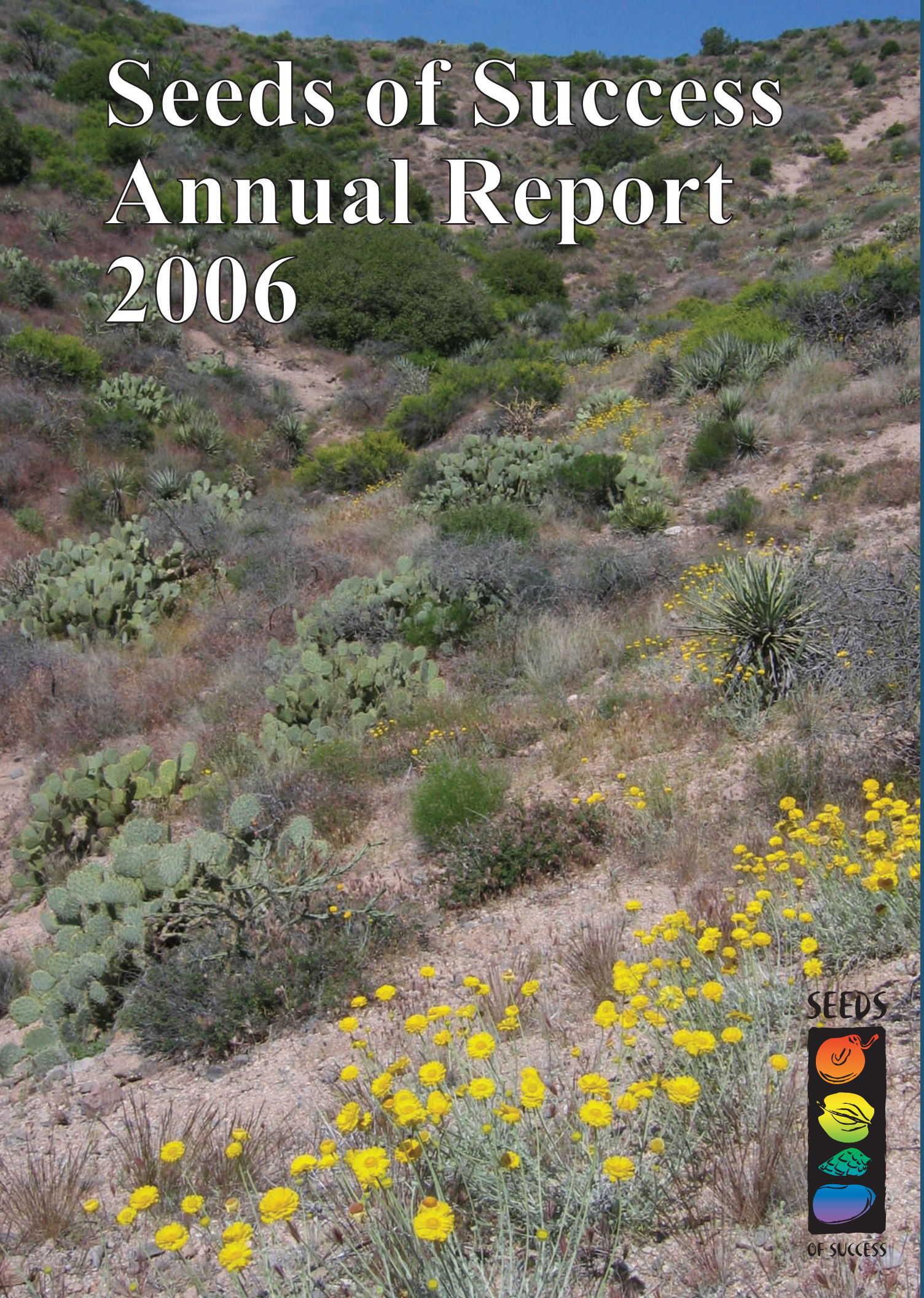
Seeds of Success Annual Report 2006



National Native Plant Materials Development & Conservation Program

SEEDS OF SUCCESS

Seeds of Success
Division of Fish, Wildlife, and Plant Conservation
Bureau of Land Management
Department of the Interior
1849 C Street NW, LSB-204
Washington, DC 20240

