

SEEDS



OF SUCCESS

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

for

SEEDS OF SUCCESS

(Updated March 12, 2012)

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1. Introduction

This protocol outlines the procedures for making seed collections for *Seeds of Success*, part of the national Native Plant Materials Development Program. The purpose of the *Seeds of Success* program in the United States is to establish a national, high quality, accurately identified and well documented native plant species seed collection. All seed collections made following this protocol can be used to support development of geographically appropriate native plant materials for restoration and emergency fire rehabilitation. Each seed collection should comprise of a significant representation of the genetic variation within the sampled population. The national collection acts as the basis for off site (*ex situ*) conservation and, where and when appropriate, can be used for study and multiplication in the native plant materials development program.

1a. Program History

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 collection teams in the United States for *Seeds of Success*. 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; and the Zoological Society of San Diego. Today there are more than 65 collection teams; this group plus the cleaning, storage and funding organizations is collectively referred to as the SOS Partners.

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 making one seed collection for each of the species on the Kew list, SOS shifted its collection strategy to making multiple collections of restoration and rehabilitation species to have genetically representative seed from across their range.

In June of 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.nps.gov/plants/sos>).

1b. Program Goals

The goal of SOS is to provide wild collected seeds to researchers for common garden studies and other native plant materials development projects within the national Native Plant Materials Development Program. The goal of the Native Plant Materials Development Program, 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.” The Seeds of Success

collection program is the first step in this process of developing native plant materials.

During Phase 1 of the Millennium Seed Bank Project (2001-2010), there was a goal of collecting 10% of the world's flora. With SOS as the U.S. partner, MSB was able to reach this goal.

Estimates have shown that between 10 and 20 collections of a single species, across its range, are needed to develop genetically appropriate ecotypes, thus this is a collection goal for each species collected by SOS. Processing and storage partnerships have been formed to achieve the program's goal of native plant materials development so that SOS collectors can make collections throughout the range of targeted species.

2. Training, Communication, and Annual Reporting

2a. Training

It is extremely important that groups and individuals 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

The training course, "Seed Collection for Restoration and Conservation" has been developed to provide comprehensive training for SOS seed collection partners.

Before starting an SOS team, or making SOS collections, it is highly recommended that at least one lead botanist (all team members are welcome) participate in the training course. If you are founding a SOS team and need to train a collection team, contact the National Coordinating Office for more information.

2b. Communication

SOS has three primary means of communication between the National Coordinating Office, collectors and other partners. These include the SOS website, SOS listserv and monthly Collectors' Call.

Web: The website may be viewed at <http://www.nps.gov/plants/sos> and includes information about targeted species, collection guidance, training materials and contact information.

List: SOS has an email list for discussing the Seeds of Success program. You must be subscribed to the list in order 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, 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 in order to confirm your subscription. After you confirm your subscription, another e-mail will be sent with instructions on how to use the list.

Call: On the first Tuesday of every month, collectors are invited to participate in the Collectors' Call, a conference call for all SOS Partners. This is a forum for discussion to raise issues and questions with other collectors and the National Coordinating Office. The conference call number cannot be posted on the website; contact the National Coordinating Office for details and to submit agenda items. Reminders, cancellations, and agendas will be posted to the SOS email list.

Collectors' Call Time

12 noon – EST	10 am – MST
11 am – CST	9 am – PST
8 am – AKST	

2c. Annual Reporting

When each collecting team has finished for the season, they must complete an annual report. A template and example 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, collections, difficulties and highlights, as well as improvements to be made for the upcoming year. This report is to be submitted to the SOS National Coordinating Office. Additional comments may be submitted to the National Coordinating Office at anytime throughout the year.

3. Target Species

Initially, collections sent to the Millennium Seed Bank (MSB) at Royal Botanic Gardens, Kew included only one collection per species. These species were on the “Kew list.” Today, the collection focus of the SOS program is on species needed for restoration and rehabilitation projects, also called the “restoration list.” Species from both lists may be collected as long as they contribute to SOS programmatic goals. Teams may make multiple collections of species on their restoration target list as long as they are capturing unique populations in each collection.

Collecting teams are encouraged to work with local federal land managers to develop and execute priority target lists. Projects using SOS seed may include emergency fire rehabilitation and restoration, waterway stabilization, landfill and corporate land recovery, wildlife habitat, threatened and endangered species habitat, and roadside revegetation. Thus we collect primarily common native workhorse species appropriate for restoration and stabilization.

In addition, BLM is continually identifying species of priority restoration value needed for native plant materials development. Teams collecting for BLM should work with their BLM colleagues to ensure that collections are being made of these high priority species.

Today with a goal of making 20 collections across the range of a species, researchers need to

develop seed transfer zones for restoration species. Each team should be working from a regional restoration target list. Regional restoration target lists should be compiled by federal land managers, native plant materials development and conservation researchers, and any other native plant stakeholders.

Target species lists should be developed at the ecoregional level by SOS partners and the National Coordination Office. SOS currently uses Omernik Level III Ecoregions for seed collections' ecoregional distinction.

Seeds of Success manages target species information on a website hosted by the *Plant Conservation Alliance* (PCA) at <http://www.nps.gov/plants/sos>. Ecoregional lists of species using Omernik Level III Ecoregions are accessible on the web to assist collectors in choosing target species. Information on target species that were assigned to collecting groups for the MSB project are also available on the web. These targeting lists track which SOS collecting groups are making restoration collections for the different species.

All collectors should coordinate with the SOS National Coordinating Office to develop regional restoration target lists. This is best done via e-mail to the National Coordinating Office. You may also contact the National Coordinating Office to request a subset of data, which can aid in compiling a unique target list and building on existing collections.

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 CPC network collection. (See **Appendix 8**) 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, or 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 species in the genus *Vitis*.
- All known recalcitrant seeds.

