in the box or sent via email. More comprehensive vouchering information can be found in **Section 10** of the Protocol and on the SOS website. For the 2024 field season, National Parks Service Teams should not ship vouchers to the Smithsonian. Please create herbarium labels and Notices of Transmittal and keep with the vouchers at the Park Unit Herbaria.

Voucher 1. Smithsonian Institution
NMNH Department of Botany, MRC 166
P.O. Box 37012
Washington, DC 20013-7012

Contact: Erika Gardner
gardnere@si.edu

If shipping with **FedEx**, please use the Smithsonian's non-PO Box address:

Smithsonian Institution
NMNH Department of Botany, MRC 166
10th and Constitution Ave., NW
Washington, DC 20560

Voucher 2. Regional Herbarium (see **Appendix F**)
Voucher 3. Collecting Team's Herbarium

Send all voucher material marked with the seed collection number, along with the herbarium label. Templates for the notice of transmittal may be found on the SOS website.

14e. Requesting Return of Seed

The first 3,000 seeds of each collection are taken from each collection and sent to the Plant Germplasm Introduction and Testing Research Unit (PGITRU) in Pullman, Washington, for incorporation into the working and long-term Seeds of Success National Collection. SOS Coordinating Offices/Agencies can request the return of any extra material (above the 3,000 seeds) to be returned to them, a cooperating agency or organization. Each cleaning facility has their own forms for requesting seed. Forms are available to download from the SOS website.

To return the current season's seed after cleaning:

Use the SOS Clearance to have the seed from the most recent collecting season returned. This form can also be used to request seed test result data ASAP. If shipping is in planning stages, but not certain until after data

are received, omit the shipping information, and complete a second clearance form to the SOS National Coordinating Office when shipping information is determined.

Complete the SOS Clearance Form (**Appendix D**) and e-mail it to your Agency Coordinator, who will then send it to the SOS National Curator by **January 30th**. The SOS National Coordinating Office will review the request, and if approved assign clearance number(s) and send the approved clearance form to the cleaning facility. A limit of 25 seed lots will be shipped or tested each month per facility; please plan requests accordingly or work with the SOS National Coordinating Office for more urgent requests.

Following the process outlined above will ensure that the cleaning facility will return material to the requested location.

To request seed that has been sent to storage:

If a Clearance Form is not filed with the SOS National Coordinating Office, your seed will remain at the cleaning facility. Starting in the spring, all the previous season's collections are moved into a long-term storage freezer. For this reason, any lots from previous collecting seasons require use of the Seed Order Form, and there is a \$35 charge associated with every lot requested from the Bend Seed Extractory. There is no additional fee for material from the Dorena Genetics Resource Center or the Palmer Plant Material Center.

An inventory of the balance of the stored seed will be circulated annually to national native plant materials development process partners. This annual inventory release will be managed by the SOS National Office. For distribution requests to be filled, an explanation of material usage needs to accompany every request and submitted via the Seed Order Form available on the website.

Cleaning facilities will not accept forms that are sent with seed collections or emailed to them from anyone other than the SOS National Office. The SOS National Office also keeps all SOS Clearance Forms and Seed Order Forms on file to track seed use.

Appendix A. National Level Contacts:

BLM	USFWS	NPS
<p><u>Peggy Olwell</u> Plant Conservation and Restoration Program Lead Bureau of Land Management 1387 S. Vinnell Way Boise, ID 83709 208-373-4090 polwell@blm.gov</p> <p><u>Sarah Hill, BLM SOS Coordinator</u> SOS National Curator / National Coordinating Office Bureau of Land Management 1387 S. Vinnell Way Boise, ID 83709 sehill@blm.gov</p>	<p><u>Patricia S. De Angelis</u> Botanist US Fish & Wildlife Service-Division of Scientific Authority 5275 Leesburg Pike, MS: IA Falls Church, VA 22041 703-358-1708 x 1753 patricia_deangelis@fws.gov</p> <p><u>Kelly Thomas, USFWS SOS Coordinator</u> Native Seed Coordinator U.S. Fish & Wildlife Service - Division of Scientific Authority 5275 Leesburg Pike, MS:IA Falls Church, VA 22041 703/358 1708 x 2635 kelly_thomas@fws.gov</p>	<p><u>Lori Makarick</u> Branch Chief, Landscape Restoration and Adaptation Biological Resources Division National Parks Service 1201 Oakridge Drive Fort Collins, CO 80525 970-817-0025 Lori_Makarick@nps.gov</p> <p><u>Katie VinZant, NPS SOS Coordinator</u> Restoration Ecologist National Parks Service 1201 Oakridge Drive Fort Collins, CO 80525 720-701-0737 Katharine_Vinzant@nps.gov</p>

Appendix B. Program Contacts: Seeds of Success Collecting Teams and Partners

2024 Update in Progress, contact your agency coordinator for more information.

Appendix C. Seeds of Success Field Data and Backup Scouting Form

SEEDS OF SUCCESS FIELD DATA FORM

Seed Collection Ref. Number:		Collector Code:	
Date(s) Collected (MM/DD/YY):		Collector Name(s):	
		Collection Number:	
		Alt. Collection Number:	
	Recollection: Y N	If yes Recollection, Original Seed Reference #:	
<u>COLLECTION DATA</u>			
Family:		No. of Plants Sampled (min. 50):	
Genus:		No. of Plants Found (approx.):	
Species:		Area Sampled (acres):	
Subspecies/Variety:		Seeds Collected From:	<i>Plants Ground Both Unknown</i>
Plant Habit:	<i>Tree Shrub Forb Succulent Grass/Grasslike</i>	Avg Plant Height (ft):	
Field Notes to assist in identification of pressed specimen (e.g. flower color):			
Common Name(s) of Plants:		NRCS PLANTS Code:	
<u>LOCATION DATA</u>			
Ecoregion (Omernik Level III):		State:	County:
Subunit (BLM area, park name, etc.):		Area within Subunit (trail name, etc.):	
Land Owner:		Non-BLM Permission Filed:	Y N
Location Details:			
Source Used:	<i>GPS Map None</i>	Accuracy:	<i>GPS Within 5km 6-20km More than 20km</i>
GPS Datum:	<i>NAD83 NAD27 WGS84 Other:</i>		
Latitude (dg/min/sec) (ex: 40° 34' 19.5" N):		Elevation:	
Longitude (dg/min/sec) (ex: 107° 36' 51.54" W):		Unit (ft or m):	
<u>HABITAT DATA</u>			
Associated Species (Scientific Name):			

Ecological Site Description, Habitat Type and/or National Vegetation Classification :			
Modifying Factors:	<i>Mowed Burned Grazed Flooded Seeded Trampled Other:</i>		
Land Form:		Avg Slope (degrees):	
Land Use:		Aspect:	<i>N NE E SE S SW W NW</i>
Geology:			
Soil Texture:	<i>Clay Silt Sand Other:</i>	Soil Color:	
<u>HERBARIUM VOUCHERS</u>			
Number of pressed specimens:		Date Voucher Taken:	
Herbaria Names (Smithsonian, Regional, Local):			
<u>SPECIALIST IDENTIFICATION</u>			
Identified by (name and organizational affiliation):			
Material Identified:	<i>In Field From Pressed Specimen on Day of Collection From Pressed Specimen on Another Date From Photograph</i>	Date Identified (MM/DD/YY):	
<u>CLEANING FACILITY</u>			
Where are these seeds being cleaned?			

PRE-COLLECTION CHECKLIST

*This section is for your reference only and not required as part of the data collected by the SOS National Coordinating Office. The conditions indicated in **boldface** describe ideal population size and seed dispersal stage for seed collecting.*

Assess Population & Seed Dispersal Stage			
Approximate area of population:	x	(feet, yards, miles.....)	
Approximate total number of individual plants present and accessible:	<i>0-50</i>	<i>50-500</i>	<i>500-5000</i> <i>> 5000</i>
Evidence of disturbance or damage:	<i>Resown</i>	<i>Burnt</i>	<i>Sprayed</i> No damage
Readiness of population for collecting: give percentages or circle the most frequently occurring:	<i>Vegetative</i>	<i>In flower</i>	<i>Immature seeds</i> Around natural dispersal <i>Post dispersal</i>
Estimate the number of individual plants at natural dispersal stage:	<i><50</i>	>50	
Is the population:	<u>A single population</u> <i>A population with distinct sub-populations (Can you sample separately or from the most suitable?)</i>		
Assess Seed Quality & Availability			
On a typical individual, where on the plant/branch/fruit is the seed at natural dispersal stage?	I can identify the location of ripe seed on this plant		
Using a cut test on the seeds at this stage, give percentages or circle the most frequently occurring:	Healthy <i>Insect-damaged</i> <i>Empty</i> <i>Moldy</i> <i>Malformed/other damage</i>		
Estimate the number of healthy seeds per fruit:			
Estimate the number of fruits per individual plant:			
Should Seed Be Collected On This Trip?			
Use the collection equation (<i># of plants in population</i>) * (<i>avg # fruits per plant</i>) * (<i>avg. # healthy seeds per fruit</i>) * 0.2 = X) to determine if collecting 20% of the healthy seeds available today will result in >10,000 PLS.			

