

# 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 July 3, 2008)

## Table of Contents

Table of Contents .....	2
1. Introduction.....	4
1a. Program History .....	4
1b. Program Goals .....	4
2. Training, Resources, and Annual Reporting.....	5
2a. Training .....	5
2b. Resources .....	5
2c. Annual Reporting .....	5
3. Target Species.....	5
4. Storage and Distribution .....	6
5. Identifying Priority Species to Collect.....	6
6. Species Excluded from this Program.....	7
7. Requesting Species for Collection.....	7
8. Permission to Collect.....	8
9. Targeting the Population(s) for Collection .....	9
10. Sampling Strategy.....	10
11. Identification and Herbarium Specimens.....	11
11a. Verification by a local taxonomist .....	12
11b. Verification by Kew Taxonomists for Shipments sent to the Millennium Seed Bank ....	12
11c. Nomenclature .....	13
12. Seed Collection Techniques.....	13
13. Field Documentation & Photos.....	15
14. Seed Collection Reference Number Format & Image Names .....	16
15. Care of Seed Collections after Harvest.....	16
16. Shipping Collections to Kew .....	17
16a. Packaging.....	17
16b. Species Restricted for Shipment to the United Kingdom .....	18
16c. Plant Health.....	18
16d. U.S. Phytosanitary Certificates .....	18
16e. CITES Species .....	19
16f. Arranging Shipment via Air Freight.....	20
16g. Shipment with DHL to RBG, Kew .....	20
Completing a DHL Shipment Airway Bill.....	21
Completing a Shipment Invoice and Notification of Transfer .....	21
16h. Shipment with FedEx to RBG, Kew .....	21
Completing a FedEx Shipment Airway Bill.....	22
Completing a Shipment Invoice and Notification of Transfer .....	23
17. Shipping Seeds to the USDA Forest Service Bend Seed Extractory in Bend, Oregon .....	23
18. Program Contacts.....	25
18a. Main Contacts .....	25
18b. Seeds of Success Collectors Contacts.....	27
18c. Bend Seed Extractory Contacts.....	28
Appendix 1. CPC National Collection of Endangered Plants.....	29
Appendix 2. BLM <i>Seeds of Success</i> Field Data Form .....	30
Appendix 3. Notification of Transfer and Shipping Invoice .....	32
Appendix 4. Letter to Courier Service .....	33

Appendix 5. Offices and Herbaria Selected to Receive Herbarium Duplicates from SOS .....	34
Appendix 6. BLM Offices and Mail Stop/Collector Codes.....	39
Appendix 7. Frequently Asked Questions .....	41
Questions about Species List Assignments.....	41
Questions about Collecting.....	41
Appendix 8. References .....	42
Topic Index .....	43

## 1. Introduction

This protocol outlines the procedures for making seed collections for *Seeds of Success*, part of the National Native Plant Materials Development and Conservation Program. The purpose of the *Seeds of Success* program in the United States is to establish a high quality, accurately identified and well documented native species seed collection at the population level. 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 collections act as a 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 for restoration purposes.

### *1a. Program History*

The Bureau of Land Management and Royal Botanic Gardens, Kew's Millennium Seed Bank (<http://www.rbgekew.org.uk/msbp/>) are participating 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. 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 and New York Department of Parks and Recreation, Greenbelt Native Plant Center; North Carolina Botanic Garden; and the Zoological Society of San Diego. This group is collectively referred to as the SOS Partners.

SOS Partners have agreed to collect seeds for the program and grant access to the lands they manage for collection; grant prior informed consent to RBG, Kew for study and long term storage of seeds collected under the program; send the first collection of a species, vouchers and field data to RBG, Kew for processing; and send an itemized species list in the *Notification of Transfer (Appendix 3)* with seeds and herbarium voucher specimens. RBG, Kew agreed to clean, process, test, develop germination protocols, and store all seed sent by BLM and perform some or most of these duties for all the SOS Partners; send half of each collection to the US for long term storage; provide the results of all testing to the collecting partners and the SOS National Coordinating Office; fund a fixed term coordinator position in BLM-National Coordinating Office to develop the collection program; and provide training and advice during the program.

### *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. Estimates have shown that between ten and twenty collections of a single species, across its range, are needed to develop genetically appropriate ecotypes. Because only one sample of each species, regardless of variety or subspecies, can be sent to RBG, Kew, additional processing and storage partnerships have been formed to achieve the program's goal of native plant materials development. Additional collections of species can be collected throughout their range by any collecting group and used as part of the National Native Plant Materials Development and Conservation Program.

Since 2003, BLM has been cooperating with the US Forest Service Seed Extractory in Bend,

Oregon for cleaning and storing restoration seed collected by BLM Field or State Offices that are also sending seed to Kew. Procedures for storing additional collections made by SOS Partners of species already stored at RBG, Kew are being developed, however all collection data for such species will be sent to the SOS National Coordinating Office regardless of storage facility.

**2. Training, Resources, and Annual Reporting**

**2a. Training**

The training course, “Seed Collection for Restoration and Conservation” is offered multiple times a year in various parts of the country. 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 because additional courses can be added as needed to the schedule posted on the SOS website.

**2b. Resources**

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 with other collectors and raising issues and questions for the National Coordinating Office who will relay specific questions to RBG, Kew and Bend Seed Extractory if necessary. The conference call number cannot be posted on the website, so contact the National Coordinating Office for details and to submit agenda items. Reminders, cancellations, and agendas will be posted to the SOS listserv.

*Collectors’ Call Time*

11 am – EST	9 am – M ST
10 am – CST	8 am – PST
7 am – AKST	

Additional resources can be found on the SOS website for packaging and shipping, listserv subscriptions, and promotional material.

**2c. Annual Reporting**

Each collecting team should complete the annual report template circulated at the end of the collecting season (late December). The team’s annual report should summarize the collecting season, collections, difficulties and highlights, as well as improvements to be made for the upcoming year and submitted to the SOS National Coordinating Office.

**3. Target Species**

The focus of *Seeds of Success* is on collecting species needed for emergency fire rehabilitation and restoration. 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.

*Seeds of Success* manages target species information on a website hosted by the *Plant Conservation Alliance* (PCA) at <http://www.nps.gov/plants/sos>. As ecoregional lists of species are obtained, they are made accessible on the web to assist collectors in choosing target species. Information on target species assigned to collecting groups is also available on the web. These targeting lists track which SOS collecting group is assigned the one collection sent to RBG, Kew Millennium Seed Bank.

#### **4. Storage and Distribution**

Species can only be collected once for the Millennium Seed Bank. Collections sent to RBG, Kew's Millennium Seed Bank, are cleaned, tested for germination and divided in half. Half of each collection stays in long term conservation storage at the Millennium Seed Bank and half is returned to the U.S. For BLM collections, 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 in Fort Collins, Colorado is managing long-term collections, and the USDA-ARS National Plant Germplasm System is maintaining working collections for distribution to researchers for native plant materials development. Species currently available can be found at <http://www.ars-grin.gov>. An accepted formal collections management strategy, which will include all SOS Partner collections, will be written and added to the protocol in early 2008.

#### **5. Identifying Priority Species to Collect**

The collecting focus of this program is on species needed for emergency fire rehabilitation and restoration. Initial target species lists were determined at the ecoregion level by BLM, PCA and RBG, Kew after consultation with field office staff; the Society for Ecological Restoration International; State Heritage Program botanists; non-profit organizations including The Nature Conservancy and state native plant societies; university botanists and ecologists; and researchers from botanic gardens that are members of the Center for Plant Conservation network. See ***Section 7. Requesting Species for Collection*** for information on how to make additions or changes to the lists.

The SOS priorities have expanded to include species need in a variety of restoration and rehabilitation projects. Collecting teams are encouraged to work with local federal land managers to develop and execute priority lists. Projects may include emergency fire rehabilitation and restoration, water way stabilization, landfill and corporate land recovery, wildlife habitat, threatened and endangered species habitat, and roadside revegetation.