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

5. Storage and Distribution

Collections are cleaned, tested, and processed at a number of different facilities. Since 2003, BLM collecting teams have their seed cleaned by the U.S. Department of Agriculture, Forest Service Bend Seed Extractory while most non-federal partners clean their own seed.

Long-term and working collection needs are being met by the U.S. Department of Agriculture, Agricultural Research Service. The National Center for Genetic Resources Preservation (NCGRP) in Fort Collins, Colorado is managing long-term collections, and the Western Regional Plant Introduction Station (WRPIS) in Pullman, WA is maintaining both long-term and working collections for distribution to researchers working on native plant materials development related topics.

WRPIS serves as the processing center for Seeds of Success collections entering the National Plant Germplasm System (NPGS). WRPIS has partnered with the Bureau of Land Management, Kew Millennium Seed Bank, and other Plant Conservation Alliance members for collection and conservation of native plant species in the United States. Although MSB Phase 1 has been completed, germplasm collection continues under the SOS program. WRPIS receives a portion, typically 10,000 seed, from each SOS collection cleaned at the USDA Forest Service Bend Seed Extractory.

Accessions are sub-divided for -20°C back-up storage at the WRPIS in Pullman and the NCGRP in Fort Collins (Table 1). If seed quantity is sufficient, a distribution component is included in the 4°C working collection as outlined below.

Table 1. Seeds of Success (SOS) germplasm proportioning for long-term back-up and working collection samples.

SOS accession seed quantity	Ratio to long-term storage at NCGRP - 20°C	Ratio to long-term storage at WRPIS - 20°C	Ratio to working collection 4°C
<6,000	1/2	1/2	0
6,000 - 7,500	2/5	2/5	1/5
7,500 – 30,000	1/3	1/3	1/3
30,000+	2/5	2/5	1/5

6. Permission to Collect

Permission is required for all seed collected for the Seeds of Success program.

6a. Collecting on BLM Lands

Collecting seeds on public land managed by the Bureau of Land Management is categorically excluded 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 6, Appendix 5, Section 5.4 (effective 5/19/92). 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.*

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.

6b. Collecting on Non-BLM Lands

Collection may take place on private lands or lands managed by another federal agency (e.g. Fish and Wildlife Service, USDA Forest Service, and Department of Defense) or state, county or municipal agencies, as long as 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.

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 lead botanists and plant ecologists working at the BLM field office or other partner institutions. **An “ideal” collection will be from a large number of individuals (100+) and will contain more than 10,000 viable seeds.** Collections larger than 20,000 viable seeds are preferred; collections this large maximize the flexibility of the collection and allow for a portion of the collection be held at a second seed bank. Maximizing the use of the collection means that:

- Sufficient seed is available for germination and viability testing
- Samples are available for distribution to users for restoration, education or scientific purposes
- A substantial amount of seed can be 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 identification with the collection of herbarium voucher specimens (see ***Section 10***), and estimate the likely harvesting date and potential seed production. Where populations are suitable and the quality and quantity of seed is adequate, it may be possible to make collections of a number of different species from the same site.

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 with the expectation of seed being transferred to an in-house native plant materials development project, or returned to the collector. Instead, collections of less than 10,000 viable seeds shall be directly transferred to the SOS National Collection.
- Seed development can vary within and between populations of the same species. 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 dispersal period to maximize the genetic diversity of samples. Collections taken from the exact same population may be combined into one accession (seed collection reference number) during a single collecting season. Collectors must ensure that no more than 20% 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 that the material was collected on multiple dates on the SOS field data form.

8. Sampling Strategy

It is important to maximize the number of alleles 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 target species has not been studied, and the capture of rarer alleles would require a markedly increased sample size. Therefore, collectors are advised to sample from a single population with individuals of the target species in excess of 50 individuals,

and to look for populations with larger numbers of plants.

As previously mentioned, between 10 and 20 collections across a species range are needed to establish seed zone guidelines and ecotype for a species. Each of those collections shall be a unique population and contain more than 10,000 seeds.

9. Seed Collection Techniques

All seed collections that are a part of SOS should follow the protocol below.

	Method	Rationale
1.	Assess the target population and confirm that a sufficient number of 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 the majority of 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.	Ensure the highest possible viability at collection and maximize the potential storage life.
4.	Cleaning should be left to the processing staff at the Bend Seed Extractory for federal partners.	Maximize the use of available field time and clean and prepare seeds in controlled laboratory conditions.
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.

	Method	Rationale
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 10,000 to 20,000+ viable seeds. However, collections of all sizes are welcome. The smaller the collection, the less useful it will be.	Enable maximum use and study of the collection. The first 10,000 viable seeds are transferred directly to the SOS National Collection.
10.	The first 10,000 seeds of each collection sent to Bend becomes part of the SOS National Collection. Collections sent to Bend can be cleaned and sent back to collectors if they are needed for native plant materials development research or a re-seeding project. See <i>Section 14</i> for details on requesting material from Bend.	Seed from Bend is then sent to the NCGRP, Ft. Collins, CO for long-term storage and the WRPIS for long-term storage and working collections. Anything over 10,000 can be requested back by the collector or shipped to a partner organization for research and development.
11.	For each collection, estimate the viable seed production per fruit, per individual and per population, and note these on the field data form.	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.
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. Voucher material is essential to enable the accurate identification of seed collections. Vegetative material and close-up photographs can occasionally be used, 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 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 a herbarium sheet.**

Below is a short description of some of the issues plant collectors should be aware of when collecting specimens for the Seeds of Success program.

Herbarium specimens are valuable additional outputs from the collecting program in their own right, and collectors should take three to four representative herbarium specimens for each seed collection made. These specimens can be held at the most appropriate regional, national and international herbaria where they will be available for study or for 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 attend an SOS training session (see *Section 2*). Literature available to consult includes: Bridson and Forman (1992); Radford, Dickison, Massey and Bell (1974); and Ross (1994).