Backup Scouting/Rescuing Form

Seeds of Success Scouting Form

Collector Code:		NRCS PLANTS Code:	
Scouting ID:		Date:	
Estimated Population Size:		Number of Acres:	
Future Potential?	Y N	Potential Collection Type:	Standard Operational Recollection Other:
Phenology:	<i>Dormant: ___% Vegetative: ___% Bud: ___% Flower: ___% Seed: ___% Post-Seed: ___%</i>		
Scouting Notes:			
Subunit:		Area within subunit:	
GPS Coordinates:	LAT:	LONG:	
Source of Coordinates:		GPS Datum:	<i>WGS84, NAD83, NAD27, NAD84</i>
Elevation:		Elevation Units:	<i>Feet Meters</i>
Any evidence of disturbance, treatment, or modification?	Y N	State, County, and Seed Zone:	
Location Details:			

Rescuing Information

Date:		Estimated Population Size:	
Number of Acres:		Future Potential?	Y N
Potential Collection Type:	Standard Operational Recollection Other:		
Phenology:	<i>Dormant: ___% Vegetative: ___% Bud: ___% Flower: ___% Seed: ___% Post-Seed: ___%</i>		
Scouting Notes:			

Collecting Information – Fill out this section when you have collected from this population.

1. Number of Plants Sampled:		2. Average Number of Fruits Per Plant:	
3. Average Number of Viable Seeds Per Fruit:		Estimated Number of Seeds Collected: (#1 * #2 * #3)	
SOS Seed Collection Ref. Number		Date Collected:	

Appendix D. EXAMPLE - Seeds of Success Return Request: Clearance Form

Request seed collected in the current season to your office with the Seeds of Success Clearance Form

***Download the correct form for the cleaning facility that corresponds to the lot you are interested in.

BLM / NPS / USFWS: How to Request Seed and/or Seed Test Results Back to your Office from Bend Seed Extractory

The U.S. Forest Service Bend Seed Extractory is the seed cleaning facility for SOS seed collected by the BLM / NPS / USFWS. After cleaning, the first 3,000 seeds are taken off the top of the collection and sent to Pullman, WA and Ft. Collins, CO for incorporation into the Seeds of Success National Collection. With this form, the coordinating Agency/Office responsible for an SOS team can request the entire remaining balance (anything over 3,000 PLS) be returned to their office or shipped to a cooperator. To request only a portion of your remaining balance, or to send the remaining balance of a single collection to multiple partners, please contact the SOS National Coordinating Office. This form can also be used to request seed test result data. If both test results and shipping are requested, please fill out both the “shipping” column and “seed test results” column. If shipping is in planning stages, but not certain until after data is received, omit the shipping info and complete a second form to the SOS National Coordinating Office when shipping information is determined.

Complete this form and e-mail it to your Agency Coordinator with associated SOS Field Data Forms by **January 30th**. They will then review the request and forward the form onto the National Coordinating Office. A monthly review of clearance forms will occur on the first Tuesday of the month, following the national coordinating call. The SOS National Coordinating Office will review the request, if approved, assign a clearance number(s), and send the approved clearance form to the Bend Seed Extractory. A limit of 25 seed lots will be shipped or tested each month, please plan requests accordingly or work with your Agency Coordinator and the SOS National Coordinating Office for more urgent requests.

Bend will not return material without SOS Field Data Forms and a clearance number assigned by the SOS National Coordinating Office. **Please allow at least 30 days from date of approval to the date you would like the seed or seed test results returned.**

Requester Contact Information

Name: Kristy Snyder

Email: ksnyder@blm.gov

FedEx Account #: 1234-5678-9

SOS Collecting Team: MT050

Phone Number: (208) 867-5309

Return Request Type

	Shipping request	Seed Test Results
Date Needed	April 2, 2024	
Name & Organization	BLM-Dillon Field Office	
Recipient's physical address or email address	1005 Selway Drive, Dillon, Montana 59725	

Please return or test the following collection(s):

SOS Collection Reference Number	Species	Clearance Number (assigned by the National Office)
MT050-77	<i>Camassia quamash</i>	Leave blank
MT050-78	<i>Achnatherum hymenoides</i>	Leave blank
MT050-79	<i>Cordylanthus ramosus</i>	Leave blank
MT050-80	<i>Orthocarpus luteus</i>	Leave blank

Native Plant Materials Development Project (Please describe, in detail, how the returned seed will be used, i.e. common garden study, restoration project, academic partnership, etc. This section must be filled out for your request to be processed.)

Seed will be used through sage grouse habitat restoration projects, timber harvest areas. Seed will be sent to a nursery to grow out. *Camassia quamash* will eventually be planted back out on native habitats within the DFO and with help from tribal partner groups.

Appendix E. EXAMPLE - Seeds of Success Annual Report

*** Download the annual report template from the SOS website (www.blm.gov/sos)

Location: Mother Lode Field Office, El Dorado Hills, California				
Number of species collected: 18		Number of SOS collections made: 25		
Collecting Season Summary (accomplishments and challenges):				
<i>*Note – missing photos for CA180-277</i>				
<p>This year was a team effort by Jake Picardat (Bio Science Tech), Landon Eldredge (Bio Science Tech), Sophia Weinmann (Bio Science Tech), Graciela Hinshaw (Pine Hill Preserve Manager), Haley O’Mara (ARC Intern), and Faith Provost (MLFO Intern). The interns benefited from the new experiences and working on these projects promoted their overall knowledge about ecology and conservation of the rare and native plant species.</p> <p>All personnel worked well to overcome difficulties caused by COVID-19, heat, and UV exposure.</p> <p>Having three Bio Science Techs and two interns made the completion of the collections this year not only possible, but run smoothly as well. Eldredge played an essential role in the very early part of the year with scouting and collecting herbarium vouchers with the assistance of O’Mara. Picardat was hired in April and soon after took lead over SOS related projects and the majority of collections were completed by Eldredge and Picardat. Weinmann and Provost were hired in July and were vital in completing later seed collections alongside Picardat.</p> <p>There were two new survey locations visited this year: the Lotus Parcel about 4 miles south of Lotus, CA, and the Big Canyon Creek Parcel about 3 miles southeast of Latrobe, CA. Both parcels are of interest due to their serpentine soils and riparian aspects as Weber Creek flows through the Lotus Parcel and both the Cosumnes River and Big Canyon Creek flow through the Big Canyon Creek Parcel. We expect numerous collections from both parcels next year after more surveying has been completed.</p> <p>This year brought more precipitation to California than a lot of years prior and because of this we were able to complete 25 collections from 18 different taxa. Nine species have not been part of our SOS collections before and of those, four appear to be first time collections for SOS as a whole, with no records of prior teams collecting them before in the SOS database.</p>				
Partners (Other agencies, NRCS, non-profit, etc.) and in what capacity you worked together:				
<p>California Native Plant Society (CNPS), non-profit: Provided technical expertise verifying voucher specimens.</p> <p>California Department of Fish and Wildlife: Pine Hill Preserve consists of managed lands by federal, state, and county entities. As such, one of our seed collections this year was partially done on one of CDFW’s parcels of the Pine Hill Preserve.</p>				
Organizations that provided volunteers, and how many:				
<p>YCC Generation Green: The YCC program provided us with 2 crews of 4-5 high school age students that helped complete one SOS and multiple in-house seed collections.</p> <p>American River College: Provided an intern who helped scout and complete early seed collections.</p>				
Education and Outreach: (include any work with other groups to promote or highlight Seeds of Success, i.e., citation for a newsletter, web article, conference/meeting display, or presentation on SOS and/or the Native Plant Materials Development Program, etc.)				
Format (talk, exhibit, publication)	Title	Name of Event or Publication	Location (Nearest City, State)	Date
Presentation	Pine Hill Preserve: A Geologically and Botanically Unique Area	Wildflowers Class Presentation at American River College	Sacramento, California	3/8/2023 Given by Graciela Hinshaw