*Seeds of Success* currently uses the ecoregions outlined by The Nature Conservancy. In early 2008, the program will begin using the Omernick Level III Ecoregions.

## 6. Species Excluded from this Program

The collecting focus of the SOS program is on species needed for emergency fire rehabilitation and restoration of federal lands and for native plant materials development in United States, and conservation of widespread native species. The species that will be 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 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, 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 non native invasive weed species
- Any agricultural or food crop species that may be growing on BLM lands
- All species in the genus *Quercus*
- All species in the genus *Vitis*
- All known recalcitrant seeds

## 7. Requesting Species for Collection

*Seeds of Success* is a large national program with partners from many different groups including the BLM with twenty or more collecting teams, Lady Bird Johnson Wildflower Center, Chicago Botanic Garden, New York Department of Parks and Recreation's Greenbelt Native Plant Center, New England Wild Flower Society, North Carolina Botanical Garden, and the Zoological Society of San Diego. In the first year of the program there were 23 different teams in the United States collecting species for *Seeds of Success*. Because RBG, Kew would like to minimize costs from duplication of species sent to the Millennium Seed Bank, **all collectors**, including BLM and SOS Partners, should coordinate with the SOS National Collections Data Manager for tracking species' assignments. This is best done via e-mail to mary\_byrne@blm.gov.

Single species collections sent to the Millennium Seed Bank (MSB) at Royal Botanic Gardens, Kew are the first of 20 collections needed for researchers 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 with federal land managers, native plant materials development and conservation researchers, and any other native plant stakeholders.

The *Seeds of Success* website has a searchable database of the species in need of collecting and accessions recorded (current inventory) available on the website (<http://www.nps.gov/plants/sos>). Use the website before requesting species to make sure the species is not already assigned or collected. Contact Mary to request a subset of data, which can aid in compiling a unique target list and building on existing collections. Teams may make multiple collections of species on their restoration target list, but not specifically assigned to them for shipment to MSB, so long as they are capturing unique populations in each collection (accession). Species should not be collected if listed as G1, G2, or S1, S2 in the state in which they are being targeted.

Requests to collect species should be sent in the form of an Excel spreadsheet. Column **A** is used by the national coordinator to identify the collecting group assigned. Columns **B**, **C**, **D**, and **E** represent the taxonomic family, genus, specific epithet (species), and subspecies or variety respectively. Column **F** is the NRCS PLANTS database symbol and column **G** is a common name for the plant.

Each species may be marked in as many ecoregions as it has been identified in and this information will be included in the data accessible on the *Seeds of Success* website (<http://www.nps.gov/plants/sos/species>).

\*\*Collectors are assigned all occurrences of the requested species in the database, regardless of variety or subspecies.

Species requests are assigned to collecting teams in the order in which the requests are received. If a collecting team does not collect all of the species assigned to them by the end of the collecting year, the species will remain on the collector's list until it is collected or traded to another collector. Collectors interested in collecting a species on another collector's list should initiate the swap by contacting the assigned collector and when the exchange is finalized, forward Mary the other team's confirmation e-mail.

## **8. Permission to Collect**

Collecting seeds on public land managed by the Bureau of Land Management is categorically excluded in 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 one 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, however, when these volunteers collect for BLM, a BLM employee must sign the *Notification of Transfer* as part of the shipping documentation for all species



collected under the cooperative agreement between BLM and Royal Botanic Gardens, Kew. 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.

**Notification of Transfer** is not needed when shipping material domestically; non-BLM SOS teams working on BLM public land should still work with their local field or district office on targeting species and notify BLM that collections are taking place.

Collection may take place on private lands or lands managed by another federal agency (Fish and Wildlife Service, US Forest Service, and Department of Defense) or a state agency, with landowner permission. 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.

Collecting is NOT permitted on National Park Service land.

## 9. Targeting the Population(s) for Collection

It is essential that a knowledgeable botanist familiar with the target species leads the collection 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 field office level in BLM and at other collecting partner institutions. An "ideal" collection will be from a large number of individuals (between 100 and 500) 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

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. Preliminary site visits are often necessary to assess the populations, confirm the identification with the collection of herbarium voucher specimens (see **Section 11**), and estimate the likely harvesting date and potential seed production.

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 1,000 viable seeds in a collection following the sampling strategy above should not be collected. Seed development can vary within and between populations of the same species. Monitor seed maturation and to assess insect damage and empty seeds throughout the population before making the seed collection.
- Collections taken from the exact same population may be combined in to one accession (seed collection reference number) over the course of a season to maximize genetic diversity and collection material. 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. Note on the SOS field data form the dates the material was collected.

## 10. Sampling Strategy

For many potential users and uses of the collection, it is important to maximize the number of alleles present within the sample by capturing the greatest proportion of those 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. This analysis suggests that, with care, a single population seed sample collected in this way would possess the potential for re-establishment at that site.

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 collection needs to be of a unique population and contain more than 20,000 seeds. The first collection of a species should be sent to MSB and subsequent collections should be sent to the Bend Seed Extractory or other domestic cleaning facility, detailed in *Section 17*.

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.

Other partners in the *Seeds of Success* program will need to work through the Plant Conservation Alliance to develop a similar agreement for the cleaning and storage of collections from multiple populations that are not going to Kew as part of the Millennium Seed Bank program.

## 11. 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 or make a herbarium label for the collection.

### *Guidelines for Shipment*

<b>Collections Shipped to the Bend Seed Extractory Voucher Specimen Distribution</b>	<b>Collections Shipped to the Millennium Seed Bank Voucher Specimen Distribution</b>
Voucher 1. U.S. National Herbarium 10 <sup>th</sup> and Constitution Ave., NW MRC-166 Smithsonian Institution Washington, DC, 20560 Contact: Rusty Russell 202-633-0920 russellr@si.edu	Vouchers 1-3. Send to the Millennium Seed Bank, with instructions to distribute voucher specimens 2 and 3 to the following: 2. U.S. National Herbarium 3. Regional Herbarium
Voucher 2. Regional Herbarium (see <i>Appendix 5</i> )	or send specimens separately, all with field data form
Voucher 3. Collecting Team's Herbarium	Voucher 4. Collecting Team's Herbarium

Send all voucher material marked with the seed collection number and a copy of the correlating field data forms.

For most collecting teams, the easiest approach to their MSB collections will be to send duplicate specimens to RBG, Kew (to the same address as for the seed collections) where updated herbarium labels will be printed and subsequent distributions to the National Herbarium at the Smithsonian Institution and regional herbaria can be organized. If it is convenient, please include these specimens with the next scheduled shipment to RBG, Kew; ideally, they will be sent in a separate cardboard package from seed collections.

For voucher specimens of collections sent to Bend, it is the collectors' responsibility to send out all vouchers with associated field collection data forms. Again, these should be unmounted without a label and should include the completed field collection data forms.

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.**

Herbarium specimens must be taken from the exact population earlier in the season (e.g. for the purposes of identification and population monitoring). **The herbarium material must truly represent the individuals from which seed was collected.** If a preliminary trip is not made and material for a herbarium voucher specimen is inadequate at seed collection time, collectors should follow the instructions in the paragraph below.

Record a representative individual(s) 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. Identification should still be carried out in the field by an acknowledged expert familiar with the species (i.e. lead collecting botanist).

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

***11a. 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 National Collections Data Manager for dissemination to all other parties holding that *Seeds of Success* collection.

***11b. Verification by Kew Taxonomists for Shipments sent to the Millennium Seed Bank***

If you do not have local or regional herbarium colleagues that can help with the verification of the herbarium specimens, please forward the complete set of duplicates to RBG, Kew (to the same address as for the seed collections). Kew will prepare herbarium labels with the collector's field identification and pass the duplicates to the Kew herbarium for verification. The determinations will be attached to the specimens, which will then be separated for the Kew herbarium, Smithsonian Institution herbarium, and regional herbaria, as numbers of duplicates allow and according to recommendations by the collecting teams. See *Appendix 5* for the

herbaria that have been identified for distribution in your state to make sure you collect the proper number of voucher specimens.