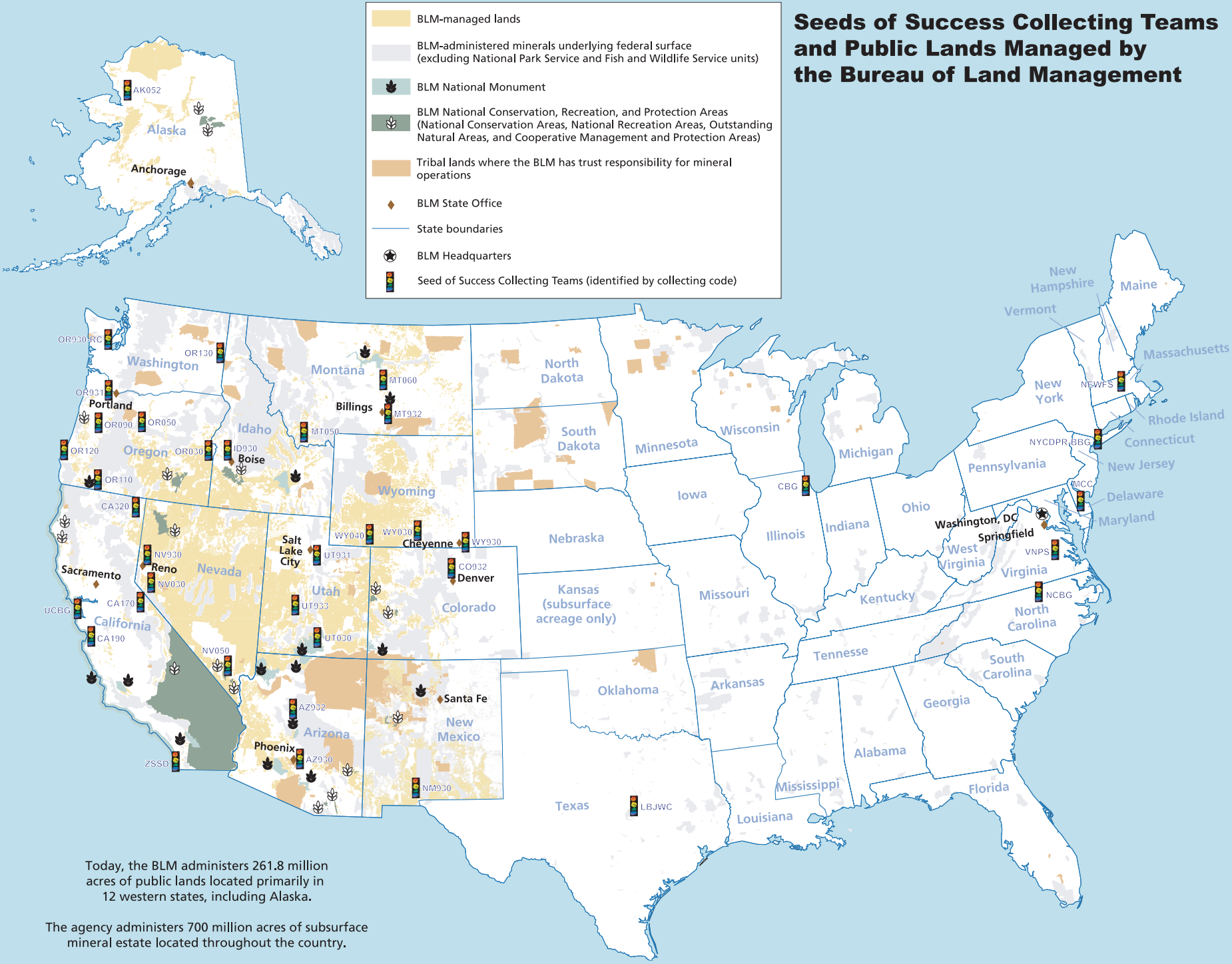
Acknowledgements

Seeds of Success could not have had such a successful year without the support of committed institutions, dedicated volunteers, and knowledgeable botanists. The Bureau of Land Management would like to extend a special thank you to the Royal Botanic Gardens, Kew Millennium Seed Bank who provide financial and technical support.

Table of Contents

Seeds of Success Collecting Teams and Public Lands Managed by the Bureau of Land Management (map) 2
Seeds of Success 3
2006 Collection Numbers by Team 3
Bureau of Land Management Collects Despite Devastating Fire Year 4
Federal Partnerships Help CPC Mission to Save Imperiled Plant Species Across Nation 5
Repatriation and Restoration Research Update 6
Bend Seed Extractory Update 7
Solving Seed Germination Problems 8
Nevada Ethnobotany and the Seeds of Success Program 9
Making the Collection: Chicago Botanic Collection 9
Seeds of Success: A Twenty-first Century Hunter-gatherer 10
Appendix 1: 2006 Collections Statistics 11
Appendix 2: Technology Transfer Activites 12

Seeds of Success Collecting Teams and Public Lands Managed by the Bureau of Land Management



Today, the BLM administers 261.8 million acres of public lands located primarily in 12 western states, including Alaska.

The agency administers 700 million acres of subsurface mineral estate located throughout the country.

Seeds of Success

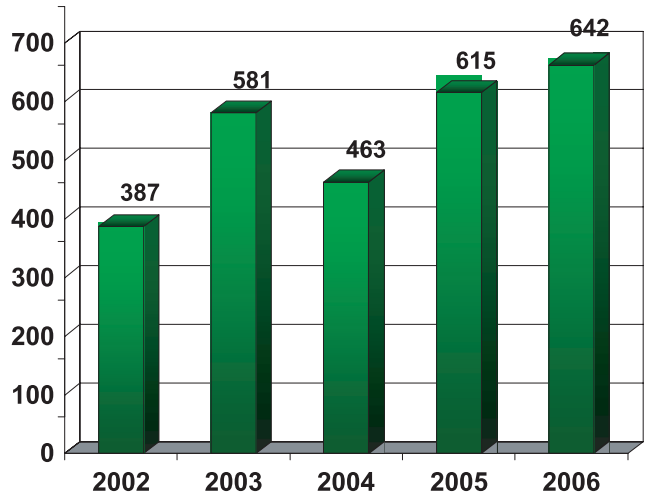
The Seeds of Success (SOS) program was established by Bureau of Land Management (BLM) and Royal Botanic Gardens (RBG), Kew in 2001 as a Plant Conservation Alliance (PCA) initiative to collect, conserve, and develop native seed materials for restoration across U.S. SOS is part of a larger effort, the National Native Plant Materials Development Program, whose main purpose is to make native seed and plants more readily available to public agencies while stimulating the private sector.

