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Seed Banking Federally Listed Mainland Plant Species on DoD Lands

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Final Report: Seed Banking Federally Listed Mainland Plant Species on DoD Lands

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Overview: The Center for Plant Conservation (CPC), through its network of participating Institutions, works to conserve species from extinction by active programs in seed banking, plant propagation, and other related conservation work. The goal of this multi-year project was to collect and secure material from federally listed mainland plant species that occur on Department of Defense lands. This final reports details deliverables on this grant. See Appendix 1 for the proposal abstract.

Partners: The following CPC Participating Institutions have contributed work on this project: Atlanta Botanical Garden, The Berry Botanic Garden, Bok Tower Gardens, Denver Botanic Garden, Desert Botanical Garden, Arboretum at Flagstaff, Holden Arboretum, Mercer Arboretum and Botanic Garden, Missouri Botanical Garden, North Carolina Botanic Garden, New England Wildflower Society, New York Botanical Garden, Rancho Santa Ana Botanic Garden, Red Butte Garden and Arboretum, Santa Barbara Botanic Garden, University of California Botanical Garden, University of Washington Botanical Garden

Status: This project is complete. The Center for Plant Conservation recently hired a new Executive Director and the organization has worked intensely to obtain final reports from all partners involved. Letters of inquiry were sent to all 18 partners asking for project updates and current status of collections that resulted from this project.

Results Brief: All work is completed on this project. All collections were either completed in previous years or were not conducted for a variety of reasons. Seeds have been banked in US facilities including at our partner institutions as well as the USDA-ARS Seed Bank in Ft. Collins, CO. Summaries of these seed collections are detailed under each participating institution in this report.

Summary Analysis: Of the 18 participating institutions contributing to this project, as many as 148 samples were collected from as many as 61 targeted species. National Tropical Botanical Garden reported the most collections as they included in their report a number of rare species in Hawaii that were collected but not originally part of the targeted species. One institution did not make collections because of adverse conditions. Two institutions did not issue final reports at the time of this final report. A summary of these collections with additional comments can be seen in Table 1.

Table 1. Summary of Seed Collections made by participating institutions.

Institution	Number of Samples	Number of Species	Comments
Atlanta Botanical Garden	2	2	
Arboretum at Flagstaff	1	1	
Berry Botanic Garden	3	2	
Bok Tower Garden	1	1	
Denver Botanic Garden	0	2	No collections were made
Desert Botanic Garden	3	1	
Holden Arboretum	3	1	
Mercer Arboretum	2	2	
Missouri Botanical Garden	15	3	
National Tropical Botanical Garden	100	30	
New England Wildflower Society	-	1	A final report was not received
New York Botanical Garden	-	1	A final report was not received
North Carolina Botanical Garden	2	2	
Rancho Santa Ana Botanic Garden	1	2	
Red Butte Garden	1	1	
Santa Barbara Botanic Garden	12	7	
University of California Berkeley	1	1	
University of Washington Botanic Garden	1	1	
Total Collections	148	61	

Outcomes: It appears that a substantial amount of funding on this project was not expended, a result of poor collecting conditions where species occur. Despite this, a number of collections were made over the course of this project and have been secured in CPC-affiliated seed banks and are now available for long-term conservation storage and/or reintroductions or other worked deemed appropriate as stipulated in the terms of the project proposal. Partners are continuing to conduct research on these species. The overall program has been a success and a number of rare species are secure from extinction as a result.

Detailed Account of Collections

The follow are summaries for work completed by each of the 18 CPC Participating Institutions. Details for species collected and what species were targeted is included. Treatment methods vary from institution to institution and as a result, reporting structure varies. Details from individual reports are included where appropriate.

Atlanta Botanical Garden (ABG), Georgia

Number of samples: 2 (at least)

Number of species: 2

Populations from each of two species were visited and seed collections were made at both. Of these, seeds were kept at ABG for germination trials and backups were sent to USDA-ARS.

Additional details: Atlanta Botanical Garden (ABG) participated in two years of a joint cooperative project to obtain seed collections for two rare plants, *Trillium reliquum* and *Xyris tennesseensis*. The ABG submitted federal collection permits, communicated with federal and state conservation agencies, conducted field surveys, and collected seed from the two rare plants in the field. Additional propagation experiments were conducted in the ABG micro-propagation lab because *Trillium reliquum* has recalcitrant seeds. Seed were sent to Andrea Lawrence at the USDA-ARS National Center for Genetic Resources Preservation in Fort Collins, CO. Field data was also used to update the CPC accession database.

Arboretum at Flagstaff (AF), Arizona

Number of samples: 1

Number of species: 1

One species was targeted as part of this project. Samples were successfully collected and banked.

Additional details: *Arctomecon californica* was targeted.

Berry Botanic Garden (BBG), Oregon

Number of samples: 3

Number of species: 2

Two species were targeted by BBG. Samples were collected three times and material is now stored at BBG and USDA-ARS.