***11c. Nomenclature***

Nomenclature will follow Kartesz and Meacham (1999), *Synthesis of the North America Flora* (<http://www.bonap.org/synth.html>). This is the standard taxonomy used in the USDA PLANTS Database and other national databases. Partners collecting for *Seeds of Success* will be given a copy of a new BLM edition of the Synthesis of the North American Flora in FY2006 which is valid until July 2008. Only Kartesz scientific names will be used on the species tracking lists and only Kartesz scientific names should be used on the field data forms. **Where subspecies and/or varieties are listed in Kartesz and Meacham, identification should be made 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.

**12. Seed Collection Techniques**

All seed collections should follow this protocol, including seeds that are used for restoration projects, sent to the US Forest Service Seed Extractory in Bend, OR, and all seeds that are collected for germination and other testing and long term conservation storage at the Royal Botanic Gardens, Kew’s Millennium Seed Bank. Seed collection should follow the outline in the table below:

	<b>Method</b>	<b>Rationale</b>
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 into 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.	In general, cleaning should be left to the processing staff at the MSB and Bend Seed Extractory.	Maximize the use of available field time and clean and prepare seeds in controlled laboratory conditions.

	<b>Method</b>	<b>Rationale</b>
5.	Fleshy fruits should be collected directly into plastic bags. Specific advice on ripening and cleaning fleshy fruits is in <i>Section 15</i> , or contact RBG, Kew or 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 10,000 to 20,000 viable seeds.	Enable maximum use and study of the collection.
10.	Collections of all sizes are welcome, at both MSB and Bend. However, the smaller the collection, the less use will be made of it.	Less use will be made of these collections.
11.	<b>Collections &gt; 20,000 are most desirable.</b> Collections sent to the MSB are halved upon return to the U.S., and as quantities allow, will be made available for distribution.	This ensures long-term storage at 2 facilities, and a working collection that can be made available for researchers. Halved MSB collections will be stored for long-term conservation, but will probably not be available for distribution.
12.	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. The first 10,000 seeds of each collection sent to Bend becomes part of the SOS National Collection. See <i>Section 17</i> for details on requesting material from Bend.	Seeds 1-2,500: Long-term Storage at NCGRP, Ft. Collins, CO Seeds 2,501-5,000 – Long-term Storage at Western Regional Plant Introduction Station, Pullman, WA Seeds 5,001 to 10,000 – Working Collection, available for distribution through the Germplasm Resource Information Network

	<b>Method</b>	<b>Rationale</b>
13.	Collections between 1,000 and 5,000 viable seeds are welcome, but distribution opportunities are limited.	Less use will be made of these collections.
14.	Collections of less than 1,000 seeds are welcome at RBG, Kew only when more productive populations are not available for sampling.	These samples will not receive any testing at RBG, Kew and if sent to Bend will not be available for distribution.
15.	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.
16.	Clearly label all bags (inside and out) with the appropriate collection number. No other data needs to be included on the label. Do <b>not</b> write on the cotton seed bags with permanent marker because it hinders their re-use in the seed collection program.	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.

Some additional information can be found in *Frequently Asked Questions (Appendix 7)*.

### 13. Field Documentation & Photos

Use a copy of the *Field Data Form (Appendix 2)* for each seed collection made and fill out all the data fields. Please make sure you use the Seed Collection Reference Number as described in *Section 14* below.

Complete the field data form and **send one copy to the data manager or email it to [mary\\_byrne@blm.gov](mailto:mary_byrne@blm.gov)** as soon as possible to document collection of the species. Hold one copy in the office where the collection took place, and send the original with the seeds to the appropriate seed cleaning facility, RBG, Kew or the Bend Seed Extractory.

Digital photos of the species being collected should also be made 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)

Instructions on how to properly name the files are included in *Section 14* below.

## 14. Seed Collection Reference Number Format & Image Names

*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 *Section 18* for collector codes and *Appendix 6* for a list of all BLM Field Offices and mail stop codes.

Digital images of the collections should be taken as described in *Section 13*. The following naming convention should be used: PLANTS Code\_Collection Number\_Picture Number. For example Chicago Botanic Garden's collection of *Symphyotrichum lanceolatum* would have photos named **SYLA6\_CBG-419\_A.jpg**, **SYLA6\_CBG-419\_B.jpg**, etc. Send images to the SOS Data Manager on CD or DVD via FedEx (see *Section 18* for the FedEx address).

## 15. Care of Seed Collections after Harvest

In general, **keep the seed collections in a cool, dry place** prior to sending to the seed bank, but do not freeze them. Do not allow collections to overheat, and do not leave them in a vehicle in full sun. Exposure to such 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 bank staff that fleshy fruits are in transit, please contact seed bank and cleaning staff as follows:

Curation Section, RBG Kew  
Email: sos@kew.org  
Tel: 011+44 1444-894128  
Fax: 011+44 1444-894110

Nita Rauch, Bend Seed Extractory  
Email: nrauch@fs.fed.us  
Tel: 541-383-5646  
Fax: 541-383-5498

## 16. Shipping Collections to Kew

### *16a. Packaging*

In general, **it is critical to the successful conservation of the seed that it is sent to the seed bank within a few days of collection**, together with the completed field data forms, using one of the air freight companies listed below. Voucher photos and herbarium specimens may be sent for verification at a later date, and any other additional information may be sent to the program coordinators quoting the unique collection number given to the seed collection.

As often as possible, place your entire seed collection in one bag. Keep a variety of sizes of bags on hand. 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 seeds inside the bag. RBG, Kew prefers that we do **not** write on the cotton seed bags with permanent marker because it hinders their re-use in the seed collection program.

The labeled bags should be securely packaged for shipping to RBG, Kew. The following packaging is recommended, either:

- Sturdy cardboard box (secured with string to permit customs inspection and resealing) into which cotton seed bags have been placed
- A canvas or thick cotton sealable sack
- Woven PVC or nylon air freight sack

Do not use the following for shipping seeds to the RBG, Kew:

- 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 15*).

### **16b. Species Restricted for Shipment to the United Kingdom**

Plant Health restricted species listed below cannot be shipped to Kew, UK without a Letter of Authority to UK customs or a phytosanitary certificate issued by the USDA Animal and Plant Health Inspection Service (APHIS). A Letter of Authority to UK customs can be obtained by contacting Janet Terry at Kew (seedbank@kew.org) with details of the collections, ideally pre-collection so that there is ample time to send the paperwork to you.

We recommend that you get a plant health letter from RBG, Kew for this program rather than an APHIS phytosanitary certificate. There is no cost for a letter from Kew, but there is a \$25.00 fee for a phytosanitary certificate and inspection is not routinely available in most towns where BLM offices are located. Remember, these are only required for shipments of specific seeds and fruits listed below. They are not required for any other species.

### **16c. Plant Health**

You will need a **Letter of Authority** issued by Janet Terry at RBG Kew (seedbank@kew.org) to send SEED from the following plants from the USA to RBG Kew: *Allium ascalonicum*; *Allium cepa*; *Allium porrum*; *Allium schoenoprasum*; *Beta vulgaris*; *Capsicum*; *Helianthus annuus*; *Lycopersicon lycopersicum*; *Medicago sativa*; *Oryza*; *Phaseolus*; *Prunus*; *Rubus*; *Secale*; *Triticum*; *Zea mays*.

You will need a **Letter of Authority** issued by Janet Terry at RBG Kew (seedbank@kew.org) to send FRUITS from the following plants from the USA to RBG Kew: *Annona*; *Cydonia*; *Citrus*; *Diospyros*; *Fortunella*; *Malus*; *Mangifera*; *Passiflora*; *Poncirus*; *Prunus*; *Psidium*; *Pyrus*; *Ribes*; *Syzygium*; *Vaccinium*.

As more becomes known about the potential hosts of *Phytophthora ramorum* (sudden oak death), the APHIS-listed species in **Section 16d** of the protocol are now to be treated as quarantine species for entry to UK and will need a **Letter of Authority** issued by Janet Terry at RBG Kew (seedbank@kew.org).