Distributions: (include information for collections that have been shipped out of your office to the Bend Seed Extractory or any other receiving institution) *all 25 collections submitted in original report, this section is abbreviated for this example

Species	SOS Seed Coll. Ref. Num	Receiving Institution	What the SOS Material will be Used For
<i>Meconella californica</i>	CA180-275	Bend Seed Extractory	Storage for future needs
<i>Mimulus cupriphilus</i>	CA180-276	Bend Seed Extractory	Storage for future needs
<i>Pogogyne serpylloides</i>	CA180-277	Bend Seed Extractory	Storage for future needs
<i>Mimulus guttatus</i>	CA180-278	Bend Seed Extractory	Storage for future needs
<i>Epilobium minutum</i>	CA180-279	Bend Seed Extractory	Storage for future needs
<i>Mimulus guttatus</i>	CA180-280	Bend Seed Extractory	Storage for future needs
<i>Collinsia heterophylla</i> var. <i>heterophylla</i>	CA180-281	Bend Seed Extractory	Storage for future needs
<i>Calochortus albus</i>	CA180-282	Bend Seed Extractory	Storage for future needs
<i>Githopsis pulchella</i> ssp. <i>serpentinicola</i>	CA180-283	Bend Seed Extractory	Storage for future needs
<i>Eriophyllum lanatum</i> var. <i>achilleoides</i>	CA180-284	Bend Seed Extractory	Storage for future needs
<i>Chlorogalum pomeridianum</i>	CA180-294	Bend Seed Extractory	Storage for future needs

Internal Research using non-SOS collections: (include tracking information for collections that are kept at your office for Native Plant Materials Development projects. This section is for non-SOS collections only).

Species	Seed Coll. Ref. Num (e.g., CBFO-23-2020)	What the non-SOS material will be used for
<i>Calochortus albus</i>	N/A	Planting in a pollinator garden project this fall/next spring
<i>Triteleia ixiodes</i>	N/A	Planting in a pollinator garden project this fall/next spring
<i>Erythranthe guttata</i>	N/A	Planting in a pollinator garden project this fall/next spring
<i>Clarkia purpurea</i>	N/A	Planting in a pollinator garden project this fall/next spring
<i>Phacelia</i> ssp.	N/A	Planting in a pollinator garden project this fall/next spring
<i>Elymus glaucus</i>	N/A	Future grassland/prairie restoration efforts

**Please submit the final annual report to your Agency Coordinator December 15th.
 BLM: Sarah Hill, sehill@blm.gov.
 USFWS: Kelly Thomas, kelly_thomas@fws.gov.
 NPS: Katie Vinzant, Katharine_Vinzant@nps.gov.**

Appendix F. Offices and Regional Herbaria

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
ALL Teams <i>*NPS hold until further notice</i>	US National Herbarium, Department of Botany MRC-166 Smithsonian Inst. 10 th and Constitution Ave., NW Washington, DC 20560	US	Erika Gardner gardnere@si.edu		
AK930	Univ. of AK Anchorage Herbarium 3311 Providence Dr. Anchorage, AK 99508	UAAH	Justin Fulkerson 907-786-6287	BLM, ASO 930, Lands and Renewable Resources Anchorage, AK 99513	John Payne 907-271-3431
AK040	University of Alaska Museum Herbarium PO Box 756960 907 Yukon Dr. Fairbanks, AK 99775- 6960	ALA	Jordan Metzgar 907-474-7109	BLM, Anchorage FO 6881 Abbott Loop Rd. Anchorage, AK 99507	
AK025	University of Alaska Museum Herbarium PO Box 756960 907 Yukon Dr. Fairbanks, AK 99775- 6960	ALA	Jordan Metzgar 907-474-7109	BLM, NFO Kotzebue Field Station Kotzebue, AK	
AZ930	Arizona State Univ. Herbarium Dept. of Plant Biology PO Box 87101 Tempe, AZ 85287-1601	ASU	Elizabeth Makings 480-965-6162	Phoenix Field Office 21605 N. Seventh Ave. Phoenix, AZ 85027	John L. Anderson 623-580-5520
All AZ Field Offices	Arizona State Univ. Herbarium Dept. of Plant Biology PO Box 87101 Tempe, AZ 85287-1601	ASU	Elizabeth Makings 480-965-6162	Desert Botanical Garden 1201 N.Galvin parkway Phoenix AZ 85008	
AZ010, AZ100				Arizona Strip FO 345 E. Riverside Dr. St. George, UT 84790- 9000	Jacqueline Roaque 435-688-3242
CA160	UC Jepson Jepson Herbarium University of California 1001 Valley Life Sciences Bldg. #2465 Berkeley, CA 94720- 2465	JEPS	Bruce Baldwin 510-643-7008	Bakersfield FO	Denis Kearns 661-391-6115
CA169	UC Jepson	JEPS	Bruce Baldwin 510-643-7008	Goodwin Education Center	Kathy Sharum 661-391-6033
CA170	Herbarium California Botanic Garden 1500 N. College Ave. Claremont, CA 91711- 3101	RSA	Mare Nazaire 909-625-8767	BLM Bishop Field Office 785 N. Main, Suite E Bishop, CA 93514	Martin Oliver 760-872-5035
CA180	UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008	University of California Davis	Ellen Dean 530-752-1091

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
CA190	UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008		
CA320	UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008		
CA330	Herbarium, Biological Sciences Department Humboldt State Univ. Arcata, CA 95521-8299	HSC	Robin Bency 707-826-4801	Arcata Field Office Herbarium	Jennifer Wheeler 707-825-2316
CA340	UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008	University of California Davis	Ellen Dean 530-752-1091
CA350	UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008	Eagle Lake FO Herbarium 2950 Riverside Dr. Susanville, CA 96130	Valda Lockie 530-252-5325
CA360	Herbarium, Biological Sciences Department California State Univ. Chico, CA 95929-0515	CHSC	Lawrence Janeway 530-898-5381	Redding FO Herbarium 355 Hemsted Dr. Redding, CA 96002	Kendra Fallon 530-224-2107
CA370	UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008		
CA650	California Botanic Garden	RSA	Mare Nazaire 909-625-8767		
CA690	UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008		
CA930	UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008		
CBG	Nancy Poole Rich Herbarium, Research Department Chicago Botanic Garden 1000 Lake Cook Rd. Glencoe, IL 60022	CHIC	Dr. Kayri Havens 847-835-8378		
All CO offices 1ST	Univ. of Colorado Museum Herbarium Clare Small Bldg. Campus Box 350 Boulder, CO 80309- 0350	COLO	Dr. Erin Tripp 303-492-3216		
All CO offices 2ND	University of Wyoming Rocky Mt. Herbarium Dept. of Botany PO Box 3165 Laramie, WY 82071- 3165	RM	Ron Hartman & Ernie Nelson 307-766-2236	Colorado College 14 E. Cache la Poudre Colorado Springs, CO 80903 4TH	Dr. Tass Kelso 719-389-6405
All CO offices 3RD	CSU Herbarium Dept. of Biology Colorado State Univ. Fort Collins, CO 80523- 1878	CS	Jennifer Ackerfield 970-491-0496	Adams State College 208 Edgemont Blvd. Alamosa, CO 81102 5TH	Kristy L. Duran 719-587-7767
All CO offices				Univ. of CO - Denver Dept. of Biology Campus Box 171 PO Box 173364 Denver, CO 80217-3364 6TH	Leo Bruederle 303-556-3419