Additional details: The Berry Botanic Garden collected the listed species *Sidalcea nelsoniana* and *Lupinus sulphureus* ssp. *kincaidii*.

Bok Tower Garden (BTG), Florida

Number of samples: 1

Number of species: 1

One species was targeted by BTG and a collection trip was made in 2011. A collection was successfully made during this trip and seeds have been sent to USDA-ARS.

Denver Botanic Garden (DBG), Colorado

Number of samples: 0

Number of species: 2 (targeted)

No samples were collected as part of this project. Extenuating circumstances were explained in a brief report.

Additional details: Ute's ladies tresses (*Spiranthes diluvialis*, federal-listed as Threatened) have the potential to exist on Fort Carson, but none have been found (Douglas et al. 1995). No federal-listed (Endangered, Threatened, or Candidate) plant species are known to occur on Fort Carson (DECAM 2000b). Searches of wetlands in 1994 and 1995 found none, and 1995 and 1996 searches of Turkey Creek found none (Douglas et al. 1995). No historic records on Fort Carson. *S. diluvialis* is not known to occur on Fort Carson. El Paso county records for this species are from sites west of the installation.

Desert Botanic Garden (DBG), Arizona

Number of samples: 3

Number of species: 1

DBG made three successful collecting trips and were able to collect significant seed each time. Seed is now stored at DBG and at USDA-ARS.

Additional details: *Coryphantha sneedii* var. *sneedii* was targeted.

Holden Arboretum (HA), Ohio

Number of samples: 3 (from three populations)

Number of species: 1

One species was targeted by Holden Arboretum as part of this project. 5 populations were visited and collections were made at three of these. A total of ~3100 seeds were collected. Seed were sent to USDA-ARS; some seed were retained for propagation. Thirty four plants were produced and these are being maintained at Holden Arboretum as part of the conservation and education collection.

Additional details: The objective was to determine the size and phenology of the population of *Solidago houghtonii* (the targeted species) at Camp Grayling Military Reservation in Grayling, Michigan as this information was imperative in determining how many seeds we could collect within the confines of

guidelines set-forth by Guerrant et al (CPC 2004). In general, the populations of *S. houghtonii*, although dominated primarily by basal rosettes, appeared to be large and healthy throughout Camp Grayling. With minimal management, including opening the canopy at all locations except M Route 72, and minimizing human impacts such as ATV use, camping, and dumping, *S. houghtonii* should continue to thrive.

Mercer Arboretum (MA), Texas

Number of samples: 2?

Number of species: 2

Only one invoice for work on this project was submitted to CPC. Two species were worked on including obtaining details on species distributions.

Additional details: *Isoetes louisianensis* and *Lindera melissifolia* were targeted.

Missouri Botanical Garden (MBG), Missouri

Number of samples: 15

Number of species: 3

MBG collected approximately 15 samples as part of this project representing 3 species (the total targeted by MBG). Difficulty was encountered in finding suitable populations for at least one species (*Aprios priceana*). However, other collection sites were visited and specimens were collected. Seeds from all three species are now banked at MBG's facilities in St. Louis as well as back up material stored at USDA-ARS.

Additional details: As a participating institution in the CPC network, MBG has been contracted to collect seed of Price's Potato-Bean (*Aprios priceana*) from Redstone Arsenal in Alabama, Running Buffalo Clover (*Trifolium stoloniferum*) from Bluegrass Army Depot in Kentucky, and Eggert's Sunflower (*Helianthus eggertii*) from Arnold Air Force Base / Tullahoma Training Site in TN. USFWS permit # TE237537-0 was issued (effective 05/17/2011) to authorize collection of *A. priceana* (Federally Threatened) and *T. stoloniferum* (Federally Endangered). A federal permit was not required for *H. eggertii* since this formerly federally threatened species was delisted in 2005.

A. priceana and *H. eggertii* were collected in the fall of 2011, and *T. stoloniferum* was collected in the spring of 2012. All seeds have been cleaned and sent to the National Center for Genetic Resource Preservation in Fort Collins, CO. Data for all accessions has been entered into the CPC database, and high resolution digital photographs, a signed photo release, and photo metadata have been supplied.

National Tropical Botanical Garden (NTBG), Hawaii

Number of samples: ~100

Number of species: ~30

NTBG collected approximately 100 samples from approximately 30 species of concern in Hawaii. Of these, seed collections are currently banked at NTBG's seed bank facility in Hawaii. A number of samples were sent to USDA-ARS in Ft. Collins. In addition to seed collections, cutting were made from many specimens and these were used for propagation at NTBG's nursery facilities on Kauai. The success of these cuttings and their current disposition was not reported.

Additional details: Some of these collections appear to be related projects and not supported directly under this grant.

New England Wildflower Society (NEWS), Massachusetts

Number of samples: ?