Potato relatives (any member of the Solanaceae family) have also acquired quarantine status for import into the UK and will need a **Letter of Authority** issued by Janet Terry at RBG Kew (seedbank@kew.org).

**Please note: Vitis species (and also true seed of potato and other tuber-forming or stoloniferous Solanaceae) are totally prohibited for import into the European Union, so on no account ship Vitis collections to the UK under this program.**

### **16d. U.S. Phytosanitary Certificates**

U.S. phytosanitary certificates are not required for shipment of seeds to RBG, Kew when the species listed above have a letter of authority from RBG, Kew. If your collection has been positively identified and is not within the above listed genera, UK authorities will not require any additional paperwork. If your shipping company asks for a phytosanitary certificate, contact the program coordinator to try to resolve the problem.

Hosts of *Phytophthora ramorum*, known as sudden oak death may require a phytosanitary certificate **for re-entry of seeds into the U.S.** The known host plants of sudden oak death listed by APHIS (<http://www.aphis.usda.gov/>) where phytosanitary certificates may be required are:

- |   |  |
|---|--|
| Arrowwood ( <i>Viburnum x odnantense</i> )                | manzanita ( <i>Arctostaphylos spp.</i> )                       |
| big leaf maple ( <i>Acer macrophyllum</i> )               | Rhododendron ( <i>Rhododendron spp.</i> ,<br>including azalea) |
| black oak ( <i>Quercus kelloggii</i> )                    | shreve's oak ( <i>Quercus parvula</i> var. <i>shrevei</i> )    |
| California bay laurel ( <i>Umbellularia californica</i> ) | tanoak ( <i>Lithocarpus densiflorus</i> )                      |
| California buckeye ( <i>Aesculus californica</i> )        | toyon ( <i>Heteromeles arbutifolia</i> )                       |
| California coffeeberry ( <i>Rhamnus californica</i> )     | douglas-fir ( <i>Pseudotsuga menziesii</i> )                   |
| California honeysuckle ( <i>Lonicera hispidula</i> )      | California redwood ( <i>Sequoia sempervirens</i> )             |
| canyon live oak ( <i>Quercus chrysolepsis</i> )           | cascara ( <i>Rhamnus purshiana</i> )                           |
| coast live oak ( <i>Quercus agrifolia</i> )               | salmon berry ( <i>Rubus spectabilis</i> )                      |
| huckleberry ( <i>Vaccinium ovatum</i> )                   | western poison oak ( <i>Rhus diversiloba</i> )                 |
| madrone ( <i>Arbutus menziesii</i> )                      | western star flower ( <i>Trientalis latifolia</i> )            |
|   | victorian box ( <i>Pittosporum undulatum</i> )                 |

Contact [seedbank@kew.org](mailto:seedbank@kew.org) for more instructions before sending any of these species to RBG, Kew.

**16e. CITES Species**

Over 600 species of US plants are controlled by the Convention on International Trade in Endangered Species (CITES). International transfer of specimens of these species may require export and import licenses depending on the species and the part of the plant involved. For *Seeds of Success*, the only CITES material that will be shipped internationally to RBG, Kew, is **clean** seed of either Appendix II or Appendix III species. Herbarium vouchers of these collections should only be sent to the U.S. National Herbarium and local herbaria, thus there is no need to contact the U.S. Fish and Wildlife Service for permits, since herbarium material and live plants will not be sent to RBG, Kew. Follow the shipping process detailed below. CITES listed species shipped domestically do not need further documentation and seeds do not need to be cleaned before domestic shipment.

*Shipping Procedures for Appendix II and Appendix III Species Cacti, Orchids, and Sarracenia Species*

Destination	Material
<b>DHL/FedEX Courier</b>	Letter to Courier Check appropriate boxes Fill in the name(s) of the <b>clean</b> seed being sent to Kew
<b>Kew</b>	<b>Clean Seed</b> Data Sheets Images

Destination	Material
<b>U.S. National Herbarium</b> 10th and Constitution Ave., NW MRC-166 Smithsonian Institution P.O. Box 37012 Washington, DC , 20560 Contact: Rusty Russell 202-633-0920 russellr@si.edu	Unmounted Vouchers Data Sheets Package the same way vouchers are sent to Kew
<b>Seeds of Success,            Washington Office</b>	Data Sheets Images

**16f. Arranging Shipment via Air Freight**

RBG, Kew has accounts with DHL and FedEx for the sole purpose of express shipping seed collections and appropriate field data to Kew for processing. Please always send the data forms along with the seed collections as this helps to accession the collections correctly. Herbarium specimens may be sent either by express freight or by standard airmail.

**DHL is the program's preferred freight agent**, and full DHL shipping instructions follow below. If DHL will come to your office location and pick up, then you are required to use DHL. If DHL will not pick up shipments from your location, please contact the National Coordinator to get help with resolving the problem.

**16g. Shipment with DHL to RBG, Kew**

To arrange a pick-up, to get information about the nearest DHL office or to track a shipment already made, call 1800-CALL DHL or (480) 303 5797 or visit <http://www.dhl-usa.com/>. You are required to include the following documents with the shipment:

Document	Number required	Notes
DHL Shipment Airwaybill	One original – one copy in box	See below
Notification of Transfer and Shipping Invoice	Five signed originals – one copy in box	See below and use form in <i>Appendix 3</i>
Letter of Authority (if plant listed in <i>Section 16c</i> )	One original – one copy in box	Obtained from RBG Kew
CITES import/export permits if CITES material is to be shipped (see <i>Section 16e</i> )	One original – one copy in box	Contact national coordinator before sending herbarium voucher material
Note to inform seed bank staff of any irritant, toxic or hazardous material	One original in box	

**\*\*To avoid loss and confusion, include a copy of all documents inside the box as well as the external shipping envelope.**

### *Completing a DHL Shipment Airway Bill*

Pre-addressed DHL airwaybills are available from the program coordinators. DHL will supply blank airwaybills for completion by hand if necessary, the following details should be entered.

1. From (Sender)

Account Number (**call the SOS National Office for the number: 202-452-7767**)

Sender Name (**enter your name**)

Company Name and Address (**enter your organization name and address**)

2. To (Receiver)

Company Name (**Millennium Seed Bank**)

Delivery Address (**Royal Botanic Gardens, Kew; Wakehurst Place: Ardingly  
Near Haywards Heath: West Sussex; Postcode RH17 6TN, United  
Kingdom**)

Contact Person (**Keith Manger**)

Contact Phone Number (**01444-894-151**)

3. Shipment Details

**Worldwide Parcel Express; Transport Collect, NO Shipment Insurance;**

Description of Contents (**non commercial wild plant seeds and herbarium  
specimens collected from the USA for scientific purposes, plus  
associated documents**)

Declared Value for Customs (**\$1** per collection or other reasonable figure, as  
entered on the invoice)

**Permanent Export: Receiver pays all duties/taxes**

\*Due to abuse of the account number, the new account number is not being made public.

### *Completing a Shipment Invoice and Notification of Transfer*

Please use the form prepared for the program in **Appendix 3**, noting the following points:

- Invoices must be originals
- Invoices must be completed on the letterhead of your organization, if available
- Invoices should be typewritten, if possible
- Invoices must not have any handwritten or obvious typewritten corrections
- Details on the invoice must match those given on the airway bill
- Five original signed invoices are required

### ***16h. Shipment with FedEx to RBG, Kew***

Use of the Royal Botanic Gardens, Kew account for shipping with FedEx is limited for use by only those offices where DHL will not make a pick up. If you cannot ship with DHL, please contact the National Coordinator to attempt to resolve the problem and get shipments set up.

The Coordinator will need the name of the city where DHL is located that would need to come to your office, and the name of the person in DHL who you talked to when trying to set up a pickup at your office. If the National Coordinator cannot reach agreement with DHL for timely pickup, then permission will be given to use the RBG, Kew shipping account with FedEx.

