

Seeds of Success: seed banking and native plant materials for a changing climate

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Abstract

Seeds of Success (SOS) is the United States' national native seed collection program, led by the Bureau of Land Management (BLM) in partnership with other federal government agencies and numerous non-federal organizations. As the first step of the Native Plant Materials Development Program (NPMDP), SOS's mission is to collect wildland native seed for research, development, long-term germplasm conservation, and ecosystem restoration. Each year, 65 collecting teams across the country collect native seed for SOS, all following the SOS Technical Protocol. SOS collections are divided into a working collection which is made available for research, and a long-term conservation storage collection which is stored at partner institutions throughout the United States. Seed collection is an efficient and cost-effective way to conserve the diversity of plant species into the future. Partnerships make a national large-scale conservation effort like SOS possible.

Keywords

Bureau of Land Management, Collection, Germplasm, Native Plants, Restoration, Seed Banking, Seeds of Success, United States.

Introduction

Healthy ecosystems provide the essential ecological services upon which all life depends, including our own. Native plants create oxygen, food, and medicines. They have broad, extensive root systems that reinforce soils and increase penetration of water and reduce erosion and flooding. Native plant communities provide the foundation for fish and wildlife habitats such as the sage-grouse. In the United States, these communities are affected by increasing wildfires, urban expansion, climate change, increased demand for energy resources, expansion of recreational areas, and non-native plant invasion. There is an increasing awareness of the importance of local plant materials for successful restoration projects. However, there are still shortcomings with respect to the availability of geographically and genetically appropriate native plant materials for restoring the American landscape. Seeds of Success (SOS), the national native seed collection program coordinated by the Bureau of Land Management (BLM), provides the initial seed collections that are used for research and long-term storage. SOS relies on partners, such as botanic gardens and native plant centers, to achieve nationwide restoration goals.

The BLM is the largest purchaser of conservation seed in the Western Hemisphere, purchasing as much as 7.4 million pounds of seed in a single year. After the 1999 wildfire season, when 5.6 million acres burned, the US Congress recognized that there was a need to develop genetically and geographically appropriate native plant materials for restoration and rehabilitation. In 2001, the United States House of Representatives' FY 2001 Conference Report directed "...the agencies to develop a long-term program to manage and supply native plant materials for various Federal land management restoration and rehabilitation needs" thus forming the Native Plant Materials Development Program (NPMDP).

The BLM leads the NPMDP, whose mission is to increase the quality and quantity of native plant materials available for restoring and supporting resilient ecosystems. As the first step of the NPMDP, the overarching goal of SOS is to collect and store native seed for long-term conservation, as well as provide material for research on native plant materials development. SOS

seeks to collect high quality, accurately identified, genetically representative, and well documented native plant seed from multiple wild populations across the US. SOS has also contributed to international seed banking efforts.

Beginning in 2000, a partnership was formed between the BLM and the Royal Botanic Gardens, Kew (RBG), the leader of an international seed collecting effort known as the Millennium Seed Bank Project (MSB). The goal of the MSB is to collect all bankable species in the world. This effort also relies on partnerships to reach its goal. Throughout the 10-year partnership, SOS provided collections to the MSB, thus helping RBG reach their goal of preserving 10% of the world's flora.

In 2008, a Memorandum of Understanding was signed between the BLM and the Chicago Botanic Garden, the Lady Bird Johnson Wildflower Center, the New England Wildflower Society, the Greenbelt Native Plant Center of the New York City Department of Parks and Recreation, the North Carolina Botanical Garden and the Zoological Society of San Diego. As the lead agency for SOS, the BLM works to facilitate cooperation and coordination of SOS in the collection of native seed for conservation and restoration. The non-federal partners collaborating with SOS provide collections in areas where there is little federal land.

The collection focus of SOS is on species needed for restoration and rehabilitation projects. Teams may make multiple collections of species on their restoration target list as long as they are capturing unique populations in each collection. Collecting teams are encouraged to work with local federal land managers and the BLM National Coordinating Office to develop and execute priority target lists. Rare, threatened or endangered species are not collected by SOS, instead these fall under the purview of the Center for Plant Conservation. In order to achieve the goal of banking most of the US flora, SOS has prioritized the collection to include:

- Species of high restoration value
- Species most at risk from climate change and associated threats such as increased wildfire and invasive species
- Species representative of key ecological communities.

More specifically, there is a goal for each species: to have a minimum of 20 accessions throughout that species' range, so that a high percentage of the genetic diversity can be preserved. Each collection is to include 10,000 – 20,000 seeds from a minimum sample size of 50 plants without taking more than 20% of the available seed on a given day. This protocol was established to collect 95% of the genetic alleles while ensuring collections do not exceed sustainable harvest levels.

As of October 2013, SOS has collected a total of 14,500 accessions representing 4,700 different taxa. Within the National Collection, 52 species are represented with 20 or more collections. The most frequently collected species include *Poa secunda*, *Achnatherum hymenoides*, *Artemisia tridentata*, *Elymus elymoides*, *Hesperostipa comata*, and *Allium acuminatum*; these represent some of the workhorse restoration species used by the BLM.

In addition to banking species for long-term conservation storage, SOS has established a working collection of native plant germplasm available for research on plant materials increase. It is not sufficient to simply bank seed; in order to be useful, species need to be developed for restoration use. This entails research on seed transfer zones (geographic areas in which seed can be used without danger of maladaptation), research on propagation, harvest and storage methods, and production of large quantities of source-identified seed for restoration. There are more than 500 partners engaged in the entire NPMDP.

The BLM has contributed over US\$70 million, which has been leveraged by partners to more than US\$100 million. Partners are critical for the success of the NPMDP and SOS. In the US, interns and volunteers from botanic garden partners enhance the work of federal agencies. One example of enhancing botanic capacity is the Conservation and Land Management Internship Program coordinated by the Chicago Botanic Garden. Additionally, partners are critical for carrying out the research, much of which is species specific, to determine the appropriate conditions and techniques for growing wild species in an agronomic environment.

Ecoregional partnerships in the Colorado Plateau, Great Basin, Mojave Desert, and Pacific Northwestern United States are carrying out research to answer questions related to how to grow native species as crops, how to harvest and clean the seed, methods for diversifying monocultures of invasive plants, and how to restore the plant communities in their unique ecosystems across the western US. The NPMDP also works with private industry to improve the equipment needed for successful native plant seedings.

In 1999, the BLM spent US\$52 million on 6.5 million pounds of seed; 70% was non-native. Since the establishment of the NPMDP the tide has turned, and today the BLM uses more natives than not. SOS continues to make collections of US native plants and the NPMDP is involved in dozens of projects to expand the research and use of native plants.

Conclusion

There is a need for continued partnerships to focus on using genetically and geographically appropriate materials, so that restoration projects are successful and funds are spent wisely. Native species **do** work in restoring native plant communities for native wildlife such as sage-grouse. They take more time to establish and require continued research and development, but in the end resilient healthy ecosystems will result.