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
FWS0201	Arizona State Univ. Herbarium Dept. of Plant Biology PO Box 87101 Tempe, AZ 85287- 1601	ASU	Elizabeth Makings 480-965-6162	Desert Botanical Garden 1201 N. Galvin Parkway Phoenix AZ 85008	Wendy Hodgson 480-481-8107
FWS0202	Department of Biology New Mexico State University Biology Annex Building Las Cruces, New Mexico 88003-0003	NMC	Sara Fuentes Soriano and Zachary Rogers 575-646-3732		
FWS0300	Nancy Poole Rich Herbarium, Research Department Chicago Botanic Garden 1000 Lake Cook Rd. Glencoe, IL 60022	CHIC	Dr. Kayri Havens 847-835-8378	Nancy Poole Rich Herbarium, Research Department Chicago Botanic Garden 1000 Lake Cook Rd. Glencoe, IL 60022	Dr. Kayri Havens 847- 835-8378
FWS0400	Biology Department Austin Peay State University 681 Summer Street Sundquist Science Complex D127 Clarksville, Tennessee 37044	APSC	Dwayne Estes 931-221-7781	Biology Department Austin Peay State University 681 Summer Street Sundquist Science Complex D127 Clarksville, Tennessee 37044	Dwayne Estes 931-221-7781
FWS0401	Biology Department Austin Peay State University 681 Summer Street Sundquist Science Complex D127 Clarksville, Tennessee 37044	APSC	Dwayne Estes 931-221-7781	University of Georgia Herbarium Plant Biology Department University of Georgia 120 Carlton Street Athens, Georgia 30602- 7271	Steven Hughes 706-583-0565
FWS0402	Biology Department Austin Peay State University 681 Summer Street Sundquist Science Complex D127 Clarksville, Tennessee 37044	APSC	Dwayne Estes 931-221-7781	University of Arkansas Herbarium Department of Biological Sciences University of Arkansas 850 W. Dickson Street; SCEN 601 Fayetteville, Arkansas 72701	Jennifer Ogle 479-575-4372
FWS0403	Biology Department Austin Peay State University 681 Summer Street Sundquist Science Complex D127 Clarksville, Tennessee 37044	APSC	Dwayne Estes 931-221-7781	Jones Center at Ichauway 3988 Jones Center Drive Newton, Georgia 39870	Lisa Giencke 229-734-4706
FWS0404	Biology Department Austin Peay State University	APSC	Dwayne Estes 931-221-7781	University of North Carolina Chapel Hill Herbarium	Carol McCormick 919-962-6931

	681 Summer Street Sundquist Science Complex D127 Clarksville, Tennessee 37044			North Carolina Botanical Garden 120 South Road, Campus Box #3280, Coker Hall Chapel Hill, North Carolina 27599-3280	
FWS0800	NRES, MS-186 Univ. of Nevada Reno 1664 N. Virginia St. Reno, NV 89557	REN O	Jerry Tiehm 775-784-1105	Austin Forest Service Herbarium Botany Austin Ranger District US Forest Service - Humboldt-Toiyabe National Forest P.O. Box 130 Austin, Nevada 89310	Dirk Netz 775-340-8505
ID070 and other Idaho without info.	Museum of Nat. History Ray D. Davis Herbarium Idaho State University Campus Box 8096 Pocatello, ID 83209	IDS	Dr. Lief Tapanila 208-202-3871		
ID080	Dept. of Biological Sciences Stillinger Herbarium Univ. of Idaho Moscow, ID 83844	ID	David Tank 208-885-7033		
ID090	Boise State University Herbarium Dept. of Biology 1910 University Dr. Boise, ID 83725	SRP	Dr. Jim Smith 208-426-3551	Lower Snake River District Herbarium 3948 Development Dr. Boise, ID 83705	Ann DeBolt 208-384-3465
LBJWC	Herbarium, Plant Resources Center Univ. of Texas at Austin 1 University Sta. F0404 Austin, TX 78712- 0471	TEX	Dr. George Yatskievych 512-471-5904 512232-3402 f		
MT030	North Dakota State Univ.. Herbarium Hastings Hall Fargo, ND 58105	NDA	Edward DeKeyser 701- 231-8180 edward.dekeyser @ndsu.edu	Dickinson Research Ext. Center 1089 State Ave. Dickinson, ND 58601	Dennis Whitted 701-231-5583
MT923	408 Lewis Hall Dept. of Plant Sciences Montana State Univ. Bozeman, MT 59717	MONT	Curator Matt Lavin 406-994-2032 w 406-994-1848 f mlavin@ montana.edu,		
MT923	Herbarium Univ. of Montana Missoula, MT 59812- 1002	MONTU	Shannon Kimball 406-270-3702		

MT923	Charles A. Taylor Herbarium Agricultural Hall 320 Dept. of Biology & Microbiology SD State Univ.	SDC	Gary E. Larson, Curator 605-690-3435		
NV030 NV052 NV930	NRES, MS-186 Univ. of Nevada Reno 1664 N. Virginia St. Reno, NV 89557	RENO	Jerry Tiehm 775-784-1105	BLM Las Vegas FO 4701 N. Torrey Pines Dr. Las Vegas, NV 89130	Lara Kobelt 702-515-5022
OR010 OR014 OR020 OR030 OR050 OR080 OR090 OR100 OR110 OR120 OR134	OSU Herbarium Dept. of Botany and Plant Pathology 2082 Cordley Hall Corvallis, OR 97331- 2902	OSC	Aaron Liston- Director Richard Halse- Curator 541-737-4106		
OR030				Albertson Coll. of Idaho 2112 Cleveland Blvd. Caldwell, ID 83605	Dr. Don Mansfield 208- 459-5287
OR020				BLM Burns District Herbarium 28910 Hwy 20 West Hines, OR 97738	Skyler Hickey 541-573- 4478
OR090B				Upper Willamette Field Office 3106 Pierce Parkway Suite E Springfield Oregon 97477	Jessica Celis 541-683- 6794
OR110				Medford BLM Herbaria, 3040 Biddle Rd, Medford, OR 97504	Bryan Wender 541-471- 6549
OR130 OR134	Herbarium Botany Dept. Univ. of Washington Box 355325 Seattle, WA 98195-5325	WTU	David Giblin 206- 543-1682 206-685-1728 f	Spokane District Herbarium Wenatchee, WA	Molly Boyter 509-665- 2137
UT931 (formerly known as RBG)	Stanley L Welsh Herbarium Brigham Young Univ. 378-MLBM Provo, UT 84602	BRY	Aaron Roe 801- 539-4065	BLM Utah State Office P.O. Box 45155 Salt Lake City, UT 84145- 0155	Aaron Roe 801-539- 4065
UT030				Grand Staircase- Escalante NM 190 E. Center St. Kanab, UT 84741	Amber Hughes 435- 826-5602

UT050	Stanley L. Welsh Herbarium Brigham Young Univ. 378 MLBM, BYU Provo, UT 84602	BRY	Robert Johnson 801-422-7094	Utah Valley State College - Herbarium Dept. of Biology Life Sciences 800 W. 1200 S. Orem, UT 84058-5999	James Harris 801-863-8623 Jason Alexander 801- 863-6806
UT080	Intermountain Herbarium Utah State University 5305 Old Main Hill Logan, UT 84322	UTC	Dr. Michael Piep 435-797- 0061	Uinta Basin Herbarium BLM 170 S. 500 East Vernal, UT 84078	Sandra Robins 435-781- 4448
UT080	Rocky Mt. Herbarium University of Wyoming 3165 University Sta. Laramie, WY 82071	RM	Ron Hartman and Ernie Nelson 307-766-2236		
VA (vnps)	Massey Herbarium, Biology Dept. VA Polytechnic Inst. and State Univ. Blacksburg, VA 24061- 0406	VPI	Thomas F. Wieboldt 540-231-5746 540-231-9307 f wieboldt@vt.ed u	URV Herbarium, Biology Department University of Richmond Richmond, VA 23173	W. John Hayden 804-289-8232 804-289-8233 f jhayden@richmond.e du
WY930	Western Wyoming College				
WY930	Rocky Mt. Herbarium University of Wyoming	RM			

