

Conserving the botanical diversity of the Golden State

California is home to over 6,500 kinds of plants, of which nearly one third are found only in California. Nearly every biome in North America is represented in California and the state is home to 32% of all plants that occur in the United States. Exceptional plant diversity and endemism have earned the California Floristic Province international recognition as a biodiversity hotspot.

Unfortunately, California's plant diversity faces many threats including habitat loss, invasive species, and climate change. Members of California Plant Rescue (CaPR) partner with land managers, funding entities, and other organizations to conserve California's plants using a variety of strategies.



CALIFORNIA
PLANT RESCUE

caplantrescue.org



Mission

The California Plant Rescue collaborating institutions make conservation collections of seeds and living plants to secure high levels of genetic diversity in off-site collections such as botanic gardens and seed banks to safeguard populations in a time of uncertainty. We also gather information about wild populations to ensure a baseline of information is available for future generations.

Goals

Our long-term goal is to secure the entire California flora in conservation collections, with a focus on seed collections. Seed collections stored in offsite seed banks are a critical and cost effective management strategy for the persistence of wild plant populations. They provide the raw materials for population enhancement, **restoration**, and recovery, opportunities for **research**, and serve as an **insurance** policy against extinction.

We strive to have California meet the conservation goals outlined in the Global Strategy for Plant Conservation of the Convention for Biological Diversity – namely **to conserve 75% of the rarest species by the year 2020**.



Panamint daisy
Enceliopsis covillei

The Convention on Biological Diversity

is an international treaty aimed at sustaining the rich diversity of life on Earth and includes a Global Strategy for Plant Conservation. Target 5 of the Strategy is to secure at least 75% of threatened plant species in secure ex situ, or off-site, collections, with at least 20% available for recovery and restoration programs. Within California, 1,164 vascular plant taxa have been ranked as rare, threatened, or endangered through CNPS's Rare Plant Ranking program and form the basis of this target for the state. With nearly 50% of taxa already conserved in ex situ collections, Target 5 is within reach for California – a rare achievement in a region of high species richness.

United for Plant Conservation

The Center for Plant Conservation (CPC) is a national network of botanical institutions working towards the conservation of the country's endangered flora. CaPR consists of the CPC



Participating Institutions located within California and their partners, each agreeing to adhere to CPC's standards and protocols in their efforts to conserve germplasm. As such, each receives technical and scientific expertise (both directly and through other CPC Participating Institutions), and benefits from CPC's ability to secure and distribute funding to support conservation efforts.

The mission of the Center for Plant Conservation is to ensure the stewardship of imperiled native plants. The core focus is on the threatened and endangered plants of the US and Canada, supporting an extensive network of Participating Institutions in their efforts to save these plants from extinction. The organization advances its mission by coordinating research and development of new tools, sharing methods and means to save native plants, and facilitating on-the-ground efforts to bank seeds, propagate plants and care for plant species in the wild. Backed by decades of scientific research, **CPC's protocols represent the best practices in plant conservation research.**

CPC promotes the prioritization of secure off-site conservation collections as part of **integrated plant conservation strategies**. Botanical gardens and related institutions are uniquely situated to link seed collections, horticultural practices and species-specific research for plant conservation.

You can find the most up to date version of CPC's protocols, CPC Best Plant Conservation Practices to Support Species Survival in the Wild, online at saveplants.org

CaPR Institutions

California Native Plant Society (CNPS)
 Center for Plant Conservation (CPC)
 Rancho Santa Ana Botanic Garden (RSABG) **
 Santa Barbara Botanic Garden (SBBG) **
 San Diego Botanic Garden (SDBG)
 San Diego Zoo Global (SDZG) **
 Tilden Regional Parks Botanic Garden (Tilden)
 UC Botanical Garden at Berkeley (UCBG)
 UC Davis Arboretum and Public Garden (UCDavis)
 UCLA Mildred E. Mathias Botanical Garden (UCLA)
 UC Santa Cruz Arboretum & Public Garden (UCSC) *
 * Regional seed bank
 ** Millennium Seed Bank partner approved regional seed bank



CALIFORNIA
NATIVE PLANT SOCIETY



UNIVERSITY OF CALIFORNIA
BOTANICAL GARDEN
AT BERKELEY



REGIONAL PARKS BOTANIC GARDEN
NATIVE PLANTS OF CALIFORNIA



UCLA | MILDRED E. MATHIAS
BOTANICAL GARDEN

SAN DIEGO ZOO
INSTITUTE FOR
CONSERVATION
RESEARCH

Facilities & Capacity

Three of the primary seed banking facilities within CaPR (RSABG, SBBG, and SDZG) consist of large chest freezers kept on emergency generator backup power and have built in temperature monitor and alarms with direct notification to staff. Their systems meet the seed conservation standards set forth by Kew Millennium Seed Bank Partnerships and have been approved by Kew staff. Additional seed banking facilities include chest freezers with temperature monitors at UCBG and UCSC.