While the initial focus of the Seeds of Success program was the dryland flora of the American West, 2006 saw the expansion of the program to the East Coast. Mt. Cuba Center, Inc., New England Wildflower Society, New York Dept. of Parks and Recreation with the Brooklyn Botanical Garden, North Carolina Botanic Garden, and Virginia Native Plant Society all joined the SOS program in collecting efforts east of the Appalachians. Their efforts will be a major contribution to the diversity of material in the SOS working collection.

To date, BLM's numerous collecting teams have covered the most ground and made the most collections. Partners such as the Chicago Botanic Garden and Lady Bird Johnson Wildflower Center, which cover the prairie states and Texas respectively, are making significant contributions.

Working collections are processed at the U.S. Forest Service's Bend Seed Extractory before incorporation into the USDA-ARS National Plant Germplasm System. The next material transfer from Bend to ARS is set for October 2007, freeing storage space for the processing and storage of collections with restoration and research potential in 2007 and beyond.

For more information regarding Seeds of Success please contact: Peggy Olwell, BLM Plant Conservation Program Lead, 202-452-7767 or Mary Byrne, SOS National Collections Data Manager, 202-452-7767.



Over the past 6 years, almost 3,000 collections have been made of over 2,000 native species

2006 Collection Numbers by Team

BLM - Alaska - Northern Field Office	8
BLM - Arizona - Desert Botanical Garden	38
BLM - Arizona - Arboretum at Flagstaff	22
BLM - California - Hollister Field Office	13
BLM - California - Alturas Field Office	7
BLM - Colorado - State Office	25
BLM - Idaho - Jarbrige Field Office	4
BLM - Montana - State Office	2
BLM - New Mexico - State Office	34
BLM - Nevada - Carson City Field Office	13
BLM - Oregon - Vale District Office	23
BLM - Oregon - Eugene District Office	4
BLM - Coos Bay District Office	3
BLM - Oregon - Rare Care	23
BLM - Oregon - Berry Botanic Garden	25
BLM - Univ. of California Botanical Garden	6
BLM - Utah - Red Butte Garden & Arb.	19
BLM - Wyoming - Rawlins Field Office	2
BLM - Wyoming - Rock Springs Field Office	2
BLM - Wyoming - State Office	4
Chicago Botanic Garden	186
Lady Bird Johnson Wildflower Center	73
Mt. Cuba Center, Inc.	1
New York Dept. of Parks and Rec. with Brooklyn Botanic Garden	16
North Carolina Botanical Garden	10
Zoological Society of San Diego	79
TOTAL	**642**

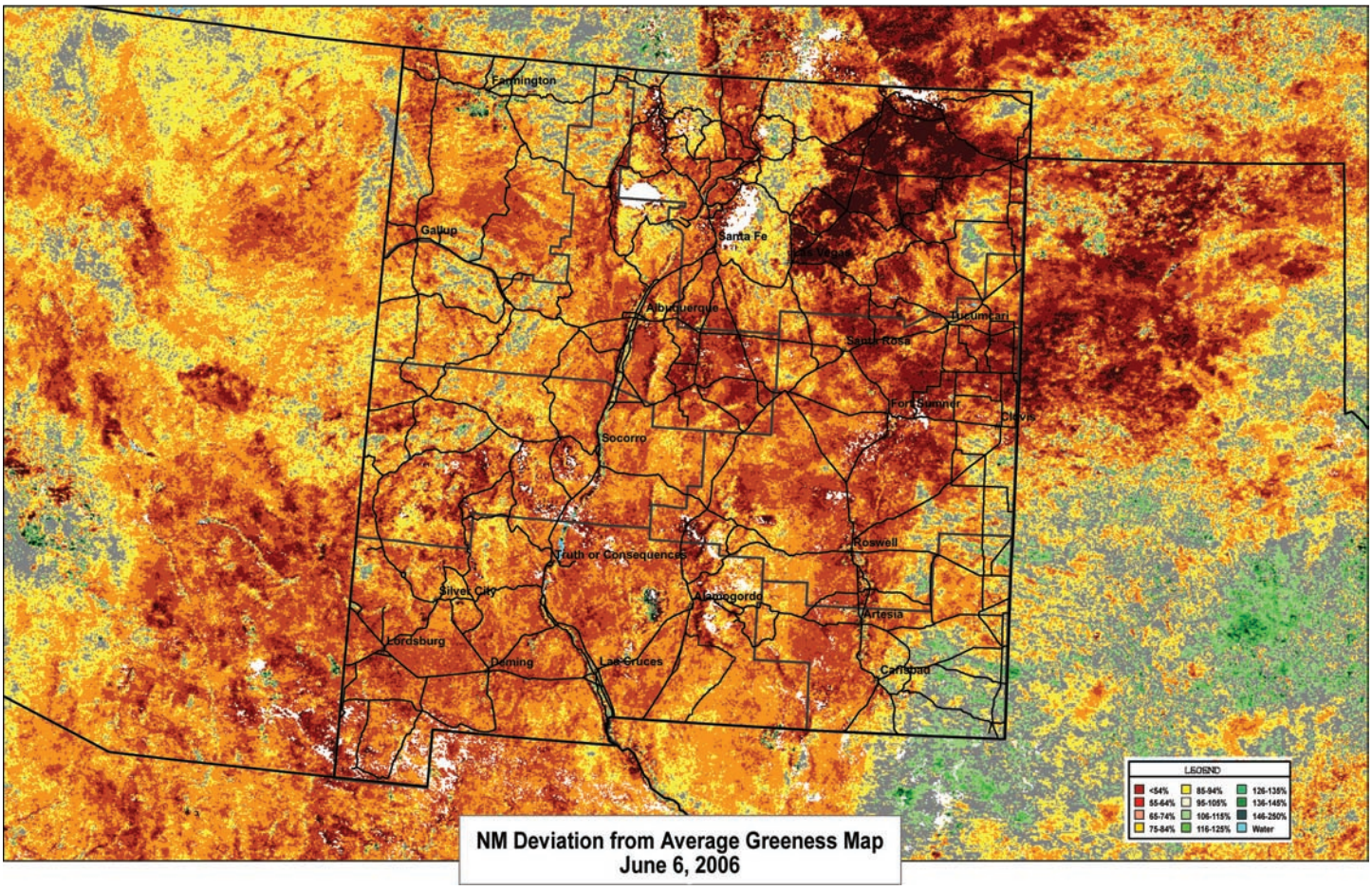
Bureau of Land Management Collects Despite Devastating Fire Year