Number of species: 1 targeted

Additional details: *Isotria medeoloides* was targeted. At the time of this final report, we have not received a report from NEWS.

New York Botanical Garden (NYBG), New York

Number of samples: ?

Number of species: 1 targeted

Additional details: *Helonias bullata* was targeted. At the time of this final report, we have not received a report from NYBG.

North Carolina Botanical Garden (NCBG), North Carolina

Number of samples: 2

Number of species: 2

NCBG was able to make two collecting trips and samples were collected on each of these trips. Samples have been deposited at USDA-ARS in Ft. Collins.

Additional details: *Echinacea laevigata* and *Schwalbea americana* were targeted.

Rancho Santa Ana Botanic Garden (RSABG), California

Number of samples: 1

Number of species: 2 (targeted; only one collected)

The severe drought in California inhibited successful seed collection in one species. Samples from the other species were collected and these are deposited at both RSA and USDA-ARS in Ft. Collins. A detailed report was provided by RSABG.

Additional details: Rancho Santa Ana Botanic Garden (RSABG) made targeted ex-situ seed collections of two Federally listed plant species: *Brodiaea filifolia* (thread stemmed brodiaea, Themidaceae), and *Chorizanthe orcuttiana* (Orcutt's spineflower, Polygonaceae).

Red Butte Garden (RBG), Utah

Number of samples: At least 1

Number of species: 1

RBG has made a number of trips to collect samples. Staff changes at RBG delayed reporting and invoicing. We are currently working with RBG to get final information on their collections.

Santa Barbara Botanic Garden (SBBG), California

Number of samples: 12

Number of species: 7

SBBG was very successful in making collections and obtained a total of 12 samples from species targeted. Samples are currently in storage at SBBG and backup collections were prepared to be sent to USDA-ARS at last report.

Additional details: *Chlorogalum purpureum*, *Cirsium fontinale* var. *obispoense*, *Eriodictyon capitatum*, *Galium buxifolium*, *Layia carnosa*, *Malacothrix indecora*, and *Phacelia insularis* ssp. *insularis* were targeted by SBBG.

University of California Berkeley (UCB), California

Number of samples: 1

Number of species: 1

UCB made one successful trip to collect specimens. These are now in storage at UCB and backups are scheduled to be sent to USDA-ARS.

Additional details: *Chorizanthe pungens* var. *pungens*, *Chorizanthe pungens* var. *pungens*, *Gilia tenuiflora* ssp. *arenaria*, *Holocarpha macradenia*, *Lasthenia conjugens*, and *Piperia yadonii* were targeted.

University of Washington Botanic Garden (UWBG), Washington

Number of samples: 1

Number of species: 1

Only one collection was made as part of this project.

Appendix 1. Proposal Abstract.

As part of a past Legacy project (#07-368), the CPC evaluated ex situ (off site) coverage for DoD species and identified 71% (130 species) of federally listed plants known to occur on DoD lands which currently have no known seed collections from sites under DoD jurisdiction. The lack of ex situ material suitable for species restoration work impedes efforts to maintain and manage plant biodiversity on DoD lands. With climate change, vulnerable plants are expected to face significant challenges and increasingly will need active management and restoration work. CPC and its participating institutions (PIs) propose initiation (Phase I) of a partnership to address this unmet need. We will collect seed of a minimum of 20 of these species located on DoD installations across the U.S.

DoD is responsible for upholding the Endangered Species Act (ESA). To protect and manage ESA species, recovery plans outline actions necessary to restore federally listed species. Eighty-six percent of recovery plans note ex situ work (augmentation and reintroduction) as an action needed for recovery. Securing wild-collected seed will safeguard the genetic integrity of declining populations, provide a seed bank resource for immediate and future restoration needs, and create a safety net against unforeseen future threats of extirpation. Seed collections will also provide material to fulfill additional research tasks identified in recovery plans (reproductive biology, genetic analysis, etc.). PIs will focus on collecting optimal genetic material of priority species using CPC protocols [cited in the United States Fish and Wildlife Service (USFWS) Policy Regarding Controlled Propagation of Species Listed under the Endangered Species Act (FR65:183, p 56916)] and then depositing them at the National Center for Genetic Resources Preservation (NCGRP). Although the final Phase I species list will determine the number of PIs that will participate, currently we expect to coordinate the work of about 10 PIs. Given current rate of travel costs, CPC and its PIs estimate approximately a 30% in-kind match in staff time and services for this project. CPC has a formal and active cooperative agreement with the NCGRP to house CPC's seed collections of vulnerable plants of the United States. For added security and where collection sizes permit, material will be backed-up at the PIs facilities and charged with the maintenance of these species. Collections will be accessioned by including the provenance, site description information, and seed information in the central database of CPC. The database is maintained by CPC and serves as a resource for CPC for future species restoration planning. The database can track the age, location, and availability of ex situ material for research and restoration work.