Be careful not to use the regular BLM FedEx account number on any FedEx airway bills or the combined FedEx Invoice and Notification of Transfer document when sending collections to RBG, Kew. BLM Field Offices do not typically budget money for international courier service, and someone will notice if the cost of using FedEx skyrockets in your office. The sub activities you work in could be taxed to pay the substantial shipping charges. Since RBG, Kew is willing to pay for courier service for all shipments of seed and plant material to the Millennium Seed Bank, please make sure that the account number you use is the correct one. Also, shipping costs are a part of the in-kind match that Kew gives to BLM for any challenge cost share type of program involving the *Seeds of Success* program.

The following documents are required for shipment with FedEx:

Document	Number required	Notes
FedEx Shipment Airwaybill	One original, one copy in box	
Notification of Transfer and Shipping Invoice	Five signed originals, one copy in box	See above and use form in <i>Appendix 3</i>
Letter to Courier Service	One signed original, one copy in box	See <i>Appendix 4</i>
Letter of Authority (if plant listed in <i>Section 16c</i> )	One original, one copy in box	Obtained from RBG Kew
CITES import/export permits if CITES material is to be shipped (see <i>Section 16e</i> )	One original, one copy in box	Contact RBG Kew
Note to inform seed bank staff of any irritant, toxic or hazardous material	One original, one copy in box	

\*\*To avoid loss and confusion, include a copy of all documents inside the box as well as the external shipping envelope.

#### *Completing a FedEx Shipment Airway Bill*

FedEx will supply blank airwaybills for completion by hand if necessary, the following details should be entered.

1. From (Sender)
  - Account Number (**call the SOS National Office for the number: 202-452-7767**)
  - Sender Name (**enter your name**)
  - Company Name and Address (**enter your organization name and address**)
  
2. To (Receiver)
  - Company Name (**Millennium Seed Bank**)
  - Delivery Address (**Royal Botanic Gardens, Kew; Wakehurst Place: Ardingly Near Haywards Heath: West Sussex; Postcode RH17 6TN, United Kingdom**)
  - Contact Person (**Keith Manger**)
  - Contact Phone Number (**01444-894-151**)

### 3. Shipment Details

**Worldwide Parcel Express; Transport Collect, NO Shipment Insurance;**  
Description of Contents (**non commercial wild plant seeds and herbarium specimens collected from the USA for scientific purposes, plus associated documents**)

Declared Value for Customs (**\$1** per collection or other reasonable figure, as entered on the invoice)

**Permanent Export: Receiver pays all duties/taxes**

#### *Completing a Shipment Invoice and Notification of Transfer*

Please use the form prepared for the program in *Appendix 3*, noting the following points:

- Invoices must be originals
- Invoices must be completed on the letterhead of your organization, if available
- Invoices should be typewritten, if possible
- Invoices must not have any handwritten or obvious typewritten corrections
- Details on the invoice must match those given on the airway bill
- Five original signed invoices are required

### **17. Shipping Seeds to the USDA Forest Service Bend Seed Extractory in Bend, Oregon**

Multiple collections of a single species for restoration projects or native plant materials development by BLM employees or contractors and partners can be sent to the following address:

USDA USFS - Bend Seed Extractory  
63095 Deschutes Market Road  
Bend, OR 97701  
(541) 383-5646  
(541) 383-5498 Fax

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 to the Bend Seed Extractory; material will not be cleaned without this documentation. Pack the seed in the same manner outlined in previous sections. Senders are responsible for all shipping costs related to seed sent to the Bend Seed Extractory.

Field data forms and return request letters (see below) need to be sent to the SOS National Collections Data Manager, via fax or e-mail. A herbarium voucher should be sent to the U.S. National Herbarium at the Smithsonian, along with a copy of the field data sheet (see *Appendix 5* for the contact information).

The first 10,000 seeds are taken off the top from each collection sent to Bend for incorporation into the *Seeds of Success* National Collections. BLM collectors can request that seeds in excess of the initial 10,000 be returned to their offices. The following information should be included in the return request when the material and data is originally sent to the Bend Seed Extractory and the SOS National Coordinating Office:

1. Seeds Collection Reference Number of Material Requested for Return
2. Purpose of return (i.e. direct re-seeding, bulking up, common garden study, etc.)
3. Ideal date material will be returned

Annually, an inventory of collections at Bend larger than 10,000 seeds and not requested for return by the collector will be circulated in June to all National Native Plant Materials Development and Conservation Program partners. Again, collectors have the right of first refusal. This annual distribution will be managed by the National Coordinating Office for *Seeds of Success*. In order for distribution requests to be filled, an explanation of material usage needs to accompany every collection requested.

The Bend Seed Extractory is developing cleaning protocol for native seeds which will be put on the web.

Ideally, all SOS Partners would send their multiple collections of a single species to the Bend Seed Extractory. However, this type of agreement has not yet been finalized with the Bend Seed Extractory. BLM's Washington Office is in discussions with Bend in regards to allowing SOS programwide shipments.



## 18. Program Contacts

### *18a. Main Contacts*

Below are program contacts in the Washington office and in the UK at the Millennium Seed Bank. Not all BLM offices have the capacity for international phone calls or faxing. Collectors are welcome to call or e-mail Mary with any questions for Kew, and she will relay the correspondence.

#### **SOS National Coordinator**

Peggy Olwell

*(For US Postal Service mail)*

Bureau of Land Management  
Division of Fish, Wildlife and Plant  
Conservation

1849 C Street NW (LSB-204)

Washington, DC 20240

Tel: 202-452-7764

Fax: 202-452-7702

Email: [peggy\\_olwell@blm.gov](mailto:peggy_olwell@blm.gov)

*(For FedEx or UPS or DHL)*

Bureau of Land Management  
Division of Fish, Wildlife and Plant  
Conservation

1620 L Street NW Room 204

Washington, DC 20036

#### **SOS Webmaster**

Olivia Kwong

Plant Conservation Alliance/Center for Plant Conservation

*(use the same addresses as listed above for Peggy)*

Tel: 202-452-0392

Fax: 202-452-7702

Email: [plant@plantconservation.org](mailto:plant@plantconservation.org) or [olivia\\_kwong@blm.gov](mailto:olivia_kwong@blm.gov)

#### **National Collections Data Manager**

Mary Byrne

Bureau of Land Management

*(use the same addresses as listed above for Peggy)*

Tel: 202-452-7767

Fax: 202-452-7702

Email: [mary\\_byrne@blm.gov](mailto:mary_byrne@blm.gov)

#### **Coordinator for the Americas at RBG, Kew**

Michael Way, BSc. MIEEM

Seed Conservation Department

Royal Botanic Gardens, Kew

Wakehurst Place, Ardingly, Haywards Heath

West Sussex, RH17 6TN, UK

Tel: 011+44 1444-894106

Fax: 011+44 1444-894110

Email: [m.way@rbgkew.org.uk](mailto:m.way@rbgkew.org.uk)

<http://www.rbgkew.org.uk/seedbank/msb.html>

**Processing team leader (USA)**

Nicola Mills  
Seed Conservation Department  
Royal Botanic Gardens, Kew  
Wakehurst Place, Ardingly, Haywards Heath  
West Sussex, RH17 6TN, UK  
Tel: 011+44 1444-894128  
Fax: 011+44 1444-894110  
Email: [n.mills@rbgkew.org.uk](mailto:n.mills@rbgkew.org.uk)  
<http://www.rbgkew.org.uk/seedbank/msb.html>

**Questions or information about individual collections of seed, herbarium material, data, taxonomy, training, shipping and packaging, and general enquires:**

[mary\\_byrne@blm.gov](mailto:mary_byrne@blm.gov), or SOS listserv below

**Questions about specific species pre-cleaning and packaging:**

[seedbank@kew.org](mailto:seedbank@kew.org), [nrauch@fs.fed.us](mailto:nrauch@fs.fed.us), or SOS listserv below

**Questions about new team set-up:**

[peggy\\_olwell@blm.gov](mailto:peggy_olwell@blm.gov)

**Requests for plant health letter of authority for United Kingdom customs:**

[j.terry@rbgkew.org.uk](mailto:j.terry@rbgkew.org.uk)