by Mary Byrne, Bureau of Land Management

More acreage burned in 2006 than in the last 50 years. By December, the BLM's total area burned was surpassing 2.4 million acres. Despite devastating drought and fire, the BLM continued to ramp up its collecting efforts, knowing that native seed collections will be a major force in restoring the damaged landscape.

When severe drought plagued the southwest for most of 2006, the New Mexico State Office Team (NM930) was calculating a total loss for the collecting season by mid-summer. This was going to be the first year for the New Mexico team, and the outlook was not good. (See the New Mexico Deviation from Average Greeness Map below). New Mexico State Botanist, Mike Howard, had a target list, populations scouted, and a solid team of 3 Conservation and Land Management Interns from the Chicago Botanic Garden, but no rain.

Rain finally came in August, breaking the drought, and previously reluctant populations began putting out flowers and setting seed. The New Mexico team rallied to make 34 collections in 2006, sending material to the Millennium Seed Bank and multiple restoration collections to the Bend Seed Extractory.



NM Deviation from Average Greeness Map
June 6, 2006

Federal Partnerships Help CPC Mission to Save Imperiled Plant Species Across Nation

Program administered by the Bureau of Land Management aims to re-seed federal lands ravaged by wildfires

Courtesy of the Center for Plant Conservation

Financial experts say that investing today will ensure a more secure tomorrow. This common-sense approach drives CPC's mission. It also drives the National Native Plant Materials Development Program, administered by the Bureau of Land Management (BLM) through the Plant Conservation Alliance. Citizens everywhere should know about the importance of this program.

The CPC national office and 11 participating institutions are cooperators with the BLM in this program supporting restoration of native vegetation. Specifically, funding is appropriated to BLM within the Department of Interior's budget for Wildland Fire Management. The Forest Service also receives funding through the U.S. Department of Agriculture's Forest Service budget in its fire program.

The National Native Plant Materials Development Program is designed to collect and distribute native plant seed materials to agency partners so they can make the materials available for wildland revegetation and restoration. The program aims to increase the supply of native plants for BLM, U.S. Fish and Wildlife Service, U.S. Forest Service, National Park Service, and Bureau of Indian Affairs to complete large native revegetation projects after fires.

Through the work of CPC institutions, the program holds great promise to solve the gap in production and seed quality that has held back the use of native plant materials nationwide. Most native plant material production has been by small businesses that don't have the capacity for research and development to increase the variety and amount of materials available. This program will help solve that problem, provide new product niches for small and large seed businesses, and will help CPC achieve better quality restoration projects and help reduce the threat of invasive species.

The program is cost-effective too. It works in partnership with conservation organizations, such as CPC and the Student Conservation Association, that provide expert and volunteer labor inexpensively, and help match the federal funds. Community and student groups meet their missions too. The benefits are multiplied when their visitors and volunteers see the success of these efforts. They can see themselves as engaged in stewardship of our wildlands and their investment in the future.

Eleven CPC institutions have been funded for seed collections for the program over the last several years through cooperative agreements with CPC and BLM. But there is a lot of work left to do to help this interagency program meet its potential as guided by a 10-year budget strategy. CPC will continue to serve as a valuable partner in this effort.

For more information regarding the Center for Plant Conservation contact, Jo Meyerkord, Communications Coordinator, Center for Plant Conservation, 314-577-9541, Jo.Meyerkord@mobot.org.

Desert Botanic Garden, a CPC garden, collects for BLM.