For those species that will not be in bloom during seed collecting time, it is suggested that a 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 (e.g. for the purposes of identification and population monitoring). If a preliminary trip is not made and material for a 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 fertile material would be available.

Below is a short description of some of the issues plant collectors should be aware of when collecting specimens for the *Seeds of Success* program.

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. A specimen that requires more than one sheet is acceptable as long as 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.

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 to be aware of 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 (i.e. pine cones): Inevitably these parts of a specimen and the point of 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. It is encouraged to indicate on the label, presence of bulky fruits and to 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 also 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 prepare accordingly. 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.

Labeling: Labels play a huge role in the significance of a 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 collector and possible determiner of the plant species.

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 determination (family, genus, and species), collection location (as specific as possible), the date of collection, the name of the collector(s), and the collection number. Currently Seeds of Success participants have been including their data sheets with their collections without labels. Although the data sheets are a

valuable resource, a traditional specimen label is the convention and would greatly speed up processing of specimens. **You may find specific labeling instructions on the SOS website.**

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) and 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). 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 (institution) 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.**

You can find a perfect example of herbarium specimen at: <http://botany.si.edu/types/>

Select: Detailed Search

Genus: *Achnatherum*

Species: *wallowaensis*

Click on the image in the right corner to enlarge.

Verification of herbarium voucher specimens can be made by one of the options outlined below.

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 <http://www.plants.usda.gov>. 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. The SOS website provides a tutorial on advanced querying of the USDA PLANTS Database under 'Training.'

11. Field Documentation

Use a copy of the *Field Data Form (Appendix 3)* for each seed collection made and fill out all the data fields. Keep one copy of the completed form for your records and send it whenever you ship seed or vouchers related to the collection. Also, email or send one copy to the SOS National Coordinating Office as soon as possible after the collection has been made to document collection of the species.

11a. Seed Collection Reference Number Format

Seeds of Success collecting teams use the following format to identify their collections. The Seed Collection Reference Number will include two parts: the SOS team code (office mail stop or organization acronym) and collection number; for example, **OR020-26** for the 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. See *Appendix 2* for collector codes and *Appendix 7* for a list of all BLM Field Offices and mail stop codes.

12. Photos

Digital photos of the species being collected should always be taken while in the field. At least three photos should be taken for each collection:

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 picture number (A, B, C, etc):

PLANTS Code_Collection Number_Picture Number

For example Chicago Botanic Garden's collection of *Symphytotrichum lanceolatum* would have photos named the following:

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

Send images to the SOS National Coordinating Office on CD or DVD via FedEx (see *Appendix*

I for the FedEx address).

13. Post-Collection Seed Care

In general, **keep the seed collections in a cool, dry place** prior to sending to the seed extractory. 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. Maintain ventilation around the collections at all times 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.

All teams have specific cleaning and processing arrangements; follow your institution's cleaning agreements and take advantage of the cleaning facilities' expertise and knowledge in cleaning seeds.

Fleshy fruits may require careful handling and partial cleaning. Notify cleaning staff that fleshy material is coming, ship immediately and never on a Friday.

Fleshy fruit shipping options:

- a. Pack the whole fruits in strong plastic bags with as much air as possible. The bags should then be packed in some kind of rigid plastic container. Shipping cold and wet ensures the fruits are not squashed and also do not get too hot and ferment too much during their journey. This method is preferred.
- b. Remove as much flesh from the fruits as possible before transit. This can be done under cool running water using a sieve. The seeds should then be left to air dry *for a little while* before shipping. Dry carefully on material that will not stick to the seeds (do not use newspaper). They should then be packed as dry seeds, i.e. in cloth bags.

If you have any specific questions such as, what "*a little while*" means for the species that you have collected, and to notify seed extractory staff that fleshy fruits are in transit, please contact the seed extractory (*see Section 14b for contact information for the Bend Seed Extractory*).

14. Packaging and Shipping

All collections made for Seeds of Success shall follow the protocol section below for packaging and shipping. Please note there are different instructions for BLM and non-BLM collection teams. If you are a non-BLM team, please double-check your institution's protocol with your manager.

When shipping seed, data sheets and herbarium specimens please remember the following:

- **Senders are responsible for all shipping costs related to seed and voucher transport.**
- **Data sheets shall accompany all seed and herbarium shipments, as well as being sent to the National Coordinating Office for input into the national database.**
- **Most BLM offices shall send seed to the Bend Seed Extractory for cleaning.**
- **Most non-federal partners are responsible for cleaning their own seed.**
- **All Seeds of Success seed shall end up with a portion in long-term storage and another portion available for research and development for native plant materials.**

14a. Packaging of Seed

In general, **it is critical to the successful conservation of the seed that it is sent to the seed extractory within a few days of collection**, together with the completed field data forms.

As often as possible, ship each seed collection in one bag. Make sure that the seed bags are clearly labeled with the unique collection number. The preferred labels are those that can be neatly tied to the neck of the bag with string. This should allow for the bag to be opened and checked while in transit to the seed bank. 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. The following packaging is recommended, either:

- Sturdy cardboard box into which cotton seed bags have been placed
- Woven PVC or nylon air freight sack

Do not use the following for shipping seeds:

- Any non-breathable bags or containers
- Any bags made from plastic or from PVC backed fabric (although you may be instructed to ship fleshy fruits in PVC bags as part of a shipment, see ***Section 13***).

14b. Shipping Seeds for Cleaning (for BLM and federal agencies)

Materials collected for Seeds of Success by BLM employees and interns hosted by BLM offices can be sent to the following address for cleaning:

USDA USFS - Bend Seed Extractory
63095 Deschutes Market Road
Bend, OR 97701
(541) 383-5646
(541) 383-5498 Fax
Contact: Nita Rauch
nrauch@fs.fed.us

Please notify the Bend Seed Extractory that seeds will be shipped and **always send the seeds overnight mail or with FedEx**. 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.