**Species requests:**

[mary\\_byrne@blm.gov](mailto:mary_byrne@blm.gov)

***Seeds of Success* USA e-mail discussion list:**

<http://www.nps.gov/plants/sos/maillist.htm>

**18b. Seeds of Success Collectors Contacts**

<b>Coll. Code</b>	<b>Team Contact</b>	<b>Email</b>	<b>Phone</b>
AK930	Scott Guyer	scott_guyer@blm.gov	907-271-3284
AZ320	Fred Wong	winfred_wong@blm.gov	928-317-3200
AZ930	McKinley-Ben Miller Kathy Rice (Desert Bot. Garden) Jennifer Johnson (DBG)	mckinley-ben_miller@blm.gov krice@dbg.org jjohnson@dbg.org	602-417-9336 480-481-8137 480-481-8187
AZ932	Sheila Murray (The Arb. at Flagstaff)	sheila.murray@nau.edu	928-774-1442 ext 112
CA170	Anne Halford	anne_halford@ca.blm.gov	760-872-5022
CA190	Julie Anne Delgado	julie_delgado@ca.blm.gov	831-630-5028
CA320	Michael Dolan	michael_dolan@ca.blm.gov	530-233-7903
CA330	Jennifer Wheeler	jennifer_wheeler@ca.blm.gov	707-825-2316
CA360	Chase Lentz	chase_lentz@ca.blm.gov	530-224-2107
CA610	Ron Gartland	ronald_gartland@ca.blm.gov	951-697-5387
CA930	Christina Lund	christina_lund@blm.gov	916-978-4638
CO932	Carol Dawson	carol_dawson@co.blm.gov	303-239-3725
ES030 ES933	June Wendlandt	june_wendlandt@blm.gov	414-297-4416
ID931	Roger Rosentreter Susan Filkins	roger_rosentreter@blm.gov susan_filkins@blm.gov	208-373-3824 208-373-3815
MT050	Brian Hockett	brian_hockett@blm.gov	406-683-8010
MT060	Vinita Shea	vinita_shea@blm.gov	406-538-1919
MT932	Nora Taylor	nora_taylor@blm.gov	406-896-5032
NM930	Mike Howard	mike_howard@nm.blm.gov	505-525-4348
NV030	Dean Tonenna	dean_tonenna@nv.blm.gov	775-885-6189
NV052	Gayle Marrs-Smith	gayle_marrs-smith@nv.blm.gov	702-647-5156
NV930	Ted Angle	ted_angle@nv.blm.gov	775-861-6401
OR030	Roger Ferriell	roger_ferriell@blm.gov	541-523-1424
OR050	Ron Halvorson	ron_halvorson@or.blm.gov	541-416-6736
OR090	Nancy Sawtelle	nancy_sawtelle@blm.gov	541-683-6111
OR110	Doug Kendig	douglas_kendig@or.blm.gov	541-773-6087
OR120	Jennie Sperling	jennie_sperling@or.blm.gov	541-756-0100
OR130	Pam Camp	pamela_camp@or.blm.gov	509-665-2100
OR930	Ellen Kuhlmann (Rare Care) Joan SeEVERS	ekuhlman@u.washington.edu joan_seevers@or.blm.gov	206-616-0780 503-808-6048
OR931	Christa von Behren (Berry Bot. Garden)	christa.vonbehren@gmail.com	503-481-7905
UT030	Amber Hughes	amber_hughes@blm.gov	435-826-5602
UT080	Jessie Salix	jessie_salix@blm.gov	435-781-3410
UT933	Maria Ulloa	maria_ulloa@blm.gov	435-896-1518
UT931	Rita Dodge (Red Butte Garden)	rita.dodge@redbutte.utah.edu	801-585-5853
WY930	Tyler Abbott	tyler_abbott@blm.gov	307-775-6227
WY010	Eve Warren	eve_warren@blm.gov	307-347-5109
WY030	Frank Blomquist	frank_blomquist@blm.gov	307-328-4207
WY040	Jim Glennon	jim_glennon@blm.gov	307-352-0336
CBG	Emily Yates (Chicago Botanic Garden) Dave Sollenberger	eyates@chicagobotanic.org dsollenberger@chicagobotanic.org	847-835-6861 847-835-6957
GBNPSIP	Nancy Shaw (Great Basin Native Plant Selection and Increase Project)	nshaw@fs.fed.us	208-373-4360
LBJWC	Michael Eason (Lady Bird Johnson Wildflower Center)	michael.eason@wildflower.org	512-292-4200
MABG	Michael Eason (Mercer Arb. & Botanic Gardens)	michael.eason@wildflower.org	512-292-4200

<b>Coll. Code</b>	<b>Team Contact</b>	<b>Email</b>	<b>Phone</b>
NCBG	Andy Walker (North Carolina Botanical Garden)	aswalker@email.unc.edu	919-962-0522
NSNWR	Al Murray (Neal Smith National Wildlife Refuge) Karen Viste-Sparkman	al_murray@fws.gov karen_vistesparkman@fws.gov	515-994-3400
NEWFS	Tristram Seidler (New England Wild Flower Society)	tseidler@newfs.org	508-877-7630
NYCDPR-BBG	Camille Joseph (NYC Dept. of Parks & Rec. w/ Brooklyn Botanic Garden)	camille.joseph@parks.nyc.gov	718-370-9044
UCBG	Barbara Keller (University of California Botanical Garden)	bkeller@berkeley.edu	510-643-8040
UP	Kelly Memmott (The Uncompahgre Plateau Project)	klmemmott@yahoo.com	970-275-0752
VNPS	Nicky Staunton (Virginia Native Plant Society)	nstaunton@earthlink.net	---
ZSSD	Bryan Endress (Zoological Society of San Diego)	bendress@sandiegozoo.org	760-291-5486
	Center for Plant Conservation		314-577-9450

***18c. Bend Seed Extractory Contacts***

<b>Organization</b>	<b>Contact Name</b>	<b>E-mail</b>	<b>Phone</b>
USDA FS Bend Seed Extractory	Jim Barner Nita Rauch	nrauch@fs.fed.us	541-383-5481 541-383-5646

## **Appendix 1. 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 back up 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 back up 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](http://www.centerforplantconservation.org/NC_Choice.html)

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

## Appendix 2. BLM *Seeds of Success* Field Data Form



Use BLOCK CAPITALS

Complete all fields.

Circle relevant descriptions shown in *italics*.

MSB Serial Number:

NRCS PLANTS Code:

Cleaning Facility:

Date(s) Collected (DD/MM/YY):  Seed Collection Reference Number:

Collector(s):

Country:  Ecoregion (T,O, B):  State:  County:

Location Details:

Lat. (dg/min/sec) (ex: 40° 34' 19.5" N):  GPS Used?:   If no, please see other side.

Long. (dg/min/sec) (ex: 107° 36' 51.54" W):  GPS Datum:

Elevation (feet):  Landowner Details (Permission?):

### HABITAT DATA

Habitat, Associated Species & Ecological Site Descriptor:

Modifying Factors:

Land Form:  Slope°:

Land Use:  Aspect:

Geology:

Soil Texture:     Soil Color:

### COLLECTION DATA - If plant has been identified by a specialist, please see other side.

Family:  No. of Plants Sampled (min. 50):

Genus:  No. of Plants Found (approx.):

Species:  Area Sampled (acres):

Subspecies/Variety:

Seeds Collected From:

Plant Habit:      Plant Height (feet):

Native plant materials development and research this accession will be used for:

Notes to assist identification of pressed specimen (e.g. flower color, odor, presence of closely related species):

Common Name(s) of Plants:

Photograph Taken:

Reference (PLANTS Code\_Coll. Number\_Pic. No.):

Where Image will be Filed:

## PRE-COLLECTION CHECKLIST

(Check box to right if condition indicated by **boldface** is met or is the most frequently occurring condition.)