Appendix G. BLM Offices and Mail Stop/Collector Codes

AK020 - Northern Field Office
AK025 - Central Yukon Field Office,
Fairbanks District Office
AK040 - Anchorage Field Office
AK050 - Glenallen District Office
AK930 - Alaska State Office
AZ030 - Kingman Field Office
AZ010 - Arizona Strip Field Office
AZ020 - Phoenix Field Office
AZ040 - Safford Field Office
AZ050 - Yuma Field Office
AZ060 - Tucson Field Office
AZ061 - San Pedro Project Office
AZ070 - Lake Havasu Field Office
AZ930 - Arizona State Office
CA067 - El Centro Field Office
CA068 - Barstow Field Office
CA160 - Bakersfield Field Office
CA170 - Bishop Field Office
CA180 - Folsom Field Office
CA190 - Hollister Field Office
CA320 - Alturas Field Office
CA330 - Arcata Field Office
CA340 - Ukiah Field Office
CA350 - Eagle Lake Field Office
CA360 - Redding Field Office
CA370 - Surprise Field Office
CA610 - California Desert District
CA650 - Ridgecrest Field Office
CA660 - Palm Springs-South Coast Field
Office
CA690 - Needles Field Office
CA930 - California State Office
CO100 - Little Snake Field Office
CO110 - White River Field Office
CO120 - Kremmling Field Office
CO130 - Grand Junction Field Office
CO140 - Glenwood Springs Field Office
CO150 - Uncompahgre Field Office
CO160 - Gunnison Field Office
CO172 - San Juan Field Office
CO200 - Royal Gorge Field Office
CO210 - La Jara Field Office
CO220 - Saguache Field Office
CO932 - Colorado State Office
ES930 - Eastern States Office
ID100 - Boise District Office
ID120 - Bruneau Field Office
ID110 - Four Rivers Field Office (was ID095)
ID130 - Owyhee Field Office (was ID096)
ID200 - Twin Falls District Office
ID210 - Jarbidge Field Office (was ID097)
ID220 - Burley Field Office (was ID078)
ID230 - Shoshone Field Office (was ID076)
ID300 - Idaho Falls District Office
ID310 - Upper Snake Field Office
ID320 - Pocatello Field Office (was ID075)
ID330 - Challis Field Office (was ID084)
ID340 - Salmon Field Office (was ID085)
ID400 - Coeur d'Alene District Office
ID410 - Coeur d'Alene Field Office (was
ID086)
ID420 - Cottonwood Field Office (was ID087)
ID930 - Idaho State Office
MT010 - Billings Field Office
MT020 - Miles City Field Office
MT030 - North Dakota Field Office
MT040 - South Dakota Field Office
MT050 - Dillon Field Office
MT06? - Havre Field Office
MT060 - Lewistown Field Office
MT070 - Butte Field Office
MT090 - Malta Field Office
MT092 - Glasgow Field Station
MT100 - Missoula Field Office
MT923 - Montana/Dakotas State Office
NM010 - Albuquerque Field Office
NM011 - Cuba Field Office
NM012 - Grants Field Station
NM018 - Taos Field Office
NM030 - Las Cruces District Office
NM040 - Tulsa Field Office
NM050 - Socorro Field Office
NM060 - Roswell Field Office
NM070 - Farmington District Office
NM080 - Carlsbad Field Office
NM930 - New Mexico State Office
NV010 - Elko Field Office
NV020 - Winnemucca Field Office
NV030 - Carson City Field Office
NV040 - Ely Field Office
NV050 - Las Vegas Field Office
NV060 - Battle Mountain Field Office
NV065 - Caliente Field Station
NV065 - Tonopah Field Station
NV930 - Nevada State Office
OR010 - Lakeview District Office
OR014 - Klamath Falls Resource Area
OR020 - Burns District Office
OR030 - Vale District Office

OR035 - Baker Resource Area OR050 -
Prineville District Office
OR054 - Central Oregon Resource Area OR056
- Deschutes Resource Area OR080 - Salem
District Office
OR086 - Tillamook Resource Area
OR090 - Eugene District Office OR091 -
West Eugene Wetlands OR100 -
Roseburg District Office OR110 -
Medford District Office OR115 - Butte
Falls Resource Area OR116 - Ashland
Resource Area OR117 - Grants Pass
Resource Area OR118 - Glendale
Resource Area OR120 - Coos Bay
District Office OR130 - Spokane District
Office OR134 - Wenatchee Resource
Area OR930 - Oregon State Office
OR931 - Berry Botanic Garden TC200 -
National Training Center UT010 -
Fillmore Field Office UT020 - Salt Lake
Field Office
UT030 - Escalante Interagency Resource
Center
UT030 - Grand Staircase-Escalante National
Monument

UT040 - Cedar City Field
Office UT052 - Richfield
Field Office
UT055 - Henry Mountains Field
Station UT060 - Moab Field Office
UT070 - Price Field Office
UT080 - Vernal Field
Office UT090 - Monticello
Field Office UT100 - St.
George Field Office
UT110 - Kanab Field
Office UT930/3 - Utah
State Office
UT931 - Red Butte Botanical Garden
WO230 - Fish, Wildlife, and Plant
Conservation Division
WY010 - Worland Field
Office WY020 - Cody
Field Office WY030 -
Rawlins Field Office
WY040 - Rock Springs Field
Office WY050 - Lander Field
Office WY060 - Casper Field
Office WY070 - Buffalo Field
Office WY080 - Newcastle
Field Office WY090 -
Kemmerer Field Office
WY100 - Pinedale Field Office
WY930 - Wyoming State
Office

Appendix H. 2024 Collector Codes and Coordinating Agencies As of 4.1.2024

Collector Code	Name	Agency Coordinator	Collector Code	Name	Agency Coordinator
AK930	AK930-Alaska State Office, UAA	BLM	DUT04	DUT04-DOI Moab, Ecoregion 20	NPS
AK930A	AK930A-Salcha-Delta SWCD	BLM	DWA00	DWA00-DOI Washington	NPS
AK930B	AK930B-Kawerak Inc.	BLM	DWY00	DWY00-DOI Green River WY, Ecoregion 18	NPS
AK930C	AK930C-Copper River Watershed Project	BLM	DWY01	DWY01-DOI Grand Teton/Yellowstone NP, Ecoregion 17	NPS
AZ010	AZ010-Arizona Strip Field Office	BLM	ES040	ES040-Northeastern States	BLM
CA067	CA067-El Centro Field Office	BLM	FWS0100	FWS0100-PFW Region 1, The Understory Initiative	USFWS
CA160	CA160-Bakersfield Field Office	BLM	FWS0202	FWS0202-New Mexico ES Field Office, Southwest Seed Partnership	USFWS
CA170	CA170-Bishop Field Office	BLM	FWS0300	FWS0300-PFW Region 3, Chicago Botanic Garden	USFWS
CA180	CA180-Mother Lode Field Office (Formerly Folsom)	BLM	FWS0400	FWS0400-PFW HQ, Southeastern Grasslands Institute	USFWS
CA180A	CA180A-Mother Lode Field Office - Cosumnes River Preserve	BLM	FWS0401	FWS0401-PFW HQ, State Botanical Garden of Georgia	USFWS
CA190B	CA190B-Hollister Field Office - Fort Ord National Monument	BLM	FWS0402	FWS0402-PFW HQ, Audubon Delta	USFWS
CA320	CA320-Applegate Field Office (Formerly Alturas FO)	BLM	FWS0403	FWS0403-PFW HQ Jones Center at Ichauway	USFWS
CA330	CA330-Arcata Field Office	BLM	FWS0404	FWS0404-PFW HQ, North Carolina Botanical Garden	USFWS
CA340	CA340-Ukiah Field Office	BLM	FWS0405	FWS0405-Caribbean ES Field Office, East Puerto Rico	USFWS

CA350	CA350-Eagle Lake Field Office	BLM
CA360	CA360-Redding Field Office	BLM
CA360A	CA360A-California (Redding) - Contract	BLM
CA370	CA370-Applegate Field Office (Formerly Surprise FO)	BLM
CA610	CA610-California Desert District	BLM
CA930A	CA930A-California Botanic Garden (Formerly RSABG)	BLM
CO130	CO130-Grand Junction Field Office	BLM
CO150	CO150-Uncompaghre Field Office	BLM
DAK930	DAK930 - Homer SWCD	BLM
DAZ00	DAZ00-DOI Tuscon, Ecoregion 81	NPS
DAZ01	DAZ01-DOI Flagstaff, Ecoregion 22/23	NPS
DAZ02	DAZ02-DOI Grand Canyon NP	NPS
DAZ03	DAZ03-DOI Patagonia, Ecoregion 79	NPS
DCA00	DCA00-DOI Central CA	NPS
DCA01	DCA01-DOI Northern CA	NPS
DCA02	DCA02-DOI Coastal/Southern CA	NPS
DCA03	DCA03-DOI Mojave, CA	NPS
DCA04	DCA04-DOI Sierra, CA	NPS