Seed storage capacity has grown by 37% since CaPR formed in 2014 and we collectively have the capacity for an estimated 25,000 accessions. CaPR institutions are currently at roughly 50% of that capacity; the institutions will be able to add accessions for many years, and have the space to increase capacity with the addition of more freezers in their secure facilities.

Backing Up Collections

CPC seed collections are valuable for the conservation of rare plants. CPC recommends dividing collections to ensure that the representative samples of seeds will be safely duplicated to mitigate for loss caused by natural or human-caused catastrophes. Any safety duplication arrangement requires a clearly signed, legal agreement between the depositor and backup institution.

The primary long-term storage institution may be a CPC institution and the backup institution can be the National Laboratory for Genetic Resources Preservation (NLGRP) in Fort Collins, Colorado. At this USDA facility, seeds are not only secured long-term but can be studied as part of the Plant Germplasm Preservation Program. CPC has a Material Transfer Research Agreement that covers CPC Participating Institution seed accessions transferred to and stored for research purposes at the NLGRP.



Brodiaea matsonii
Sulphur creek brodiaea



Castilleja mollis
Softleaf Indian paintbrush



What We Do



Conserving Seed

Seed collections are an effective and cost efficient management strategy for the persistence of wild plant populations for most of the species in California. Since the formation of CaPR, participants have focused their efforts on collecting the rare species of the state.

Some seed collections take patience. Bristlecone fir (*Abies bracteata*), a rare fir tree restricted to the Santa Lucia Mountains near Big Sur was one such collection. The trees are mast seeders, meaning they only produce a good crop of seeds once every few years and only when conditions are right. The populations grow on rugged terrain and the cones are only produced at the very top of 30-meter-tall spindly trees, making the seeds difficult to access. The firs have been impacted by high levels of seed predation, years of drought, and the 2016 Soberanes fire. Though RSABG had secured funding to collect seeds of this species in 2014, a variety of obstacles as described above prevented a suitable collection from being made until 2017. But the patience paid off, with a collection made with UCLA and RSABG staff providing enough seed for both long-term conservation and to propagate living trees in the nursery.



Monitoring Wild Populations

Little is known about the life history of many rare plant species. Seed collection activities therefore have a parallel objective: enhancing the knowledge of the species. CaPR botanists seeking to collect seeds often make key observations by visiting populations multiple times; scouting during flowering for identification and demographic purposes and then returning when seed is ripe.

As with many rare plant occurrences in California, the known population of Ben Lomond buckwheat (*Eriogonum nudum* var. *decurrens*) on Mount Hermon had not been visited in decades and required more fieldwork. Volunteers on a CNPS Rare Plant Treasure Hunt were able to relocate a small population that was previously recorded, but they also observed an expansion of the occurrence over a much wider area and documented thousands of individuals. Later in the year, volunteers returned to make a seed collection, now knowing there were enough plants to do so without impacting population viability.



Sharing Data, Expertise, & Tools

A shared database keeps all partners aware of collections that have been made by other institutions, species being targeted and who is monitoring them, and progress towards our goal. This helps to promote communication between partners and reduce any duplication of effort. While sensitive information is only available to partners, the database allows the public to see which plant species in California have been collected and at which seed bank facility they are located.



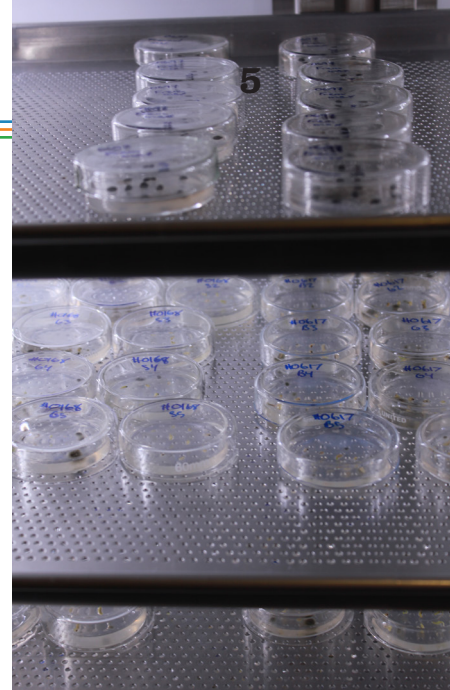
Species	Target Status	Accession Number	Collecting Org	Collection Type	Collection/Accession Date	Seed Count
Abies bracteata	Not collected, not in target list					
Abies bracteata		10000	Rancho Santa Ana Botanic Garden	Living	10/10/1987	
Abies bracteata		10000	Rancho Santa Ana Botanic Garden	Living		