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:	<i>Resown</i>	<i>Burnt</i>	<i>Sprayed</i>	<b>No damage</b>
Readiness of population for collecting: give percentages or circle the most frequently occurring:				
	<i>Vegetative</i>	<i>In flower</i>	<i>Immature seeds</i>	<b>Around natural dispersal</b> <i>Post dispersal</i>
Estimate the number of individual plants at natural dispersal stage:	<50	<b>≥50</b>		
Is the population:				
	<b>A single population</b>	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:	<b>Recognized</b>
Using a cut test on the seeds at this stage, give percentages or circle the most frequently occurring:	
	<b>Healthy</b> <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?
Using the above information, if you only collect 20% of the healthy seeds available today, will this result in a collection of <b>&gt;10,000</b> healthy seeds?

### OTHER DATA

If GPS was not used, please state method of obtaining lat. and long.:

Map Publisher:	<input type="text"/>		
Series:	<input type="text"/>	Scale:	<input type="text"/>
Map Coordinates:	<input type="text"/>	Map Date (DD/MM/YY):	<input type="text"/>

### Herbarium voucher specimens:

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

Circle one:

a. All Herbarium duplicates will be sent to Kew to arrange labeling, verification and distribution (default)
b. One duplicate will be sent to _____ herbarium for verification, other duplicates will be sent by the collector to Kew to arrange labeling and distribution.
c. All Herbarium duplicates will be sent to _____ herbarium that has agreed to arrange labeling, verification and distribution.
d. A herbarium voucher has been sent to the National Herbarium at the Smithsonian, and the remaining will be distributed by the _____ collecting team to regional herbaria: _____.

By default, besides any herbaria mentioned above, one specimen will be sent to Kew and one to the Smithsonian. If you would like to request that additional specimens be sent to regional and/or local herbaria, please fill in the following information:

Regional Herbarium:	<input type="text"/>	Local Herbarium:	<input type="text"/>
---------------------	----------------------	------------------	----------------------

### If collection has been identified by a specialist, please complete sections below:

Material Identified:	<input type="text" value="In Field"/> <input type="text" value="From Pressed Specimen on Day of Collection"/> <input type="text" value="From Pressed Specimen on Another Date"/> <input type="text" value="From Photograph"/>	Date identified (DD/MM/YY):	<input type="text"/>
Identified by:	<input type="text"/>	Organization:	<input type="text"/>

### Appendix 3. Notification of Transfer and Shipping Invoice

THE FOLLOWING ITEMIZED LIST OF MATERIAL IS TRANSFERRED BETWEEN BLM AND RBG, KEW IN ACCORDANCE WITH TERMS AND CONDITIONS OF THE ACCESS AND BENEFIT SHARING AGREEMENT DATED MAY 9TH 2000.

**SIGNED BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
**Title:** \_\_\_\_\_ **Name:** \_\_\_\_\_  
**For and on behalf of the United States Department of the Interior Bureau of Land Management**

Date of invoice:		Airwaybill number:	
Invoice Number:		Carrier:	DHL Express
Number of pieces:		Total weight:	
Dimensions:	x x cm	Account number:	

<b>Sender:</b>	<b>Receiver:</b>
Name:	Name: Millennium Seed Bank
Address:	Address: Royal Botanic Gardens, Kew Wakehurst Place, Ardingly, West Sussex
Zip Code:	Postcode: RH17 6TN
Country: USA	Country: United Kingdom
Contact name	Contact name Keith Manger
Tel:	Tel 01444-894151
Fax:	Fax 01444-894110

Customs Code number	Reason for export:	Terms of delivery	Full description of Goods	Type of export:	Collected on land managed by Bureau of Land Management?
	scientific study, processing and conservation at Royal Botanic Gardens, Kew	WPX United Kingdom	Non-commercial wild plant seeds collected from USA for scientific purposes; dried pressed plant specimens; associated documents and data forms	Permanent and temporary (Half of the processed seeds will be returned to US by agreement)	Indicate Yes or No
Date Collected	Seed Collection Reference Number	Plant Family	Name of Plant Species	Number of herbarium Duplicates	

**DECLARATION:** I declare that the above information is true and correct to the best of my knowledge, and that the goods are of USA origin. **Total value for Customs \$USD 10**

SIGNED BY: \_\_\_\_\_ NAME: \_\_\_\_\_

Job title \_\_\_\_\_ Date: \_\_\_\_\_

Organization: \_\_\_\_\_

SIGNED ON RECEIPT BY: \_\_\_\_\_ NAME: \_\_\_\_\_

Title: \_\_\_\_\_ DATE: \_\_\_\_\_

For and on behalf of the Board of Trustees of the Royal Botanic Gardens, Kew, United Kingdom



## Appendix 4. Letter to Courier Service

Date

Bureau of Land Management  
Office address

Dear Courier:

Please be advised that this shipment complies with all Plant Health and Convention in the Trade of Endangered Species (CITES) regulations. One of the two following statements regarding plant health regulations is checked and applies to this shipment:

- This package does not need a phytosanitary certificate. It does not contain any material restricted for import into the European Union (EU) under plant health regulations.
- A *Letter of Authority* issued by the Plant Health Officer, Royal Botanic Gardens, Kew accompanies all *Seeds of Success* shipments that contain restricted plant material. The Letter of Authority allows import of such species into the licensed quarantine facilities on their premises at Wakehurst Place, Sussex, United Kingdom (UK), and replaces the phytosanitary certificate issued by the Animal and Plant Health Inspection Service (APHIS). This shipment contains \_\_\_\_\_ which require(s) a *Letter of Authority* for import into the UK.

The Bureau of Land Management does not include any listed (under provisions of the Endangered Species Act) threatened or endangered plant species or plants on Appendix I of CITES in the *Seeds of Success* Program. Appendix I species are not included in this shipment. One or more of the following checked statements covers the status of CITES permits or licenses.

- This shipment does not contain any species listed on CITES Appendix II or III. This shipment contains seeds and/or dried plant specimens that are not controlled by CITES. No permits or licenses are required.
- This shipment contains **seeds** of \_\_\_\_\_, which is/are included on Appendix II or III of CITES. Seeds of plants from the United States listed as Appendix II or III species are exempt from CITES regulations and do not require import licenses or export permits.
- This shipment contains **seeds** of \_\_\_\_\_, which is/are included on Appendix II or III of CITES. An export permit issued by the *US Fish and Wildlife Service*, the US CITES authority and an import license issued by UK authorities are included.

Please be advised that, as the shippers of plant material from public lands in the US, there is close co-ordination between the botany program personnel of the Bureau of Land Management, and the Royal Botanical Gardens, Kew. This close coordination ensures that all shipments are in accordance with all Plant Health and CITES regulations.

Sincerely,

NAME

POSITION

## Appendix 5. Offices and Herbaria Selected to Receive Herbarium Duplicates from SOS

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
IF >1 Dup.	Royal Botanic Gardens Kew Herbarium	K	Stuart Cable s.cable @kew.org		
IF >2 Dups.	US National Herbarium, Botany Section MRC-166 Smithsonian Inst. P.O. Box 37012 Washington, DC 20013- 7012	US	Rusty Russell Coll. Manager 202-357-2534 202-786-2563 f rustell.rusty@nm nh.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	Randy Meyers 907-442-3430
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	Randy Meyers 907-442-3430
AZ930	Arizona State Univ. Herbarium Dept. of Plant Biology PO Box 87101 Tempe, AZ 85287-1601	ASU	Dr. Les Landrum	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	Desert Botanical Garden 1201 N.Galvin parkway Phoenix AZ 85008	Kathy Rice 602-941-1225
AZ010				Arizona Strip FO 345 E. Riverside Dr. St. George, UT 84790- 9000	Lee Hughes 435-688-3229
AZ100				Arizona Strip FO 345 E. Riverside Dr. St. George, UT 84790- 9000	Kari Yanskey 435-688-3379
CA160 (also first BMP)	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	FO Botanist(Vacant) 661-391-6000

