

Past, present, and future of native plant conservation within the California Department of Fish and Wildlife

KRISTI A. LAZAR* AND JEB M. BJERKE

California Department of Fish and Wildlife, California Natural Diversity Database, 1807 13th Street, Suite 202, Sacramento, CA 95811, USA (KAL)

California Department of Fish and Wildlife, Native Plant Program, 1416 9th Street, Suite 1260, Sacramento, CA 95814, USA (JMB)

**Correspondent: Kristi.Lazar@wildlife.ca.gov*

Native plant conservation is an essential part of the California Department of Fish and Wildlife's (CDFW) mission to manage California's diverse natural resources. The awareness of the need to conserve native plants gained a strong foothold in the 1960s and 1970s due to activities of the California Native Plant Society as well as enactment of conservation-minded legislation, such as the Native Plant Protection Act and the California Environmental Quality Act. CDFW responded to this surge in attention to native plant conservation by creating staff positions and programs to help address the need for botanical expertise throughout California. CDFW botanical staff and programs have been, and will continue to be, an essential component to maintaining the biodiversity of California's native flora.

Key words: California Department of Fish and Wildlife, legislation, native plant conservation, plant programs

The California Department of Fish and Wildlife's (CDFW) mission to manage California's diverse natural resources for their ecological values and public benefits can be daunting. Among the 6,500 native plant taxa in California (Baldwin et al. 2012), approximately 2,300 are considered to be of conservation concern (CNDDB 2014); this is a staggering number of plants for CDFW to monitor and manage. In this paper, we explore the journey native plant conservation has taken within California, from the initial awareness of native plant conservation brought forward by the California Native Plant Society, to enactment of conservation-minded legislation, and the subsequent role that CDFW botany programs and staff have played, and continue to play, in the regulation of sensitive plant taxa and promotion of native plant conservation.

NATIVE PLANT CONSERVATION AWARENESS (1960s AND 1970s)

Much of the initial awareness of the need to protect native plants and vegetation communities in California grew from the work of the California Native Plant Society (CNPS) in the late 1960s and 1970s. In 1968, G. Ledyard Stebbins, CNPS president at the time, began keeping a card file of information on native plants that appeared to have a limited distribution in California based primarily on information from Philip Munz's *A California Flora* (Powell 1975, York et al. 1982). CNPS used this card file as a starting point for soliciting the knowledge of local botanists on plant rarity, and subsequently compiled several informal rare plant lists. Culmination of a major CNPS effort to update and expand rare plant information occurred in 1974 when G. Ledyard Stebbins, along with the Chairman of the newly formed CNPS Rare Plant Committee, Roman Gankin, and Director of the CNPS Rare Plant Project, W. Robert Powell, organized a meeting with amateur and professional botanists to evaluate and refine the list of plant taxa of conservation concern and manually map localities for each plant record (Powell 1975, Smith 1986, York et al. 1982). As a result, the first *Inventory of Rare and Endangered Vascular Plants of California* (CNPS *Inventory*) was published in 1974, with a total of 1,393 plant taxa (Smith 1986). The CNPS *Inventory* was the first of its kind in California, and possibly the nation, and helped raise awareness of the need for native plant conservation.

LEGISLATION

This awareness of the need for native plant conservation was instrumental in the passage of the Native Plant Protection Act (NPPA) in 1977, which was the first California legislation designed to protect native plants (Cochrane 1988). The NPPA was the first California law, and one of the first in the country, to formally designate plant taxa as rare or endangered. In 1984, plant protection was expanded beyond the NPPA when plants were included for protection under the revised California Endangered Species Act (CESA) (Cochrane 1988). CESA did not replace the NPPA, but added the designations of "threatened" and "candidate" species to the existing rare and endangered designations from the NPPA (Cochrane 1988). CESA also provided a more formalized method to petition the Fish and Game Commission to add, delete, or change the status of a taxon, and provided a consultation process for projects subject to the California Environmental Quality Act (CEQA), a key piece of legislation that was passed in 1970 (Cochrane 1986, 1988).

While the NPPA and CESA are important laws, they apply only to the 218 plant taxa that are officially designated as rare, threatened, endangered, or as a candidate for such listing by the state of California (CNDDDB 2014). There are >2,500 additional plant taxa that are in need of conservation and management in California, which explains in part why CEQA is one of the most important laws for plant protection. CEQA provides for the protection of taxa and natural communities that may not have been formally listed under state law or the federal Endangered Species Act, but that can be shown to meet the definition of rare, threatened, or endangered (CEQA 2005, Wagner 2006). CEQA requires local and state agencies to examine the environmental impacts of proposed projects during the planning process, publicly disclose those impacts, identify project alternatives, and implement feasible mitigation measures (Cochrane 1986, Wagner 2006). The CEQA process is often the only means of protecting plant taxa that are of conservation concern in California, but not officially designated as rare, threatened, endangered, or as a candidate for such listing under California law.