FWS0406	FWS0406-Caribbean ES Field Office, West Puerto Rico	USFWS
FWS0500	FWS0500-NWRS Region 5, Native Plant Trust 1	USFWS
FWS0501	FWS0501-NWRS Region 5, Native Plant Trust 2	USFWS
FWS0502	FWS0502-NWRS Region 5, MARSB	USFWS
FWS0800	FWS0800-Reno Fish and Wildlife Office	USFWS
MD1	MD1-Mojave Desert Native Plant Program	BLM
MT050	MT050-Dillon FO	BLM
MT100	MT100-Missoula FO	BLM
MT092	MT092-Glasgow FO	BLM
MT923	MT923-Montana/Dakotas State Office	BLM
MT923A	MT923A-Montana Conservation Corps	BLM
NM080	NM080-Carlsbad Field Office	BLM
NM930	NM930-New Mexico State Office	BLM
NPAK00	NPAK00- AK SOS - NPS	NPS
NPAK01	NPAK01-AK Terrestrial Weeds - NPS	NPS
NPAK02	NPAK02-AK Aquatic -NPS	NPS
NPCA00	NPCA00-Central California - NPS	NPS
NPCA01	NPCA01 -Northern California - NPS	NPS

DCO00	DCO00-DOI Rocky Mountain NP	NPS
DCO01	DCO01-DOI Trinidad, Ecoregion 21	NPS
DCO02	DCO02-DOI Grand Junction, Ecoregion 18/20	NPS
DFWS0407	DFWS0407-DOI Georgia, State Botanical Garden of Georgia	USFWS
DFWS0801	DFWS0801-DOI Stillwater Wildlife Refuge, Carson District, and Battle Mountain District. Fallon, NV	USFWS
DHI00	DHI00-DOI Hawaii	NPS
DID00	DID00-DOI Idaho, Minidoka	NPS
DID100	DID100-DOI Boise District Office	NPS
DMT00	DMT00-DOI West Montana, Ecoregion 17/41	NPS
DMT01	DMT01-DOI East Montana, Ecoregion 42/43	NPS
DNM00	DNM00-DOI Las Cruces SW, Ecoregion 24	NPS
DNM01	DNM01-DOI Las Cruces NE, Ecoregion 24	NPS
DNM02	DNM02-DOI Farmington, Ecoregion 20/22	NPS
DNPNV00	DNPNV00- DOI Ely Field Office, Great Basin NP, Nevada	USFWS
DNV010	DNV010-DOI Elko Field Office	USFWS

NPCA02	NPCA02-Coastal/Southern CA - NPS	NPS
NPCA03	NPCA03-Mojave - NPS	NPS
NPCA04	NPCA04-Sierra -NPS	NPS
NPCO00	NPCO00-Northern Rockies IPMT -NPS	NPS
NPID00	NPID00-Idaho - NPS	NPS
NPMI00	NPMI00-Sleeping Bear Dunes, MI -NPS	NPS
NPMT00	NPMT00-Big Hole, MT -NPS	NPS
NPNM00	NPNM00-Carlsbad - NPS	NPS
NPSD00	NPSD00-Dakotas and Nebraska -NPS	NPS
NV030	NV030-Carson City Field Office	BLM
NV052	NV052-Las Vegas Field Office	BLM
OR090B	OR090B-NWO District - IAE contract	BLM
OR010	OR010-Lakeview District Office	BLM
OR110	OR110-Medford District Office	BLM
OR930A	OR930A-OSU Collections - BLM lands	BLM

DNV020	DNV020- DOI Winnemucca District Office	USFWS
DNV040	DNV040-DOI Ely District Office	USFWS
DNV060	DNV060 -DOI Battle Mountain Field Office	USFWS
DOR020	DOR020-DOI Burns District Office	USFWS
DUT00	DUT00-DOI Hurricane-Southwest, Ecoregion 20	NPS
DUT020	DUT020-DOI West Desert District	NPS
DUT03	DUT03-DOI Hurricane-Central, Ecoregion 20	NPS

UT030	UT030-Grand Staircase-Escalante National Monument	BLM
UT040	UT040-Cedar City Field Office	BLM
UT060	UT060-Moab Field Office	BLM
UT070	UT070-Price Field Office	BLM
UT080	UT080-Vernal Field Office	BLM
WY930	WY930-Wyoming State Office	BLM
WY930A	WY930-Contractor WY State Office	BLM

Appendix I. CPC National Collection of Endangered Plants

Seeds of Success does not collect seeds from threatened or endangered species. The SOS Technical Protocol is designed for the sustainable collection of common ‘work-horse’ species that can be used in restoration projects.

The Center for Plant Conservation's (CPC) National Collection of Endangered Plants contains plant material for more than 2,000 of the country's most imperiled native plants. Seeds, cuttings, and other plant material are collected and carefully maintained by botanical institutions that participate in the CPC. Researchers and botanists at each participating institution collect plant material and seeds from the most imperiled plants in their regions. The institutions study and hold this material in protective custody. An important conservation resource, the CPC National Collection is a backup in case a species becomes extinct or no longer reproduces in the wild. The Collection is also an important resource for the scientific study of plant rarity, rare plant life cycles, and rare plant storage and germination requirements.

After studying and growing the plants, institutions provide plant material to federal and state agencies and private land managing organizations to assist their efforts to recover imperiled plants in the wild. CPC participating institutions are involved in restoring more than 60 of America’s rarest plants in their natural habitat.

More information about the Center for Plant Conservation is available online at <https://saveplants.org/>

For more information contact:
Center for Plant Conservation, info@saveplants.org, (760) 796-5686.

Appendix J. References

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Appendix K. Glossary

**Denotes a required field on the SOS Field Data Form.*

Accession Number – A number representing a unique germplasm or collection and associated with a Seed Collection Reference Code or field number. This number is consecutive and never to be reused. Collections made in different growing seasons from the same population are unique accessions or collections, assigned unique seed collection reference numbers. Example: CO932-5. See also **Seed Collection Reference Number** for the accession number format required for SOS.

Alt. Collection Number – Alternate collection numbers are secondary identification number representing a code assigned by another institution – they are *not* required for the SOS National Office. They may represent another organization or individual involved in the collection, a batch number or other numbering system previously employed by the current institution. E.g., MSB378585, CH-101, or 2014-16.

Agency Coordinator – The SOS coordinator for the BLM, NPS, or USFWS that is the primary point of contact for a collection team for the season. You will send this person all end of year reporting data and attend the breakout session they lead during the monthly collector calls.

***Area Sampled** – In acres, the size of the area in which the collection was made. Since collections should ideally be made from the entire population, this number should be very close to the actual population size, in acres.

***Area within Subunit** - The geographic area where this collection was made. Geographic areas are physical or logical areas that transcend the geopolitical areas defined in the State, County, Subunit fields. These may include mountain ranges, river valleys, trail names, etc. e.g., Marigold Trail, Red Rocks Canyon, or Maroon Bells.

***Aspect** – The cardinal direction of the slope where the collection was made. Measure using a compass. E.g., NW.

***Associated Species** – List the scientific name for all plants found coexisting with the collected species, ideally at least five for SOS.

***Collector Code** - BLM field office or institutional code assigned to your collection team. These are assigned by the SOS National Coordinating Office. E.g., AK930, NCBG or CP2.

***Collector Name(s)** – All active participants participating in seed collection. Collectors' name should be entered as last name, first initial. Example: Dawson, C., Howard, M., Haidet, M.

***Collection Number** - The collection number is the sequential, unique, number assigned to a given collection. This number is the second part of the seed collection reference number.

***Common Name(s)** – The vernacular or trade name(s) of the collected species. Common names should be lower case, except for proper nouns within the name. E.g., blue grass, Iowa tall grass, and creeping Jenny.

***County** – The county the collection was made.

Cut Test – A test performed by splitting seeds in half to determine the viability of a potential collection. Immature seeds are usually green, and seeds ripe for collecting are usually brown with a notable live embryo. A cut test can be used to estimate the number of healthy seeds per fruit.

***Date(s) Collected** – Enter up to two dates a collection was made from the same population. Use MM/DD/YY format. Collections made in different growing seasons from the same population are unique accessions or collections, assigned unique seed collection reference numbers (see *Recollection*). E.g., August 4, 2021 is recorded as 08/04/2021.