14c. Shipping Seeds for Storage (for non-federal partners that have cleaned seed)

For those collection teams that have the ability to clean their own seed, you may send your seed directly to the Western Regional Plant Introduction Station (WRPIS) in Pullman, WA. Please contact the National Coordinating Office for more information.

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

Herbarium vouchers should be sent to the following locations, along with a notice of transmittal and a copy of the field data sheet. These should be unmounted, labelled and should include the completed field collection data forms. More comprehensive vouchering information can be found in **Section 10** of the Protocol and on the SOS website.

- Voucher 1. U. S. National Herbarium
Smithsonian Institution (MRC-166)
10th and Constitution Ave., NW
Washington, DC 20560
Contact: Andrew Clark
202-633-0943
clarkap@si.edu
- Voucher 2. Regional Herbarium (see **Appendix 6**)
- Voucher 3. Collecting Team's Herbarium

Send all voucher material marked with the seed collection number and a copy of the correlating field data forms. Templates for the notice of transmittal may be found on the SOS website.

14e. Requesting Return of Seed from Bend

The first 10,000 seeds of each collection are taken off the top from each collection and sent to the Western Regional Plant Introduction Station (WRPIS) in Pullman, WA for incorporation into the working and long-term Seeds of Success National Collection. Collectors can request the return of any extra material, above the 10,000 seeds, to be returned to them or a cooperating agency/organization. The SOS Clearance form is the mechanism to have the seed returned.

The SOS Clearance Form (**Appendix 4**) should be filled out completely. The Clearance Form, along with the associated SOS field data forms, should be emailed to the SOS National Coordinating Office who will review the request, and if approved, assign a clearance number and send it to the Bend Seed Extractory.

Following the process outlined above will ensure that Bend will return material to a requested location. If this process is not followed, and a Clearance Form is not filed with the National

Coordinating Office, your seed will remain at Bend and be distributed for long-term storage and research.

Annually, an inventory of the balance of collections greater than 10,000 stored at Bend, that have not requested for return by the collector, will be circulated to national Native Plant Materials Development Program partners. This annual distribution will be managed by the SOS National Coordinating Office. In order for distribution requests to be filled, an explanation of material usage needs to accompany every distribution request.

Appendix 1. Program Contacts: National Coordinating Office

Below are program contacts in the National Coordinating Office of Seeds of Success, located in Washington, DC.

Native Plant Materials Development Program Bureau of Land Management Plant Conservation Program Lead

Peggy Olwell

(For US Postal Service mail)
Bureau of Land Management
1849 C Street NW, Rm 2134LM
Attention: Peggy Olwell
Washington, DC 20240
Tel: 202-912-7273
Email: polwell@blm.gov

(For FedEx or UPS or DHL)
Bureau of Land Management
20 M Street SE, Rm 2134LM
Attention: Peggy Olwell, 5249
Washington, DC 20003

Seeds of Success National Collection Curator Megan Haidet

(For US Postal Service mail)
Bureau of Land Management
1849 C Street NW, Rm 2134LM
Attention: Megan Haidet
Washington, DC 20240
Tel: 202-912-7233
Email: mahaidet@blm.gov

(For FedEx or UPS or DHL)
Bureau of Land Management
20 M Street SE, Rm 2134LM
Attention: Megan Haidet, 5250
Washington, DC 20003

SOS Webmaster

Olivia Kwong

(For US Postal Service mail)
Bureau of Land Management
1849 C Street NW, Rm 2134LM
Attention: Olivia Kwong
Washington, DC 20240
Tel: 202-912-7232
Email: plant@plantconservation.org or
okwong@blm.gov

(For FedEx or UPS or DHL)
Bureau of Land Management
20 M Street SE, Rm 2134LM
Attention: Olivia Kwong, 5251
Washington, DC 20003