Researching Germination & Propagation

Best practices, as promoted by CPC, require germination testing of the seed collected to both gauge quality of the seed and to alert the collectors to the need for further research.

Adobe sanicle (*Sanicula maritima*) is a rare perennial herb restricted to San Luis Obispo County. Since 2016, the SBBG has been working to understand the biology of this species and to salvage and restore populations as mitigation for development. There is virtually no published literature on this species. Since adding seed to their seed bank in 2016, SBBG has conducted a germination study and recognized the need to also study root propagation to determine how best to grow it. Their efforts have resulted in seedlings to outplant for mitigation and restoration.



Expanding Germplasm Collection Types

While the institutions within CaPR have world-class facilities for the maintenance of seed collections, not all plants can be conserved in this manner. Some seeds are known to not survive the drying and freezing process involved in seed conservation (recalcitrant seeds) or are short-lived when frozen (intermediate seeds). For these species, other forms of long-term storage are required and may include living conservation groves, cryopreservation of embryos extracted from seed, or tissue culture. Recognizing the need to expand into these realms, CaPR members are partnering with other members of CPC as well as with The Huntington Library, Art Collections and Botanical Gardens in San Marino, California. Expanding on the research and resources of partners, CaPR will be able to conserve germplasm from all of California's flora in the years to come.



Collective Fundraising & Development

CPC has worked with CaPR to distribute funds from the Kew Foundation America to all CaPR partners' actively making seed collections of rare plants. The group has, and continues to, come together to collectively apply for various funding opportunities from a variety of sources including state, federal, and private sources. Various partners within CaPR (i.e., CPC, RSABG, SDZG) have taken the lead on grant applications as is most appropriate for each project, each with the ability to establish and oversee subcontracts with partners. Depending on the nature of the work, various partners have submitted grant proposals on behalf of the CaPR collective. However, CPC is prepared to formally serve as the fiscal sponsor for the CaPR collaborative group, to disburse funds, serve as the lead institution on grants, and oversee subcontract work. CPC has an indirect cost rate of 10% applied to grants and contract work where permitted.



Erythranthe rhodopetra
Red rock canyon
monkeyflower



Outreach & Education

CaPR has collectively produced outreach material to help members promote the importance of seed collections for integrated conservation work to various audiences. This includes both printed material and presentations as well as training workshops to reach others working with plants throughout California.



Stronger Together • Key Partnerships

Research Partners: Whether common or rare, often little is known about the species CaPR members add to their collections; we partner with researchers to learn more. In addition to providing long-term seed storage, National Laboratory for Genetic Resources Preservation tests seed viability and researches best practices for storage. CaPR members also collaborate with universities, federal agencies, and private entities to increase our understanding of the species.

- California Institute of Environmental Studies • Conservation Biology Institute • National Laboratory for Genetic Resources Preservation • San Diego Natural History Museum • Seed Bank of Mexico (Banco de semillas FESI-UNAM) • UCDavis • UCLA • UC Santa Barbara National • USGS •

Volunteers and Students: Each of the CaPR institutions are able to leverage assistance from volunteers or students to help conduct their work – combining productivity with training, education and outreach. For example, staff at UC Santa Cruz and California State University, Monterey Bay in partnership with CaPR institution UCBG, have had students assist in surveying, scouting, and collecting populations of rare plants on the Fort Ord Natural Reserve, providing training to budding scientists.

Recovery Agencies: California Department of Fish and Wildlife and US Fish and Wildlife Service not only work with CaPR for proper permitting and reporting, but they also consult with CaPR institutions to determine conservation and research prioritization. We working together to secure funding opportunities to conserve rare plant populations.

Data Sources: The California Natural Diversity Database (CNNDDB) and the Consortium of California Herbaria (CCH) are important data sources for our work. In turn, CaPR partners collect and deposit herbarium specimens at CCH member herbaria and conduct population surveys to help update database records in the CNDDDB.