Date Range - If the collection dates span more than two dates, utilize this field in the web portal, which is a free text box. Enter the range of dates, or the individual dates. Use MM/DD/YY format and separate multiple dates with a comma. For example, if the collection took place on August 4th, 5th, 7th, and 9th, 2021, then enter the first two dates in the first two fields, and then “08/07/2021, 08/09/2021” in the “Date range” field.

***Ecoregion** – Ecoregions denote areas within which ecosystems (and the type, quality, and quantity of environmental resources) are generally similar. The SOS standard is to use Omernik Level III and IV Ecoregions (<https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>).

***Elevation** – Distance above or below sea level. If necessary, indicate a range, e.g., 1200-1400 feet.

Estimate the number of healthy seeds per fruit – After performing a cut test, calculate the number of seeds ripe for collection per fruit.

Estimate the number of healthy fruits per plant – This number will yield an approximation of how many plants in the population need to be sampled to reach the ideal sample size of more than 10,000 healthy seeds.

Evidence of disturbance or damage – Any manipulations made to the collection site. Most collections should be made on sites falling under ‘No Damage.’

***Family** – The family to which the collection belongs.

***Genus** – The genus to which the collection belongs.

***Geology** – The mineral structure of the collection site, either a formation type or specific rock which makes up the parent material. E.g., granite, limestone, or sandstone. If you are unable to recognize the parent material, reference the soil map for the location at <https://websoilsurvey.sc.egov.usda.gov>

***GPS Datum** – GPS device setting, when using GPS with a map, make sure both tools match. The SOS standard is NAD83.

***Habitat Type** – Description of the collection site as a plant community or ecosystem. Example: oak savanna, prairie, sagebrush steppe. Ecological site descriptions and national vegetation classifications are also accepted for this field on the SOS data form.

***Identified by** – The name and organization of the botanist or plant specialist who identified the taxa of the collection.

Infraspecific Rank – The term preceding the infraspecific epithet. E.g., ssp. (subspecies), var. (variety), or subvar. (subvariety).

Infraspecific Epithet – The taxonomic designation below the species level to which the collection belongs, part of the scientific name. Example: *multiflora* in *Brickellia longifolia* var. *multiflora*.

***Landform** – Description of local topography. E.g., mountain, hill, alluvial fan, flat, etc. A selection of landforms and their definitions is available on blm.gov/sos.

***Landowner** – This should reflect the public agency or municipality that is responsible for the land on which the collection was made. Omit private individuals' names. You **MUST** keep written permission on file in your office if a collection was made on private land or land other than BLM. E.g., USFWS.

***Land Use** – How the land is used by humans. E.g., mining, recreation, grazing, conservation.

***Latitude** – Direction from the equator (N/S), degree, minute, and second.

***Location Details** – The locality of the collection site, including driving and hiking directions from some recognizable point to the collection site. Be detailed enough that someone can retrace the location details and find the population using cardinal directions, mileage, and permanent landmarks. E.g., Starting at the intersection of Fifth St and Cole Ave, head SW on Fifth St towards Albert St. and turn right onto Albert St. In 6 miles slight right east onto Coffee Pot Rd E. In 5.4 miles turn S (right) to Coffee Pot Recreation area and continue for 3 miles. The population primarily lines the road just after the cattle guard and is off to the right when facing the lake.

***Longitude** – Direction from the Prime Meridian (E/W), degree, minute, and second.

Long-term storage portion - The first 3,00 seeds from any SOS collections are stored in long-term storage conditions for conservation purposes with the USDA-ARS.

***NRCS PLANTS Code** – A code system for recording plant names in the United States is used in the USDA NRCS PLANTS Database. Plant species "symbols," as they're called, are comprised of the first two letters of the genus, followed by the first two letters of the species, the first single letter of the variety name (if present), and sometimes a tie-breaking number. See <http://plants.usda.gov/> and query the scientific name to find the unique code.

***Modifying Factors** – Any event that has altered the collection site, such as burning, grazing, or seeding. If a modifying factor results in a cultivated population, the population can no longer be considered for collection. However, naturally occurring populations within a seeded area may be considered as suitable collection populations.

Native Plant Materials Development Process – The interagency process developed by the BLM which works to develop a reliable, stable crop of high-quality native seeds and seedlings from wild collected species for restoration, rehabilitation, and reclamation.

Natural Dispersal Stage – The point in the population’s growing cycle where seeds would be distributed without human interference. The best stage at which to collect seed.

***Non-BLM Permission Filed** – Permission is needed to collect on all private and public lands. Written permission should be kept on file for all collections. Indicate “yes” that permission is filed.

***No. Plants Found** – Total number of plants living at the collection site; this number includes those plants whose seeds are not ripe for collection on the day of collection.

***No. Plants Sampled** – Number of plants seed was collected from. There should be a minimum of 50 plants sampled, and the number should be exact, *not* an average or range.

Operational Collection – A seed collection made following the SOS Protocol that is over 80,000 estimated PLS (weight can vary). The purpose of these collections is for restoration, particularly for increasing through a grow-out.

Organization – On the collection form, this refers to the federal agency associated with the team organization and seed use. E.g. BLM, NPS, USFWS, DOI.

Photograph Reference – Use the following naming convention to document each of the three digital images taken with for every collection: PLANTS Code_Collection Number_Letter. Example: Photos for Chicago Botanic Garden’s collection of *Symphyotrichum lanceolatum* are named SYLA6_CBG-419_A.jpg, SYLA6_CBG-419_B.jpg, SYLA6_CBG-419_C.jpg.

Plant Habit – The way the collected species grows. E.g., tree, shrub, forb, succulent, or grass/grasslike.

***Plant Height** – Distance from the ground to the top of the plant in feet and inches. This number should be an average of the population.

PLS – Pure live seed. The number of viable seeds in a collection.

Population – A group of individuals living within the same collection site, continuous in range and generally uniform in appearance; one accession or collection. Geographic features such as roads, ridges, and rivers inhibit gene flow between populations, and thus are useful indicators of separate populations.

Readiness of Population – The ripeness of the population on collection day; collections should be made when the population is closest to natural dispersal stage.

Recollection – A seed collection made from a population that has previously been collected from following the SOS Protocol.

***Seed Collection Reference Number** – Collector code, BLM field office or institutional code, followed by collection number, a consecutive and chronological number representing the unique collection or accession, never to be reused. See *Accession Number*. Example: CA170-42, OR110-347 or CBG-2481.

***Seed Collected From** – Choose from the following: plant, ground, both. The best

collections are made from plants.

Seed Transfer Zones – There are many different seed transfer zones, all which are used to determine the where seeds can be moved and sourced within a region. All SOS collections in the lower 48 have a Provisional Seed Zone associated with them. Depending on the geographic area and species, there may be additional zones to narrow the area based on additional further research.

- **Provisional Seed Zone** – An area defined by annual temperature and aridity, which is used as a general guideline to determine where seeds can be moved and sourced within a region. Source: Bower et al. Provisional Seed Zones (<https://www.fs.usda.gov/wwetac/seedzoneGISdata.php>)
- **Eastern States Seed Zone** – Seed transfer zones specific to eastern states. Eastern States Seed Transfer Zones created by Carolyn Pike et al. (Pike, Carolyn; Potter, Kevin M; Berrang, Paul; Crane, Barbara; Baggs, Joanne; Leites, Laura; Luther, Tom. 2020. New Seed-Collection Zones for the Eastern United States: The Eastern Seed Zone Forum. *Journal of Forestry*. 9(2): 271-. <https://doi.org/10.1093/jofore/fvaa013>.)
- **Desert Southwest Seed Zone** – Seed transfer zones specific to the desert southwest. Shyrock et al. Desert Southwest Provisional Seed Zones. Source: <https://www.fs.usda.gov/wwetac/seedzoneGISdata.php>
- **Empirical Seed Zones** - Includes Climate Matched, Common Garden, and Landscape Genetic Seed Zones for specific species: Basin wildrye (*Leymus cinereus*), Blue grama (*Bouteloua gracilis*), Blue wildrye (*Elymus glaucus*), Bluebunch wheatgrass (*Pseudoroegneria spicata*), Bottlebrush Squirreltail (*Elymus elymoides*), Desert globemallow (*Sphaeralcea ambigua*), Hoary tansyaster (*Machaeranthera canescens*), Indian ricegrass (*Achnatherum hymenoides*), James' galleta (*Pleuraphis jamesii*), Mountain Brome (*Bromus carinatus*), Mtn. Big Sagebrush (*Artemisia tridentata* ssp *vaseyana*), Nevada ephedra (*Ephedra nevadensis*), Oceanspray (*Holodiscus discolor*), Prairie junegrass (*Koeleria macrantha*), Rocky Mountain beplant (*Cleome serrulata*), Rushy milkvetch (*Astragalus lonchocarpus*), Sand dropseed (*Sporobolus cryptandrus*), Sandberg's bluegrass (*Poa secunda*), Showy goldeneye (*Heliomeris multiflora*), Small-leaf globemallow (*Sphaeralcea parvifolia*), Sulfur-flower buckwheat (*Eriogonum umbellatum*), Tapertip onion (*Allium acuminatum*), Thurber's needlegrass (*Achnatherum thurberianum*), WY Big Sagebrush/Big Sagebrush (*Artemisia tridentata* ssp *wyomingensis* and ssp *tridentata*), Yellow spiderflower/Yellow beplant (*Cleome lutea*). Source: <https://www.fs.usda.gov/wwetac/seedzoneGISdata.php>

Short-term storage portion – The seed remaining in a collection after the long-term storage portion has been removed. These seeds are kept in short-term storage conditions by the Bend Seed Extractory or other facility until requested. The original collecting team has right of first use or can make seed available for other SOS partners for native plant materials development projects.