Repatriation and Restoration Research Update

by R.C. Johnson and Mike Cashman, Western Regional Plant Introduction Station

Native seed collections through the Seeds of Success (SOS) program have been received, catalogued, processed, and stored within the National Plant Germplasm System. In 2006, the Western Regional Plant Introduction Station (WRPIS) received 615 accessions collected through SOS and repatriated from Kew gardens. Collection details for each accession have been documented in the Germplasm Resources Information Network (GRIN). For all accessions, at least 5,000 seeds were placed in long-term storage (-20°C); half at the National Center for Genetic Resource Preservation (NCGRP), Fort Collins CO, and half at the Western Regional Plant Introduction Station (WRPIS), Pullman WA. The remaining seeds of each accession were placed in the WRPIS active collection at 4°C for potential distribution to the user community. A total of 424 accessions had sufficient seed quality to be in the active collection and available as needed for research and testing.

The SOS project has simulated research on key species needed for restoration and revegetation on BLM managed land. After consultations with BLM, collections of *Pseudoroegneria spicata* (Bluebunch wheatgrass), *Poa secunda* (Sandburg bluegrass), *Achnatherum hymenoides* (Indian ricegrass), and *Allium acuminatum* (Taper-tip onion) have been expanded across the Great Basin. So far common garden studies of *Pseudoroegneria spicata*, *Achnatherum hymenoides*, and *Allium acuminatum* have been established and data collection is underway. These studies are expected to uncover new, adapted germplasm for restoration and revegetation on BLM managed lands.

4°C working collections at the USDA-ARS Western Regional Plant Introduction Station in Pullman, Washington.

Bend Seed Extractory Update

by Nita Rauch, Bend Seed Extractory, U.S. Forest Service

For the 2006 seed processing year, which started after April 12, 2006 and we finished billing through May 31, 2007, 91 different seedlots from 8 states for the SOS program were received. Of those 91 seedlots, we needed to update and photograph 53 species. Approximately 85% of that 53 were new species, the others were subspecies or species we didn't get photographed from previous years'collections.

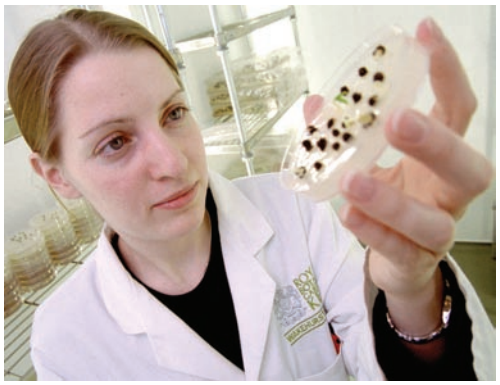
Our most challenging species from the SOS program this year were *Anemone tuberosa* and *Fouquieria splendens*, which both presented the challenge of removing the very "fuzzy" outer layer from the seedcoat. After various methods were tried the most effective method was to soak the seed in very mild solutions of either a weak bleach solution or a product called Pectinex, which removed the "fuzz." Both these types of procedures are used for the berry crops to remove the flesh from the seedcoat.

For more on the Forest Service's Bend Seed Extractory contact Nita Rauch at nrauch@fs.fed.us, 541-383-5646.

BLM Carson City Field Office collecting team examines a transect.

Solving Seed Germination Problems

by Sarah Gattiker, Curation, Millennium Seed Bank



MSB scientist at work.

Problematic germination is not an uncommon scenario for members of the Millennium Seed Bank's Curation Section. Between 1st April 2006 and 31st March 2007, 4302 species were set-up for an initial germination test. Out of those, 1732 or 40% failed. To pass the germination test, 75% or more seeds need to germinate.

Curation deals with this dilemma by dividing the failed collections by family. A staff member is then assigned to solve germination issues for each "Problem Family." The difficulties mainly arise with most of the seeds being incredibly small (around or under 1mm) and the family being something of a taxonomic jumble.

Numerous Scrophulariaceae have been donated to the Millennium Seed Bank Project by Seeds of Success. Several of these species are familiar to many people, since the family includes the well-known Castillejas and Penstemons.

After assessing nearly two hundred failed germination test sheets, I divided the family by genus in an attempt to tackle the problem. There were thirty-five Penstemons waiting testing, thirty-three of which were from the USA and I decided to focus my efforts on those. Some of the seeds had never shown any signs of germinating, but others were a little more hopeful with an average of around 35% germination.

For the collections which had shown some signs of life, I setup the germination test again with the addition of Gibberellic acid (GA3) to the 1% agar media. GA3 is known for its uses as a hormone in promoting germination in difficult seeds. I also noticed that few of the tests had been setup at low temperatures with the standard initial testing temperatures being 15, 20, 25˚C. After a few singular experiments and with the help of my team, twenty-nine different species were setup in November 2006 at a low temperature of 0 or 5˚C and a higher temperature if they had indicated some germination potential. To maximize the chance of passing the test, I aimed to use any of the tests at lower temperatures that did not show any signs of germination as a cold stratification.

Thankfully our hard work paid off; all but one of the Penstemons germinated at one of the temperatures. It became apparent that the problematic Castillejas required either 0 or 5˚C and GA3 to germinate. The Penstemons also either germinated at 5˚C on GA3 or after a cold stratification, geminated at approximately 20˚C on GA3. The originating collection site and altitude had little effect on the germination criteria, apart from species from Oregon which required cold temperatures to promote germination.

Consequently, Scrophulariaceae germination from US species has now been solved with a pass rate of 87%. They are no longer as much of a problem as first thought.