Appendix 2. Program Contacts: Seeds of Success Collectors

Coll. Code	BLM Offices	Team Contact	Email	Phone
AK930	Alaska State Office	Eric Geisler	egeisler@blm.gov	907-271-1985
AZ040	Safford Field Office	Jeff Conn	jconn@blm.gov	520-348-4470
AZ100	Arizona Strip District Office	Kahtleen Harcksen	kharckse@blm.gov	435-688-3380
AZ310	Kingman Field Office	Ammon Wilhelm	awilhelm@blm.gov	928-718-3758
AZ320	Yuma Field Office	vacant	vacant	928-317-3200
AZ930	Arizona State Office Desert Botanic Garden	Tim Hughes Matt King	thughes@blm.gov mking@dbg.org	602-417-9356 480-481-8187
AZ932	The Arboretum at Flagstaff	Sheila Murray	sheila.murray@nau.edu	928-774-1442 ext 112
CA160	Bakersfield Field Office	Steve Laymon	slaymon@blm.gov	661-391-6117
CA170	Bishop Field Office	Martin Oliver	mpoliver@blm.gov	760-872-5035
CA180	Mother Lode Field Office (formerly Folsom)	Graciela Hinshaw Harry McQuillen	ghinshaw@blm.gov hmcquill@blm.gov	916-941-3134 916-683-1701
CA190A	Hollister Field Office	Ryan O'Dell	rodell@blm.gov	831-630-5000
CA190B	Hollister Field Office	Bruce Delgado	bdelgado@blm.gov	831-394-8314
CA320	Alturas Field Office	Michael Dolan	mdolan@blm.gov	530-233-7923
CA330	Arcata Field Office	Jennifer Wheeler	jswhee@blm.gov	707-825-2316
CA360	Redding Field Office	Chase Lentz	clentz@blm.gov	530-224-2107
CA370	Surprise Field Office	Scott Soletti	ssoletti@blm.gov	530-279-2824
CA610	California Desert District	vacant	vacant	951-697-5387
CA650	Ridgecrest Field Office	Carrie Woods	cwoods@blm.gov	760-384-5448
CA660	Palm Springs Field Office	Jill Beckmann	jbeckman@blm.gov	760-833-7125
CA690	Needles Field Office	Hanem Abouelezz	habouelezz@blm.gov	760-326-7011
CA930	California State Office	Christina Lund	clund@blm.gov	916-978-4638
CA930A	Rancho Santa Ana Botanical Garden	Naomi Fraga Tommy Stoughton	nfraga@rsabg.org tstoughton@rsabg.org	909-625-8767 909-625-8767 ext. 204
CA930B	Lockeford Plant Materials Center	Annie Young-Matthews	anna.young-matthews@ca.usda.gov	209-727-5319 ext 10
CA930C	Zoological Society of San Diego	Bryan Endress	bendress@sandiegozoo.org	760-291-5486
CO810	Dolores Public Lands Office	Cara MacMillan	caramacmillan@fs.fed.us	970-882-6854
CO932	Colorado State Office	Carol Dawson	cdawson@blm.gov	303-239-3725
ES030, ES933	Eastern States Office	Derek Strohl	dstrohl@blm.gov	414-297-4416
ID310	Shoshone Field Office	Danelle Nance	dnance@blm.gov	208-732-7220
ID931	Idaho State Office	Roger Rosentreter Susan Filkins	rrosentreter@blm.gov sfilkins@blm.gov	208-373-3824 208-373-3815
MT020	Miles City Field Office	Mel Schroeder	mschroed@blm.gov	406-233-2816
MT050	Dillon Field Office	Brian Hockett	bhockett@blm.gov	406-683-8010
MT060	Lewistown Field Office	Vinita Shea	vshea@blm.gov	406-538-1919
MT923	Montana/Dakotas State Office	Wendy Velman	wvelman@blm.gov	406-896-5032
NM930	New Mexico State Office/Southern NM	Mike Howard	mhoward@blm.gov	505-525-4348
NM930N	Farmington District Office/Northern NM	Sheila Williams	slwillia@blm.gov	505-599-6345
NV030	Carson City Field Office	Dean Tonenna	dtonenna@blm.gov	775-885-6189

NV040	Ely Field Office Eastern Nevada Landscape Coalition	Erica Husse Greg Gust	ehusse@blm.gov ggg_enlc@sbcglobal.net	775-289-1828 775-289-7974
NV052	Las Vegas Field Office	Fred Edwards	fsedwards@blm.gov	702-515-5022
NV930	Nevada State Office	Mark Coca	mcoca@blm.gov	775-861-6475
OR010	Lakeview District Office	Brennan Hauk	bhauk@blm.gov	541-947-6156
OR014	Klamath Falls Resource Area	vacant	vacant	541-885-4136
OR020	Burns District Office	Caryn Meinicke	cmeinick@blm.gov	541-573-4517
OR030	Vale District Office	Susan Fritts	sfritts@blm.gov	541-473-6274
OR050	Prineville District Office	JoAnne Armson	jarmson@blm.gov	541-416-6786
OR080	Salem District Office	Claire Hibler	chibler@blm.gov	503-375-5677
OR090	Eugene District Office	Nancy Sawtelle	nsawtell@blm.gov	541-683-6111
OR100	Roseburg District Office	Susan Carter	scarter@blm.gov	541-464-3289
OR110	Medford District Office	Doug Kendig	dkendig@blm.gov	541-261-3605
OR120	Coos Bay District Office	Jennie Sperling	jsperlin@blm.gov	541-756-0100
OR130	Spokane District Office	Molly Boyter	mboyter@blm.gov	509-665-2137
OR134	Wenatchee Resource Area	Molly Boyter	mboyter@blm.gov	509-665-2137
OR930	Univ. of WA Bot. Gardens Oregon State Office	Ellen Kuhlmann Mark Mousseaux	ekuhlman@u.washington.edu mmousseaux@blm.gov	206-616-0780 541-618-2232
OR931	Portland State University (formerly Berry Botanic Garden)	Kris Freitag	kfreitag@pdx.edu	503-725-2468
UT030	Grand Staircase-Escalante National Monument	Amber Hughes	ahughes@blm.gov	435-826-5602
UT080	Vernal Field Office	Maggie Marston	mmarston@blm.gov	435-781-3410
UT933	Utah State Office	Ron Bolander Dustin Rooks	rbolande@blm.gov drooks@blm.gov	801-539-4065 435-644-4327
UT931	Red Butte Bot. Garden	Rita Reisor	rita.reisor@redbutte.utah.edu	801-585-5853
WY010	Worland Field Office	Eve Warren	ewarren@blm.gov	307-347-5109
WY020	Cody Field Office	Destin Harrell	dharrell@blm.gov	307-578-5933
WY030	Rawlins Field Office	Frank Blomquist	fbloomqui@blm.gov	307-328-4207
WY040	Rock Springs Field Office	Jim Glennon	jglennon@blm.gov	307-352-0336
WY050	Lander Field Office	Tim Kramer	tkramer@blm.gov	307-332-8431
WY060	Casper Field Office	Cheryl Mandich	cmandich@blm.gov	307-261-7505
WY070	Buffalo Field Office	Bill Ostheimer	bostheim@blm.gov	307-684-1117
WY080	Newcastle Field Office	Nate West	nwest@blm.gov	307-746-6608
WY090	Kemmerer Field Office	Marion Mahaffey	mmahaffey@blm.gov	307-828-4543
WY100	Pinedale Field Office	Josh Hemenway	jhemeway@blm.gov	307-367-5322
WY930	Wyoming State Office	Adrienne Pilmanis	apilmani@blm.gov	307-775-6035
WY932A	University of Wyoming: Hufford Lab	Kristina Hufford	khufford@uwyo.edu	307-766-5587
WY932B	University of Wyoming: Mealor Lab	Brian Mealor	bmealor@uwyo.edu	307-766-3113
Coll. Code	SOS MOU Signatories	Team Contact	Email	Phone
CBG	Chicago Botanic Garden	Emily Yates Dave Sollenberger	eyates@chicagobotanic.org dsollenberger@chicagobotanic.org	847-835-6861 847-835-6957
LBJWC	Lady Bird Johnson Wildflower Center	Minnette Marr	mmarr@wildflower.org	512-292-0240
NEWFS	New England Wild Flower Society	Bill Brumback	bbrumback@newfs.org	508-877-7630