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
CA169	UC Jepson	JEPS	Bruce Baldwin 510-643-7008	Goodwin Education Center	Kathy Sharum 661-391-6033
CA170 (also second BMP)	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 (also third BMP duplicate to be sent here)	Anne Halford 760-872-5022
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	Beth Corbin 530-252-5305
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	Joe Molter 530-224-2130
CA370	UC/Jepson Herbarium	JEPS	Bruce Baldwin 510-643-7008		
CA650	Rancho Santa Ana Botanic Garden	RSA	Steve Boyd 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 <b>1ST</b>	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 <b>2ND</b>	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 <b>4TH</b>	Dr. Tass Kelso 719-389-6405
All CO offices <b>3RD</b>	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 <b>5TH</b>	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 <b>6TH</b>	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		
NM	No response to memo				
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 Lin 541-573-4465
OR110				Medford BLM Herbaria, 3040 Biddle Rd, Medford, OR 97504	Mabel Jones 541-618-2269
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	Pamela Camp 509-665-2100

Office/ Team Code	Statewide or Regional Herbaria	Index Herb Code	Contact Info	Local Herbaria chosen	Contact Info
UT930 (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	Walter Fertig 435-644-4363
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	Robert Specht 435-781-4436
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
VA (vnps)	North Carolina Botanical Garden Univ. of North Carolina CB 3280, Coker Hall Chapel Hill, NC 27599- 3280	NCU	Carol Ann McCormick 919- 962-6931 919-962-6930 f herbarium@bio.u nc.edu	WILLI Dept. of Biology The College of William and Mary P.O. Box 8795 Williamsburg, VA 23185-8795	Holly J. Grubbs 757-221-2213 757-221-6483 f willi@wm.edu
WY930	Western Wyoming College				
WY930	Rocky Mt. Herbarium University of Wyoming	RM			

## Appendix 6. 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  
NM??? - Amarillo Field 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 7. Frequently Asked Questions

### *Questions about Species List Assignments*

**Q: What if I want to add a species to my list that is already assigned to another collector?**

Collectors interested in collecting a species on another collector's list should contact that collector to get the switch approved and then notify Oliva Kwong & Mary Byrne of any changes via e-mail to [speciesrequest@plantconservation.org](mailto:speciesrequest@plantconservation.org).

**Q: What if I don't collect everything on my list during the collecting year?**

Unless your collecting group has been contracted for a certain quota, there is no penalty. If a collecting group does not collect all of the species assigned to them by the end of the collecting year, the species will remain on the collector's list until it is collected or traded to another collector.

### *Questions about Collecting*

**Q: How should I collect Orchid seeds?**

**A:** Orchid seeds should be carefully collected as entire, ripe capsules just prior to dehiscence. Ensure that the capsules are completely dry, wrap gently in filter or other absorbant paper, then pack gently into a small rigid plastic box for shipping (tic-tac boxes have worked ok). Seeds that affix directly to the sides of a plastic container will be almost impossible to remove due to static that builds up, but seeds can be easily brushed from paper.

**Q: Can I make repeated collections from the same population to get sufficient seed for a single collection?**

**A:** Seed samples from a single population that are collected over a period of approximately one week are likely to share similar viability, germination and storage characteristics. We recommend that normally, samples from this length period can be combined to achieve a single, larger collection. If seed has to be collected in stages from across the entire season, the initial samples must be held at low relative humidity (e.g. over silica gel) or dispatched to the seed bank to prevent unnecessary ageing. The field data form should be used to record the dates and handling used for the parts of the collection, which should be given a suffix e.g. a, b, c, to allow any variation in the quality of the samples to be managed. We would not normally combine seed from collections over more than one month.

**Q: Can I collect from several locations to get sufficient seed for a single collection?**

**A:** The sampling strategy is intended to achieve a representative sample of the genetic diversity of a single population. Seed samples may only be combined into a single population sample if samples have been collected:

- from groups of apparently similar individual plants from nearby locations, and
- which appear capable of frequent interbreeding (consider the seed dispersal characteristics and the kind of pollination agent for the species - 'nearby' may mean 1 mile for an insect pollinated species, but as far as 10 miles for a wind-pollinated species) if the sampling approach has been consistent at each location, such that that combined sample is truly representative of the population. In this case, it is good practice to note the location of the centre of each sub-population on the field data form. If you have any doubt about combining such samples, it would be wise to select the most suitable sub-population for sampling.

## Appendix 8. References

- Brown, AHD & Marshall, DR (1995). *A basic sampling strategy: theory & practice*. In: *Collecting Plant Genetic Diversity*, Eds. L Guarino, V Ramanatha Rao & R Reid. CABI.
- Bridson and Forman (1998). *The Herbarium Handbook*, Third Edition, edited by Diane Bridson and Leonard Forman, RBG Kew, UK.
- Kartesz, JT (2006). *A Synonymized Checklist and Atlas with Biological Attributes for the Vascular Flora of the United States, Canada, and Greenland*. Second Edition. In: JT Kartesz and CA Meacham. *Synthesis of the North American Flora, Version 2.0-BLM*.
- Massey, J.R. (1974). The Herbarium. In *Vascular Plant Systematics* by A.E. Radford, W.C. Dickison, J.R. Massey and C.R. Bell, Harper and Row Publishers,
- Ross, Tim (1994). *Basic Techniques for Field Documentation of Vascular Plants from Rancho Santa Ana Botanic Garden Workshop on Field Collecting*. Held March, 1994.

## Topic Index

- accession number, 16
- annual report, 5
- Bend Seed Extractory, 23
  - contacts, 28
- BLM
  - collector codes, 39
  - contacts, 27
- Center for Plant Conservation
  - National Collection of Endangered Plants, 29
- CITES, 19
- collecting
  - field data, 15
  - herbarium specimens, 12
  - permission, 8
  - post-harvest care, 16
  - reference number, 16
  - target populations, 9
  - techniques, 13
- collector codes, 16, 39
- conference call, 5
- contacts
  - Bend Seed Extractory, 28
  - BLM, 27
  - main, 25
  - partners, 27
- DHL, 20
  - Shipping Invoice, 32
- distribution, 6
- documentation
  - DHL requirements, 20
  - FedEx requirements, 21
  - field data, 15
  - field data form, 30
  - Letter to Courier Service, 33
  - Notification of Transfer and Shipping Invoice, 32
- FedEx, 21
  - Letter to Courier Service, 33
  - Shipping Invoice, 32
- field data, 15
- field data form, 30
- forms. *See* documentation
- fruits, fleshy, 16
- goals, 4
- herbaria, 34
- herbarium specimens, 11
  - collecting techniques, 12
  - herbaria, 34
- history, 4
- identification
  - herbarium specimens, 11
- introduction, 4
- Letter of Authority, 18
- Letter to Courier Service, 33
- Millennium Seed Bank, 4
- National Coordinator
  - contact information, 25
- nomenclature, 13
- Notification of Transfer, 32
- orchid seeds, 41
- permission, 8
- photos, 15, 16
- Phytophthora ramorum, 19
- phytosanitary certificates, 18
- Plant Health, 18
- populations
  - targeting, 9
- references, 42
- resources, 5
- sampling, 10
  - populations, 9
- seed
  - distribution, 6
  - storage, 6
- seed collection reference number, 16
- seeds
  - orchid, 41
- Seeds of Success, 4
  - goals, 4
  - history, 4
- shipping, 20
  - Bend Seed Extractory, 23
  - CITES, 19
  - DHL instructions, 20
  - FedEx instructions, 21
  - fruits, fleshy, 16
  - herbarium specimens, 11
  - Kew, 17
  - packaging, 17
  - prohibited (UK), 18
  - restrictions, 18

species

- excluded, 7
- list, 5, 7
  - questions, 41
  - switches, 41
- prohibited (UK), 18
- rare, 7, 29
- request, 7
- target, 5
  - identifying, 6
- storage, 6
- sudden oak death
  - hosts, 19
- taxonomy, 13

techniques

- fruits, fleshy, 16
- herbarium specimens, 12
- multiple location collections, 41
- post-harvest care, 16
- repeated harvest collections, 41
- sampling, 10
- seed collecting, 13
- training, 5
- verification
  - Kew taxonomists, 12
  - local taxonomists, 12
- voucher specimens. *See* herbarium specimens