Some of the Scrophulariaceae seeds collected by Seeds of Success teams.

Nevada Ethnobotany and the Seeds of Success Program

by Dean Tonenna, Carson City Field Office Botanist, Bureau of Land Management

The Carson City Field Office (NV030) is working with the Seeds of Success team to help collect native seed from plants that are traditionally important to the Paiute, Shoshone and Washoe Tribes of western Nevada and eastern California. The seeds are available for Tribes to use in restoration projects on Tribal lands and for use by the BLM in restoration projects.

Seeds of Success mentor and BLM botanist, Dean Tonenna, has given talks about the Seeds of Success program. Dean talks about the Seeds of Success program and presents examples of BLM projects where Tribal partners are assisting with restoration projects to ensure that traditionally important plants are included in the list of plant species to be used in restoration efforts.

Spacing trials for restoration research.

Ethnobotanical species included in this project are: *Achnatherum hymenoides*, *Allium parvum*, *Bromus marginatus*, *Calochortus bruneaunis*, *Calochortus leichtlinii*, *Descurainia paradisa*, *Ericameria bloomeri*, *Lepidium lasiocarpum*, *Lewisia nevadensis*, *Leymus cinereus*, *Lilium parvum*, *Melica bulbosa*, *Mentzelia albicaulis*, *Mirabilis alipes*, *Penstemon heterodoxus*, *Penstemon newberryi*, *Pleuraphis jamesii*, *Psoralidium lanceolatum*, and *Stanleya pinnata*.

Making the Collection: Chicago Botanic Garden

Hardest seed collection: *Mirabilis linearis*, narrowleaf four o'clock

by Betsy Allen and Emily Yates, Chicago Botanic Garden

The beautiful flower and interesting stature of narrowleaf four o'clock beguiles its difficulty in collecting its seeds. Last fall, we collected this species with the help of two Millennium Seed Bank employees at the Konza Prairie in the Flint Hills of Kansas owned by The Nature Conservancy and Kansas State University. It took 6 people for a total of 40 hours to collect roughly 5,000 seeds of this species. Each flower only produces one seed and although each plant produces numerous flowers, the seeds drop from the plant with even the suggestion of a sneeze. It was both comical and frustrating while we tried to collect. In the end we probably dispersed more than we actually collected, but we got the job done.

Bison grazing on the prairie in Kansas.

Seeds of Success: A Twenty-first Century Hunter-gatherer

by Ellen Kuhlmann, Rare Care, University of Washington

Rare Care became part of Seeds of Success in 2004, under the guidance of the BLM Oregon-Washington State Office. I joined the team in early 2006 to lead Rare Care's seed collection efforts. Before joining Rare Care, I had had little interest in, or experience with, seeds and seed collection. I usually timed my wildflower excursions to coincide with flowering periods. Professionally, I had often worked in one area throughout an entire growing season, so I learned to identify many species from the seedling through the senescent stages. But I had rarely looked at the seeds; they were only of interest if needed to make a definitive species identification.

So now I was facing something new. Questions crowded my mind. How long did it take for seed to develop to maturity? How long would the seed be mature and available for collection, that is, not dispersed? And at a fundamentally important level—what does a mature seed look like? How do you know when it is fully-grown and developed?

These questions had no easy answers. I learned that the rate of seed development varied by species and also within a species as maturation rates are affected by weather conditions and habitat. Seed size, shape, and color also vary among species; there are no absolutes. But there are some common trends in seed development. A rough estimate of maturation time from flower to mature fruit is four to six weeks for many native species in Washington State. Immature seeds are usually green, and become beige or brown throughout when mature. Seeds with viable embryos inside are plump, and the presence of an embryo can be confirmed by cutting the seed open and peering inside.

Many factors go into a successful seed collection. Wild plants resist modernization, growing where it best suits them; no neat rows of field edges mark population borders. One needs to go on a hunt of sorts to find them, using your senses and skills: a sharp eye to recognize the pattern of a specific species, persistence to search for and watch a population as the seed matures, a keen sense of timing to be there when the seed is ripe, the dexterity to harvest it, and the knowledge of how to process the seed and package it for long-term storage.

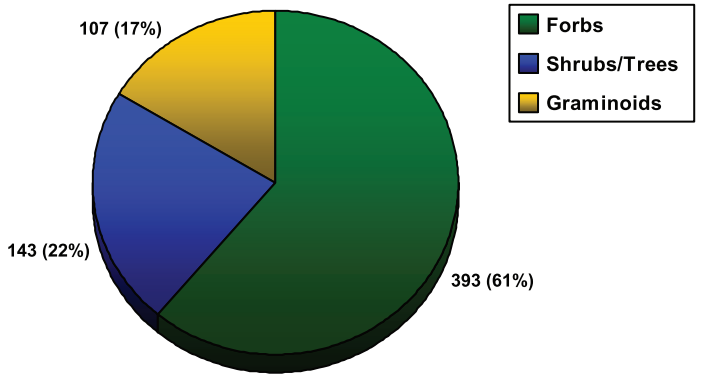
When a population large enough to support seed collection is found, and a good estimate of when it will be ready for harvest has been made, then the collection team is assembled. This past summer, I relied upon the aid of fourteen valiant volunteers who participated in many aspects of the program.