Another noteworthy piece of California legislation for native plant conservation is the Natural Community Conservation Planning Act (NCCPA), which was enacted in 1991 (NCCPA 1991, Pollak 2001). The intent of the NCCPA is to promote long-term protection of plants, animals, and natural communities through landscape-level planning while still allowing compatible land use and economic activity (NCCPA 1991, Morey and Ikeda 2001, Pollak 2001). The NCCPA is designed to provide for conservation of ecosystems, including all of their components whether they are rare or common, rather than a strategy of addressing impacts to rare taxa on a piecemeal, individual development project basis (Pollak 2001). By preserving larger areas of important habitat, it is hoped that rare taxa will survive long-term and common taxa will not become rare in the future.

CDFW BOTANY PROGRAMS AND STAFF

Due to the size of California, CDFW has staff in centralized headquarters in Sacramento, and in regional offices. Currently, there are three main programs at CDFW headquarters that actively work to support native plant conservation: the Native Plant Program, the California Natural Diversity Database (CNDDB), and the Vegetation Classification and Mapping Program (VegCAMP). A unifying purpose of these three programs is to provide regional CDFW staff with the knowledge, data, and tools that they need to support “on the ground” native plant conservation.

Native Plant Program.—CDFW responded to the passage of the NPPA by hiring its first botanist at headquarters in 1978, and subsequently formed the Endangered Plant Project (EPP) (S. Rae, Musci Natural Resource Assessment, personal communication). The EPP, which later became the Endangered Plant Program, implemented the NPPA by coordinating and carrying out listing and protection activities for plants (Cochrane 1986). Among the first tasks undertaken by the EPP were to update maps that depicted rare and endangered plant distributions, develop and expand rare plant status reports, develop a standardized field survey form, help fund conservation projects, and help with the establishment of reserves for rare plant preservation such as the Pine Hill Ecological Reserve (S. Rae, Musci Natural Resource Assessment, personal communication). However, with limited staff to address the multitude of rare plant issues that needed attention, a large focus of the EPP was to support regional CDFW biologists with projects or problems concerning listed plant taxa and to increase awareness of the need for plant conservation throughout California (Cochrane 1988).

The Endangered Plant Program was renamed several times in the 1990s and 2000s, becoming the Plant Conservation Program, the Species Conservation and Recovery Program, and the Rare Plant Program. In 2010, the program was again renamed, and became the Native Plant Program, highlighting the need to conserve and manage all of California’s native plant species. The Native Plant Program is now part of CDFW’s Habitat Conservation Planning Branch, and coordinates statewide plant conservation efforts. The Native Plant Program still provides support to regional CDFW biologists, but the program also issues permits to take state-listed plants for scientific, educational, or management purposes; assists with management of grants for plant conservation and research; evaluates petitions to list new plant species under CESA; and assists CDFW and the public with various other plant-related issues.

California Natural Diversity Database (CNDDB).—While native plant conservation was gaining a foothold in California with the passage of the NPPA, The Nature Conservancy was establishing Natural Heritage Programs throughout the nation; there are

now >80 such programs in the western hemisphere. The purpose of these programs is to collect and manage data on the status and distribution of species and ecosystems that are of conservation concern. In 1979, the California Natural Diversity Database (CNDDDB) program was established as California's Natural Heritage Program, and in 1981 CDFW gained responsibility for CNDDDB as part of the legislated California Significant Natural Areas Program (Significant Natural Areas Program 1981, Bittman 2001).

The CNDDDB program inventories the status and locations of plants, animals, and natural communities of conservation concern within California. Within its first year, the CNDDDB botany program began collaborating with the CNPS Rare Plant Program. The CNDDDB botany program used CNPS rare plant data as the starting point for CNDDDB's rare plant dataset. Such data sharing is an excellent example of CDFW successfully collaborating with other organizations for the benefit of native taxa, and was the beginning of a lasting and mutually beneficial relationship between CDFW and CNPS. Over the years, the relationship between the CNDDDB botany program and the CNPS rare plant program became more streamlined, with less duplication of effort. The CNDDDB botany program now takes the lead on mapping and managing rare plant data and the CNPS rare plant program takes the lead on evaluating and tracking the rarity status of California plant taxa.