NYCDPR-BBG	NYC Dept. of Parks & Rec. w/ Brooklyn Botanic Garden	Heather Liljengren	heather.liljengren@parks.nyc.gov	718-370-9044
NCBG	North Carolina Botanical Garden	J.C. Poythress	jpoythre@email.unc.edu	919-962-0522
ZSSD	Zoological Society of San Diego	Bryan Endress	bendress@san Diegozoo.org	760-291-5486
Coll. Code	Other SOS Partners	Team Contact	Email	Phone
CP	Colorado Plateau Native Plant Initiative	Wayne Padgett	wpadgett@blm.gov	801-539-4076
CP1	Landsward Institute, Northern Arizona University	Patty West	patty.west@nau.edu	928-523-0736
GBNPSIP	Great Basin Native Plant Selection and Increase Project	Nancy Shaw	nshaw@fs.fed.us	208-373-4360
LLPMC	Los Lunas Native Plant Materials Center	Greg Fenchel	gregory.fenchel@nm.usda.gov	505-865-4684
RMRS	Rocky Mountain Research Station	Matt Fisk	mfisk@fs.fed.us	208-373-4376
UCBG	University of California Botanical Garden	Barbara Keller	bkeller@berkeley.edu	510-643-8040
USBG	U.S. Botanic Garden	Ray Mims	rmims@aoc.gov	202-226-4067
	Center for Plant Conservation	Anna Strong	anna.strong@mobot.org	314-577-9450
	Bend Seed Extractory	Nita Rauch	nrauch@fs.fed.us	541-383-5646

Appendix 3. BLM *Seeds of Success* Field Data Form

SOS Seed Collection Ref. Number:	<input type="text"/>	Alternate Collection Number:	<input type="text"/>
Date(s) Collected (MM/DD/YY):	<input type="text"/>	NRCS PLANTS Code:	<input type="text"/>
		Cleaning Facility:	<input type="text"/>
Collector(s): <input style="width:100%;" type="text"/>			
Ecoregion (Omernik Level III):	<input type="text"/>	State:	<input type="text"/>
		County:	<input type="text"/>
Location Details: <input style="width:100%; height:40px;" type="text"/>			
Lat. (dg/min/sec) (ex: 40° 34' 19.5" N):	<input type="text"/> N	GPS Used:	<input type="text"/> <i>Yes</i> <input type="text"/> <i>No</i> If no, please see other side.
Long. (dg/min/sec) (ex: 107° 36' 51.54" W):	<input type="text"/> W	GPS Datum:	<input type="text"/> <i>NAD83</i> <input type="text"/> <i>NAD27</i> <input type="text"/> <i>WGS84</i> <input type="text"/> <i>Other:</i>
Elevation (feet):	<input type="text"/>	Landowner:	<input type="text"/>
		Non-BLM Permission Filed:	<input type="text"/>

HABITAT DATA

Associated Species (Scientific Name):	<input style="width:100%; height:40px;" type="text"/>		
Modifying Factors:	<i>Mowed Burned Grazed Flooded Seeded Trampled Other:</i>		
Land Form:	<input type="text"/>	Slope (degrees):	<input type="text"/>
Land Use:	<input type="text"/>	Aspect:	<input type="text"/> <i>N NE E SE S SW W NW</i>
Geology:	<input style="width:100%; height:20px;" type="text"/>		
Soil Texture:	<input type="text"/> <i>Clay Silt Sand Other:</i>	Soil Color:	<input style="width:100%; height:20px;" type="text"/>

COLLECTION DATA

Family:	<input type="text"/>	No. of Plants Sampled (min. 50):	<input type="text"/>
Genus:	<input type="text"/>	No. of Plants Found (approx.):	<input type="text"/>
Species:	<input type="text"/>	Area Sampled (acres):	<input type="text"/>
Subspecies/Variety:	<input type="text"/>	Seeds Collected From:	<input type="text"/> <i>Plants</i> <input type="text"/> <i>Ground</i> <input type="text"/> <i>Both</i>
Plant Habit:	<input type="text"/> <i>Tree</i> <input type="text"/> <i>Shrub</i> <input type="text"/> <i>Forb</i> <input type="text"/> <i>Succulent</i> <input type="text"/> <i>Grass/Grasslike</i>	Plant Height (feet):	<input type="text"/>

Native plant materials development & research this accession will be used for:	<input style="width:100%; height:40px;" type="text"/>
Observational field notes to assist in identification of pressed specimen (e.g. flower color, odor):	<input style="width:100%; height:40px;" type="text"/>
Common Name(s) of Plants:	<input style="width:100%; height:20px;" type="text"/>

Photograph Checklist (at minimum): **Habitat:** **Plant:** **Seed:**

PRE-COLLECTION CHECKLIST

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: 0-50 50-500 500-5000 > 5000

Evidence of disturbance or damage: *Resown* *Burnt* *Sprayed* **No damage**

Readiness of population for collecting: give percentages or circle the most frequently occurring:

Vegetative *In flower* *Immature seeds* **Around natural dispersal** *Post dispersal*

Estimate the number of individual plants at natural dispersal stage: <50 **≥50**

Is the population:

A single population *A population with distinct sub-populations (Can you sample separately or from the most suitable?)*

Assess Seed Quality & Availability

On a typical individual, where on the plant/branch/fruit is the seed at natural dispersal stage: **Recognized**

Using a cut test on the seeds at this stage, give percentages or circle the most frequently occurring:

Healthy *Insect-damaged* *Empty* *Moldy* *Malformed/other damage*

Estimate the number of healthy seeds per fruit:

Estimate the number of fruits per individual plant:

Should Seed Be Collected On This Trip?