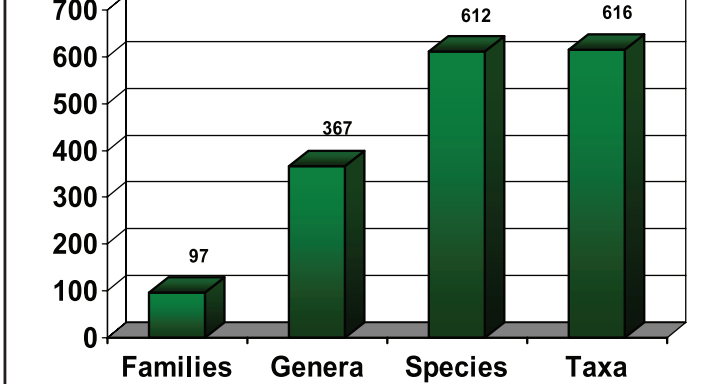
Even the best-laid plans can go awry. This past season, we encountered several pitfalls that complicated our seed collection efforts. A few chosen populations, including ones of great red paintbrush (*Castilleja miniata*) and mountain arnica (*Arnica latifolia*), had little seed maturation due to insect infestation. Populations of beadlily (*Clintonia uniflora*) and devil's club (*Oplopanax horridus*) had plentiful fruit development, but the local fauna beat us to the harvest.

The Rare Care team completed a total of twenty-three collections for Seeds of Success in 2006, and will be back out on the seed-gathering trail in the spring of 2007. For more information on Rare Care, contact Ellen Kuhlmann, ekuhlman@u.washington.edu.

Ellen Kuhlmann is a member of the Koma Kulshan Chapter of WNPS. Previously Ellen has belonged to the Wenatchee Valley Chapter and served on the WNPS State Board of Directors. She has an M.S. in Biology from Western Washington University. Prior to her position with Rare Care, Ellen worked for the U.S. Forest Service in the Wenatchee National Forest, and for the PNW Research Station's Forestry Sciences Laboratory in Wenatchee, WA.

Appendix 1: 2006 Collections Statistics





2006 Collections were made in a variety of ecoregions across the United States. Below is a list of ecoregions with the number of collections made in the ecoregion and the percentage out of total collections for 2006. For a detailed collections list of species and collecting teams, please go to the Seeds of Success website (http://www.nps.gov/plants/sos/).

California South Coast	79 (12.31%)
Osage Plains/Flint Hills Prairie	68 (10.59%)
Chihuahuan Desert	52 (8.10%)
Central Tallgrass Prairie	38 (5.92%)
Southern Rocky Mountains	34 (5.30%)
Colorado Plateau	32 (4.98%)
Ozarks	27 (4.21%)
Sonoran Desert	24 (3.74%)
Middle Rockies - Blue Mountains	23 (3.58%)
West Gulf Coastal Plain	22 (3.43%)
California Central Coast	20 (3.12%)
Edwards Plateau	20 (3.12%)
Great Lakes	18 (2.80%)
Great Basin	16 (2.49%)
North Atlantic Coast	16 (2.49%)
West Cascades	16 (2.49%)
Columbia Plateau	15 (2.34%)
Apache Highlands	13 (2.02%)
Klamath Mountains	10 (1.56%)
Dakota Mixed-Grass Prairie	9 (1.40%)
Mid-Atlantic Coastal Plain	9 (1.40%)
Prairie-Forest Border	9 (1.40%)
Puget Trough - Willamette Valley - Georgia Basin	8 (1.25%)
Wyoming Basins	7 (1.09%)
Arizona-New Mexico Mountains	6 (0.93%)
Beringian Tundra	6 (0.93%)
California North Coast	6 (0.93%)
Utah-Wyoming Rocky Mountains	6 (0.93%)
Modoc Plateau and East Cascades	5 (0.78%)
Crosstimbers and Southern Tallgrass Prairie	4 (0.62%)
Central Shortgrass Prairie	3 (0.47%)
North Cascades	3 (0.47%)
Northern Tallgrass Prairie	3 (0.47%)
Upper West Gulf Coastal Plain	3 (0.47%)
Gulf Coast Plains and Marshes	2 (0.31%)
Interior Alaska Taiga	2 (0.31%)
Okanagan	2 (0.31%)
Pacific Northwest Coast	2 (0.31%)
Piedmont	2 (0.31%)
Northern Great Plains Steppe	1 (0.16%)
Superior Mixed Forest	1 (0.16%)

Total Ecoregions Sampled: 41

Appendix 2: Technology Transfer Activities

Publications

- Chicago Magazine, Stuart Luman
- Friends of Kew
- Great Lakes Consortium, National Public Radio, Sandy Hauserman
- Kansas Native Plant Society Newsletter
- Konza Gazetter
- Quintessential Barrington Magazine, April Anderson

Training Course

- Bureau of Land Management National Training Center - Sacramento, CA
- Chicago Botanic Garden - Glencoe, IL
- Mt. Cuba Center - Greenville, DE
- Student Conservation Association - McCall, ID

Presentations/Talks/Meetings

Allen, B. 2006. Millennium Seed Bank Project: International Conservation of Seeds. Annual Kansas Native Plant Society Meeting, Holton, KS, September 8-10, 2006.