***Slope** – The degree of steepness at the collection site; record a number representing the degree of slope 0-90 measured with a clinometer. E.g., 30 degrees.

***Soil Color** – Refer to the Munsell Soil Color Chart and document color using the code and descriptive name. E.g., 7.5 YR 3/3 “dark brown”.

***Soil Texture** – Describes the soil at the collection site with the following terms: clay, silt, and sand etc. Soil texture is best estimated by rolling a sample of soil between your finger and thumb.

***Source Used** – The source used to obtain the lat/long coordinates for the collection site. E.g., gps, map, other.

***Species** – The species to which the collection belongs.

Standard Collection – A seed collection made following the SOS Protocol that is under 80,000 PLS. All SOS collections are for restoration purposes.

***State** – The state in which the collection was made.

Sub-Populations – A cluster of individuals that are divided from the main population either physically or in appearance.

***Subspecies** – See *Infraspecific Rank*.

***Subunit** – The descriptive name of the area given to it by the landowner or land manager. This may include the city, town, village, park, forest, or refuge in which the material was collected. E.g., Blue Mountains, Antelope Island State Park, Ridgecrest Field Office, Phoenix.

***Variety** – See *Infraspecific Rank*.

Viability Equation – The equation used to determine whether only collecting 20% of the healthy seeds available on a given day will result in a collection greater than 10,000 seeds.

$$\begin{aligned} & (\# \text{ of viable seeds per fruit}) * (\# \text{ fruits per plant}) * (\# \text{ of plants in the population}) * 0.2 \\ & = \\ & >10,000 \text{ seeds} \end{aligned}$$

Appendix L. Device Specs for Digital Data Collection

Many different devices can be used with the SOS digital data collection platform if they meet the following specifications:

- Minimum storage space is 128 GB. Maps, data, apps and other crew resources tend to eat up a significant amount of this space, so we recommend opting for more storage space on the device itself.
- Device **MUST** be a Wi-Fi + Cellular model (network provider doesn't matter). This is required for the device GPS to work. Wi-Fi only devices do not have a GPS chip. **The device does not have to have an active cellular plan**, though it can be helpful for troubleshooting in the field. Crews should be able to download all that they need in the office or somewhere with Wi-Fi connection.
- A waterproof case, heavy duty straps, and battery pack are **HIGHLY** recommended for all devices.
- You can also purchase USB type devices to back up tablet data if you are going to be in remote areas for an extended amount of time.

Below is a list of BLM recommended devices from FY 2021, there is not a more up-to-date list. As long as the device meets the requirements above, **it does not have to be from this BLM list**. The list has a variety of devices, so you could investigate the most current models of those listed. It is purely for illustrative purposes.

Mobile device models approved for purchasing for field data collection by the national BLM GIS Programs (FY21)

1. Samsung Galaxy S21 (Phone)
2. Samsung Galaxy S21+ (Phone)
3. Samsung Galaxy Note20 (Phone)
4. Samsung Galaxy Note20 Ultra (Phone)
5. Samsung Galaxy Tab A 8" 2019 (Tablet)
6. Samsung Galaxy Tab A 10" 2019 (Tablet)
7. Samsung Tab Active 3 8" (Ruggedized Tablet)
8. Samsung Tab Active Pro 10" (Ruggedized Tablet)*
9. Samsung Tab S7 (11") (Tablet)
10. Samsung Tab S7+ (12.4") (Tablet)
11. Samsung XCover Pro 6.3" (Ruggedized Phone)
12. Apple iPhone 11 2019
13. Apple iPad Air 2019 (GPS chip in 4G model only)**
14. Apple iPad Mini Gen 5 (GPS chip in 4G model only)**

Appendix M. End of Season Checklist

***A copy of this checklist is also available to download from the SOS website

General

- Each collection has 3 photos, one of the seed, one of the plant, and one of the landscape.
- Each collection has 3 herbarium specimens.
- Each collection has a Field Data Form (and scouting form if collecting with digital data tools) that has all the required fields filled out.
- Each collection's seeds are accounted for, have been treated with a No-Pest Strips, are securely packaged, and labeled.
- Seed treatment protocols differ by agency. See section 13 in the SOS Technical Protocol for guidance.

Data Submission – All due by December 15th. Submit all end of season reporting when everything is finished for the season your Agency Coordinator.

- Each collection has been entered in the SOS web portal or reviewed in the GeoPlatform Data Management dashboards.
- Photos are correctly labeled (PLANTS Code_Seed Collection Reference Number_Picture Number; e.g., SYLA6_CA180-419_A.jpg)
- Location data is deleted from the photos. Follow instructions on the “Taking Quality Photos” help document.
- If photos are missing at the end of the season, make a note at the top of your annual report. See Appendix E of the SOS Technical Protocol for an example.
- Data forms are correctly labeled with the SOS Seed Collection Reference Number and are saved as individual PDFs or Word documents rather than one large file.
- Photos and data forms for all collections have been emailed to your Agency Coordinator as either zipped attachments or via a Google Drive link. They are not in subfolders.
- Permits/permissions for all collections made on ALL non-BLM lands are emailed to your Agency Coordinator
- An annual report has been submitted to your Agency Coordinator, according to the annual report template found on the SOS website.
- Local copies of the data forms, photos, permit, and annual report are saved at your organization/ Field Office

Seed Shipping

- Ensure you are shipping to your designated cleaning facility.
- All NON-SOS seed should have “NON-SOS” Written on the outside of the box.
- Bags are sealed securely, including corners and any other weak points, and pass the “shake test” meaning no seeds escape when the bag is shaken.
- Bags are labeled with the SOS Seed Collection Reference Number and species.
- If there are multiple bags for a single collection, they are labeled 1 of 3, 2 of 3, etc.
- Bags are placed in a box with their associated Field Data Form(s).
- Boxes are sealed securely and have the correct mailing address.
- Boxes are mailed early in the week rather than on a Thursday or Friday.
- Fill out the Seed Tracking Form on either your tablet or the Geoplatform. If your team is not using the Seed Tracking Form. Email the SOS National Curator with the collection number, species, and the cleaning facility.
- The SOS National Curator has been notified via email when the last boxes of seeds for your collecting team have been shipped for the year.
- Any Clearance Forms have been emailed to your Agency Coordinator by January 30th.

Herbarium Vouchers

- **One voucher per collection has been prepared following the “Guide to Herbarium Specimens for SOS” on the SOS website, including labels and notice of transmittal, and has been mailed to the U.S. National Herbarium (Smithsonian). The bottom line of the label “Collected Under the Auspices of...” has the appropriate government agency.
 - **NPS SOS Teams – hold onto third voucher for Smithsonian. Create herbarium label/notice of transmittal for each collection and file with office copy. Vouchers will be sent at a later date.
 - DOI teams collecting vouchers from NPS lands may send those vouchers to the Smithsonian. Use the

BLM herbarium label template.

- One voucher is kept at the local Field Office/local organization.
- One voucher has been sent to a regional herbarium (see list of herbaria in Appendix F of the SOS Protocol)

Note: There may be additional end of season duties or requirements requested by the SOS National Curator, your Agency Coordinator, your organization, or contract.