Using the above information, if you only collect 20% of the healthy seeds available today, will this result in a collection of **>10,000** healthy seeds?

OTHER LOCATION DATA

If GPS was not used, please state method of obtaining lat. and long.: *Altimeter* *Map* *Google Earth* *Other:*

Map Publisher:

Series:

Scale:

Map Coordinates:

Map Date (MM/DD/YY):

HERBARIUM VOUCHERS

Number of Pressed Specimens: *or more* Date Voucher Was Taken (MM/DD/YY):

An herbarium voucher has been sent to the National Herbarium at the Smithsonian:

The remaining vouchers will be distributed by the collecting team to the following herbaria:

Regional herbarium:

Local herbarium:

SPECIALIST IDENTIFICATION

For collections identified by a specialist, please complete sections below:

Material Identified:

In Field *From Pressed Specimen on Day of Collection*
From Pressed Specimen on Another Date *From Photograph*

Date identified (MM/DD/YY):

Identified by:

Organization:

Appendix 4. Seeds of Success Return Request: Clearance Form

How to Request Seed Back to your Office with the Seeds of Success Clearance Form

*** A word version of this document is available on the SOS website

The first 10,000 seeds of each collection are taken off the top of each collection and sent to the U.S. Forest Service Bend Seed Extractory to be cleaned. They are then sent to Pullman, WA and Ft. Collins, CO for incorporation into the Seeds of Success National Collection. With this form, BLM collectors can request any seed over 10,000 be returned or shipped to a cooperator.

Complete this form and e-mail it to the SOS National Coordinating Office with associated SOS Field Data Forms. The SOS National Office will review the request, if approved assign a clearance number(s), and send the approved clearance form to the Bend Seed Extractory.

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 returned.**

Contact Information

Name: _____ SOS Collecting Team: _____
Email: _____ Phone Number: _____

FedEx Account Number: _____

Return Request

Please return the following collection(s) by (date) _____ to:

Name and Title:

Organization and Office:

Shipping Address:

SOS Seed Collection Reference Number/ Collection Number	Species Name	Clearance Number (assigned by the National Office)

Native Plant Materials Development Project (Please describe how the returned seed will be used, i.e. common garden study, restoration project, academic partnership, etc.)

Please submit the **completed** clearance form to Megan Haidet (MAHaidet@blm.gov).

Appendix 6. Offices and Herbaria Selected to Receive Herbarium Duplicates from the Seeds of Success Program

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
IF >1 Dups.	US National Herbarium, Department of Botany MRC-166 Smithsonian Inst. 10 th and Constitution Ave., NW Washington, DC 20560	US	Andrew Clark 202-633-0943 202-786-2563 f clarkap@si.edu		
AK930	Univ. of AK Anchorage Herbarium 3311 Providence Dr. Anchorage, AK 99508	UAAH	Marilyn Barker 907-786-1324	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	Carolyn Parker 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	Carolyn Parker 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	Dr. Les Landrum 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	Dr. Les Landrum 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

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
CA170	Herbarium Rancho Santa Ana Botanic Garden 1500 N. College Ave. Claremont, CA 91711- 3101	RSA	Steve Boyd 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
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	Carolyn Gibbs 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	Chase Lentz 530-224-2107
CA370	UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008		
CA650	Rancho Santa Ana Botanic Garden	RSA	909-625-8767		
CA690	<i>No reply.</i> Use UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008		
CA930	<i>No reply.</i> Use 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	Tom Ranker 303-492-5074 ranker@stripe.col orado .edu		

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
All CO offices 2ND	University of Wyoming Rocky Mt. Herbarium Dept. of Botany PO Box 3165 Laramie, WY 82071- 3165	RM	Ron Hartman 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	Dr. Mark Simmons 970-491-0496 psimmons@lamar.colostate.edu	Adams State College 208 Edgemont Blvd. Alamosa, CO 81102 5TH	Catherine Kleier 719-587-7767 cckleier@adams.edu
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
ES	No response to memo. North Carolina Botanic Garden will be recommended				
ID070 and other Idaho without info.	Museum of Nat. History Ray D. Davis Herbarium Idaho State University Campus Box 8096 Pocatello, ID 83209	IDS	Karl Holte 208-282-3530		
ID080	Dept. of Biological Sciences Stillinger Herbarium Univ. of Idaho Moscow, ID 83844	ID	Pam Brunfield 208-885-4623		
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 Tom Wendt 512-471-5904 512232-3402 f		
MT030	North Dakota State Univ.. Herbarium Hastings Hall Fargo, ND 58105	NDA	Dr. Lee Manske 701-483-2076	Dickinson Research Ext. Center 1089 State Ave. Dickinson, ND 58601	Dr. William Barker 701-231-7222
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,		

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
MT923	Herbarium Univ. of Montana Missoula, MT 59812- 1002	MONTU	Curator David Dyer 406-243-4743		
MT923	Charles A. Taylor Herbarium Agricultural Hall 320 Dept. of Biology & Microbiology SD State Univ.	SDC	Gary E. Larson, Curator 605-688-4552 605-688-6677 f		
NV052	Nevada State Museum 600 N. Carson St. Carson City, NV 89701	NSMC	George Baumgardner 775-687-4810	Herbarium Dept. of Bio. Sci. Univ. of NV - Las Vegas 4505 Maryland Pkwy Box 454004 Las Vegas, NV 89154- 4004	Dr. Wes Niles 702-895-3098
NV052				BLM Las Vegas FO 4701 N. Torrey Pines Dr. Las Vegas, NV 89130	Gayle Marrs-Smith 702-515-5156
NV030	Herbarium, Environmental and Resource Sci. Dept. Univ. of Nevada 920 Valley Road Reno, NV 89512-0013	RENO	Christy Malone 775-784-1105		
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 Also OR015 to be sent here, but unconfirmed.	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	Douglas Linn 541-573-4478
OR110				Medford BLM Herbaria, 3040 Biddle Rd, Medford, OR 97504	Mark Mousseaux 541-618-2232
OR130	Herbarium Botany Dept. Univ. of Washington Box 355325 Seattle, WA 98195-5325	WTU	Dick Olmstead 206-543-1682 206-685-1728 f	Spokane District Herbarium Wenatchee, WA	Molly Boyter 509-665-2137