Allen, B. Chicago Botanic Garden and Seeds of Success. Women's Board, Chicago Botanic Garden, Glencoe, IL, 2006.

Allen, B., P. Vitt and K. Havens. 2006. Seed Banking the Prairie: Chicago Botanic Garden's Role in the Millennium Seed Bank Project, Botanical Society of America meeting, California State University, Chico, CA, July 28-August 2, 2006.

BLM Botany Meeting on Seeds of Success and the Colorado Plateau, Salt Lake City, UT, November 2006.

Byrne, M. Seeds of Success: Collection, Study and Conservation for Seeds for Native Plant Species. Plant Conservation Alliance Bi-Monthly Meeting at NatureServe, September 2006.

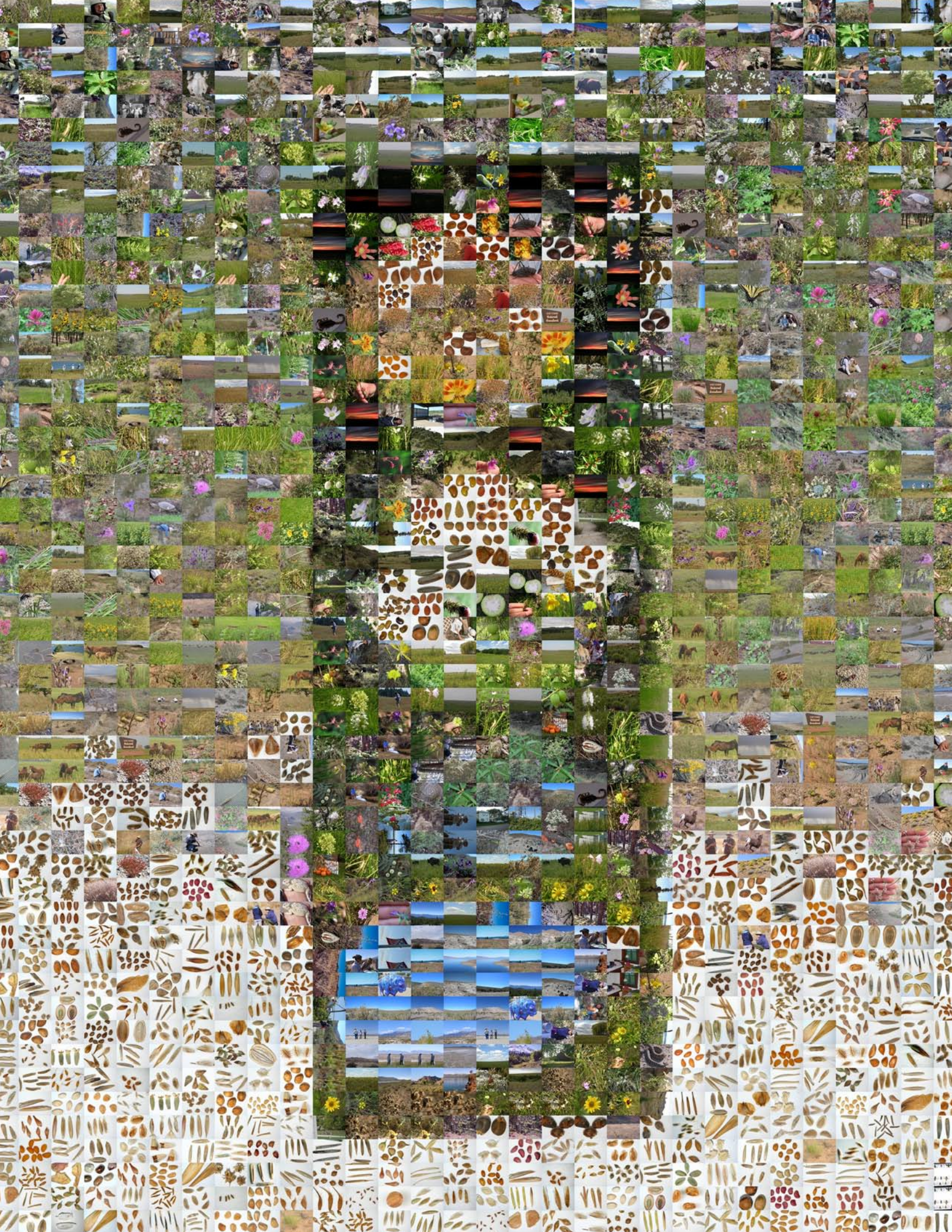
Chicago Botanic Garden. Seeds of Success Poster Presentation. Wild Ones National Conference. Naperville, IL, July 14-16, 2006.

Olwell, P. Seeds of Success and Native Plant Materials Development. Intermountain Native Plant Summit, Boise, ID, March 2006.

Olwell, P. Seeds of Success and Native Plant Materials Development. Mojave Desert Restoration Meeting, April 2006.

Olwell, P. Seeds of Success: Native Plant Materials and Botanic Gardens. American Public Gardens Association Annual Meeting, June 2006.

Olwell, P. Seeds of Success. American Seed Trade Association, Seattle, WA, July 2006.

Olwell, P. Seeds of Success. U.S. Fish and Wildlife Service Brown Bag, Arlington, VA, July 2006.

Seeds of Success Annual Meeting, San Francisco, CA, June, 2006.