Land Managers: From federal agencies to local governments and land trusts, CaPR members partner with land managers to make collections with the proper permissions, identify other species to monitor and target, and help develop reintroduction plans if needed. For instance, our members are working at the US National Parks Service at Channel Islands National Park and Death Valley National Park for the prioritization and proper permitting of their rare species.

- California State Parks • CalFire • Center for Natural Lands Management • City of San Diego • County of San Diego • Jardín Botánico San Quintín • Land Trust of Napa County • Lawrence Livermore National Laboratory • San Mateo County Parks • Sonoma County Regional Parks • The Presidio Trust • Terra Peninsular • US Forest Service • US Navy • Wildlands Conservancy •

Nonprofits and Businesses: In using our collections as part of integrated plant conservation strategy, many other entities become crucial in helping to collect and deposit plant material, conduct ecological monitoring, conduct site preparation for restoration, recruit volunteers, and spearhead projects.

- Althouse and Meade, Inc. • Bureau of Reclamation • Chaparral Lands Conservancy • ManTech International Corporation • Mojave Lands Trust • TetraTech • The Nature Conservancy • Theodore Payne Foundation • Sociedad de Planta Nativas • Vollmar Natural Lands Consulting, LLC •

Key Funding Sources



Bureau of Land Management: The BLM funds RSABG to make seed collections of the rare and threatened plants occurring on their lands for long-term conservation banking. The BLM has also supported SDZG in its collections of common species as part of the Seeds of Success Program.



California Department of Fish and Wildlife: CDFW has been a key funder for numerous partners, supporting seed collection and development of plant material from the seed to be used for reintroduction of rare species.



Department of Defense: With financial support from both Vandenberg Airforce Base and the U.S. Navy installations of the Channel Islands and Point Mugu, SBBG has worked with rare species on defense lands, aiding in their supporting their mission to manage and protect listed species on DOD property.



Kew Foundation America: Has funded new species accessions for CaPR for the past five years, with CPC administering the funds to partners upon completion of the collections. This funding has allowed CaPR institutions to focus on species ranked as rare and threatened by CNPS but lacking the funding mechanisms of legally protected species.



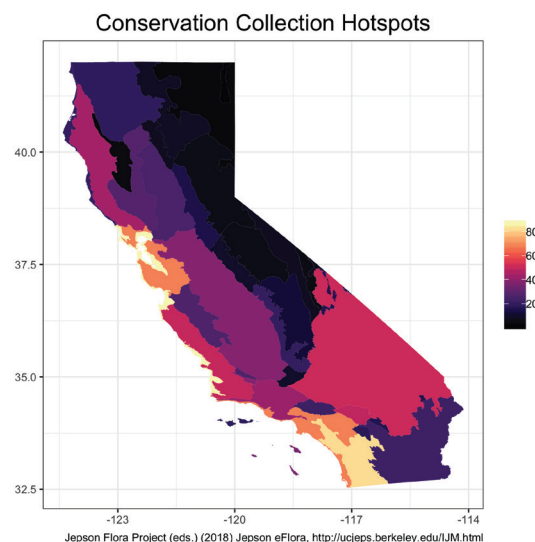
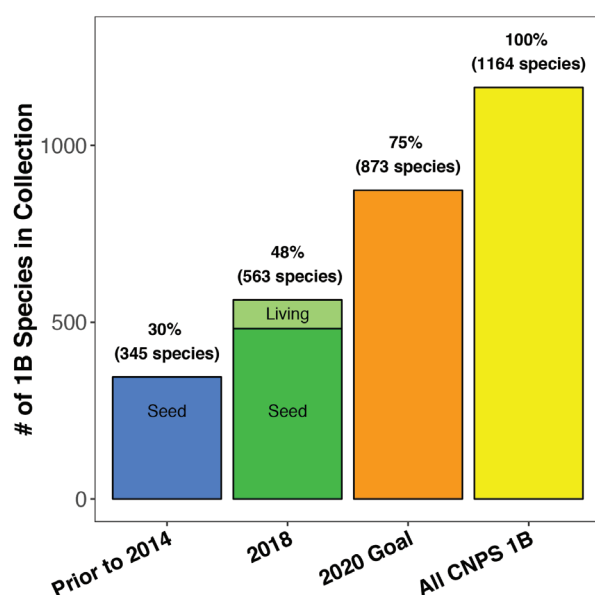
U.S. Fish and Wildlife Service: Both through grant funding and contract support, the USFWS has helped fund collections of the species they are most concerned about and/or have the most potential for recovery.