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
UT931 (formerly known as RBG)	Stanley L Welsh Herbarium Brigham Young Univ. 378-MLBM Provo, UT 84602	BRY	Duane Atwood 801-378-4955	BLM Utah State Office P.O. Box 45155 Salt Lake City, UT 84145-0155	Ronald Bolander 801-539-4065
UT030				Grand Staircase- Escalante NM 190 E. Center St. Kanab, UT 84741	Amber Hughes 435-826-5600
UT050	Stanley L. Welsh Herbarium Brigham Young Univ. 378 MLBM, BYU Provo, UT 84602	BRY	Duane Atwood 801-378-4955	Utah Valley State College - Herbarium Dept. of Biology Life Sciences 800 W. 1200 S. Orem, UT 84058-5999	Renee VanBuren 801-222-8479 801-222-8695
UT080	Intermountain Herbarium Utah State University 5305 Old Main Hill Logan, UT 84322	UTC	Dr. Mary Barkworth 435-797-1584	Uinta Basin Herbarium BLM 170 S. 500 East Vernal, UT 84078	Maggie Marston 435-781-3410
UT080	Rocky Mt. Herbarium University of Wyoming 3165 University Sta. Laramie, WY 82071	RM	Dr. Ron Hartman 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.edu	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 7. BLM Offices and Mail Stop/Collector Codes

AK020 - Northern Field Office	ID100 - Boise District Office
AK025 - Central Yukon Field Office, Fairbanks District Office	ID120 - Bruneau Field Office
AK040 - Anchorage Field Office	ID110 - Four Rivers Field Office (was ID095)
AK050 - Glenallen District Office	ID130 - Owyhee Field Office (was ID096)
AK930 - Alaska State Office	ID200 - Twin Falls District Office
AZ030 - Kingman Field Office	ID210 - Jarbidge Field Office (was ID097)
AZ010 - Arizona Strip Field Office	ID220 - Burley Field Office (was ID078)
AZ020 - Phoenix Field Office	ID230 - Shoshone Field Office (was ID076)
AZ040 - Safford Field Office	ID300 - Idaho Falls District Office
AZ050 - Yuma Field Office	ID310 - Upper Snake Field Office
AZ060 - Tucson Field Office	ID320 - Pocatello Field Office (was ID075)
AZ061 - San Pedro Project Office	ID330 - Challis Field Office (was ID084)
AZ070 - Lake Havasu Field Office	ID340 - Salmon Field Office (was ID085)
AZ930 - Arizona State Office	ID400 - Coeur d'Alene District Office
CA067 - El Centro Field Office	ID410 - Coeur d'Alene Field Office (was ID086)
CA068 - Barstow Field Office	ID420 - Cottonwood Field Office (was ID087)
CA160 - Bakersfield Field Office	ID930 - Idaho State Office
CA170 - Bishop Field Office	MT010 - Billings Field Office
CA180 - Folsom Field Office	MT020 - Miles City Field Office
CA190 - Hollister Field Office	MT030 - North Dakota Field Office
CA320 - Alturas Field Office	MT040 - South Dakota Field Office
CA330 - Arcata Field Office	MT050 - Dillon Field Office
CA340 - Ukiah Field Office	MT06? - Havre Field Office
CA350 - Eagle Lake Field Office	MT060 - Lewistown Field Office
CA360 - Redding Field Office	MT070 - Butte Field Office
CA370 - Surprise Field Office	MT090 - Malta Field Office
CA610 - California Desert District	MT092 - Glasgow Field Station
CA650 - Ridgecrest Field Office	MT100 - Missoula Field Office
CA660 - Palm Springs-South Coast Field Office	MT923 - Montana/Dakotas State Office
CA690 - Needles Field Office	NM??? - Amarillo Field Office
CA930 - California State Office	NM010 - Albuquerque Field Office
CO100 - Little Snake Field Office	NM011 - Cuba Field Office
CO110 - White River Field Office	NM012 - Grants Field Station
CO120 - Kremmling Field Office	NM018 - Taos Field Office
CO130 - Grand Junction Field Office	NM030 - Las Cruces District Office
CO140 - Glenwood Springs Field Office	NM040 - Tulsa Field Office
CO150 - Uncompahgre Field Office	NM050 - Socorro Field Office
CO160 - Gunnison Field Office	NM060 - Roswell Field Office
CO172 - San Juan Field Office	NM070 - Farmington District Office
CO200 - Royal Gorge Field Office	NM080 - Carlsbad Field Office
CO210 - La Jara Field Office	NM930 - New Mexico State Office
CO220 - Saguache Field Office	NV010 - Elko Field Office
CO932 - Colorado State Office	NV020 - Winnemucca Field Office
ES930 - Eastern States 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 8. 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 National Collection of Endangered Plants contains plant material for more than 600 of the country's most imperiled native plants. An important conservation resource, the National Collection is a backup in case a species becomes extinct or no longer reproduces in the wild.

Seeds, cuttings and other plant material are collected and carefully maintained by botanical institutions that participate in the Center for Plant Conservation. 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 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.

Current information on the National Collection of Endangered Plants is available online at http://www.centerforplantconservation.org/NC_Choice.html

For more information contact: Center for Plant Conservation 314-577-9450.

Appendix 9. References

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