• AECOM • American Public Gardens Association • Bob Powers Gateway Preserve • California Department of Transportation • California High-Speed Rail Authority • Carol W. Witham • Catalina Island Conservancy • Center for Natural Lands Management • City of San Francisco • Chaparral Lands Conservancy • Conrad Hilton Foundation • Creekside Science • Dudek • Environmental Science Associates • Foundation for Sustainability and Innovation • Gallaway Enterprises • Garcia and Associates • The Glanville/Grill Foundation • Glendora East Ranch LLC • Glenn Lukos and Associates • Heinz Ranch Land Company • The Helen Clay Frick Foundation • Irvine Ranch Conservancy • Jericho Systems • The JiJi Foundation Fund • Land IQ • Laguna Canyon Foundation • The Massen Greene Foundation • NCRM • Pacific Midland Homes • Psomas • Raintree Foundation • Ray Collett Trust • Redwood Biological Consulting • Santa Barbara County • Santa Barbara Foundation • Santa Clara Valley Habitat Agency • Santa Clara Valley Water District • Seaver Foundation • SANDAG/ TransNet • San Elijo Lagoon • Schlum Foundation • Talmadge Brothers LP • The Nature Conservancy • US Forest Service •

Accomplishments

Long before CaPR formed, its various partners had been making seed collections of both rare and common species, some for many decades. This approach successfully conserved germplasm of some 30% of plants acknowledged by CNPS as rare or threatened in California (ranked 1B). In the few years since CaPR's inception in late 2014, and with concerted focus on rare species, CaPR has increased its seed bank holdings of the rarest plants in California by 57%.

Focusing on the CNPS ranked 1B species, which often lack sufficient resources for protection, has allowed CaPR to conserve rare species that might otherwise fall through the cracks. CaPR will be targeting the 1Bs that have never been collected over the 2019 and 2020 seasons to help us reach our primary goal of 75% by 2020.



CaPR institutions have made collections in each of the state's ecoregions. The brighter regions represent ecoregion with more 1B species collected – hotspots of collection in areas with high threat of development.

A Lupine on the Brink

In June of 2016, road maintenance activities impacted a large portion of last known occurrence of Milo Baker's lupine (*Lupinus milo-bakeri*), leaving less than 100 total alive in the wild. With support from CalTrans and CDFW, RSABG took a small portion of a seed collection from the remaining plants and grew plants to increase seed production. Over 4,000 seeds were produced in the RSABG nursery for reintroduction in the wild to both enhance the existing Milo Baker's lupine population and to experiment with the reintroduction of seeds at historic lupine sites.



Accomplishments

CaPR institutions have been able to expand their capacity, with both improved equipment and facilities and added staff, as well as our ability to share data.

- Since 2014, freezer additions have expanded our germplasm storage capacity by 37%.
- Facility updates in alarms and temperature monitors ensure our collections are well maintained.
- CaPR institutions have been able to add additional staff, with staff hours dedicated to rare plant collection, monitoring, collection maintenance equaling over 13 full-time employees.
- Training workshops and site visits between facilities help keep each institution up to date on procedures and able to train new staff and volunteers. We've held seven workshops open to the public, four annual meetings, and numerous site visits.
- CaPR institutions have given over two dozen public presentations, manned exhibit booths and explained posters at state-wide meetings, and is developing a standard presentation for all partners to share at local CNPS chapters.
- Creating a shared database and map with search ability. Not only can all partners view which species have been collected, but from which occurrences.



Amsinckia grandiflora
Large-flowered fiddleneck

Partnering for Fiddleneck

*With only one natural self-sustaining population remaining, large-flowered fiddleneck (*Amsinckia grandiflora*) had been on a steady decline since European settlement. The species produces little seed and making a seed collection was an early priority. UCBG staff were able to make a key seed collection that provided the material for the creation of new populations within the historic range of the species. With support from partners at Lawrence Livermore National Laboratory and Vollmar Natural Lands Consulting, and funding from the Bureau of Reclamation, four experimental reintroduction sites have shown great promise – almost reaching their population number goals in just a few short years.*



Onward for Biodiversity

CaPR has made great strides towards conserving California's botanical diversity, but there is still much to be done. Millions of seeds still need to be collected to ensure the long term conservation of the unique California flora. Fortunately, this network of California institutions is well positioned to take on this challenge. We have the facilities and expertise to ensure that all California plants are preserved and available to the scientific community, a critical step in restoring degraded habitats. We have established the partnerships and tools to leverage our strengths and track our progress. With support, CaPR is ready to accelerate the pace of its work to secure the future of California's plant biodiversity.