The CNDDDB program is part of CDFW's Biogeographic Data Branch, and helps to conserve California's biotic diversity by providing tools, and information on special-status taxa, to decision-makers involved with land-use and resource management activities. In the first years of the CNDDDB program, location data for rare taxa were hand drawn onto topographic maps that were then digitally processed into a CAD/CAM (computer aided design/computer aided manufacturing) system. In 1990, the CNDDDB program became the first Natural Heritage Program in the nation to enter its rare taxa location data into a Geographic Information System (GIS) (Bittman 2001, 2014). The CNDDDB is now composed of a GIS linked to a database that contains information on occurrences of rare taxa. The CNDDDB program distributes these data to its subscribers via an internet-based application called RareFind, which allows users to query the CNDDDB and generate reports. RareFind is linked to a map viewer called BIOS, which allows users to view and analyze spatial data.

The CNDDDB program also distributes GIS data for use in ArcGIS and ArcView programs. When the CNDDDB began utilizing GIS to map plant occurrences in 1990, it consisted of fewer than 18,000 occurrence records for rare plants, animals, and natural communities (Bittman and York 1988, Bittman 2014). The CNDDDB has now grown to >73,000 occurrence records for rare plants and animals, making California's Natural Heritage Program one of the largest and most complex programs in the Natural Heritage Program network. The CNDDDB is used by CDFW personnel, the Natural Heritage Program network, and over 500 subscribers including federal and state agencies, private consulting firms, researchers, and project planners.

Vegetation Classification and Mapping Program (VegCAMP).—The natural communities portion of CNDDDB worked from 1979 to 1995 to maintain an inventory of rare California natural communities. However, following the publication of the *Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995), CDFW realized the value of a detailed statewide vegetation classification and map to identify all natural communities of conservation significance (T. Keeler-Wolf, CDFW, personal communication). VegCAMP was created in 2005 to meet this need, and is staffed with personnel from the natural communities portion of CNDDDB and the former Significant Natural Areas Program.

VegCAMP maintains a standardized vegetation classification and mapping system by developing vegetation mapping rules for California in accordance with federal and international standards. VegCAMP and the CNPS Vegetation Program produce field sampling protocols, hold workshops to teach field sampling and mapping, and update *A Manual of California Vegetation* (Sawyer et al. 2009), California's authoritative guide to plant communities. VegCAMP also maps smaller areas of vegetation such as on CDFW lands, and contracts for field data collection and mapping of larger areas. As with many CDFW programs, VegCAMP also provides support to regional CDFW staff by helping to assess the definitions of, and impacts to, rare natural communities during environmental review of proposed projects (D. Hickson, CDFW, personal communication).

Regional CDFW staff.—In many ways, it is the regional CDFW staff that have the greatest impact on native plant conservation. CDFW has six terrestrial regions, and each covers a separate geographic area of California. Prior to the early 1990s, wildlife biologists dealt with all plant-related issues in the regions in addition to their day-to-day wildlife-related duties. It was not until 1991 that the first regional plant ecologists were hired, with each CDFW region having at least one plant ecologist (J. Horenstein, CDFW, personal communication). Hiring of these plant ecologists was an important step for CDFW in recognizing and fulfilling the need for botanical expertise at the regional level.

While job classifications within CDFW have been modified since the first regional plant ecologists were hired, there are still CDFW staff in each region with botanical expertise. Those individuals perform a wide variety of tasks and deal with issues such as environmental review, land management, population monitoring, enforcement, research, and conservation planning. Among the most important tasks of CDFW regional staff is the cultivation of relationships with local governments, agencies, and private landowners to help ensure the protection of rare plants and natural communities. CDFW regional staff also comment on CEQA documents with regard to impacts that projects have on native plants and natural communities, and recommend actions that will avoid, minimize, or mitigate impacts to California's sensitive plant taxa.

THE FUTURE OF BOTANY WITHIN CDFW

It is the combination of strong CDFW plant programs at headquarters and knowledgeable CDFW regional staff that continues to distinguish CDFW's contributions to native plant conservation in California. As conservation concerns change within California, however, so must the response of CDFW and its botanists. The decades-long evolution of CDFW responsibilities was formally recognized in 2013 with the change in name from the California Department of Fish and Game to the California Department of Fish and Wildlife. This important symbolic change served to emphasize that CDFW is responsible not just for the management of fish and game species, but for the management and conservation of all wildlife, including native plants.

Many California plant taxa have been severely impacted by a history of human-induced change, and many of these taxa continue to be threatened by changes in land use, invasive species, hydrological changes, altered fire regimes, pathogens, genetic factors, pollution, or other degradations of natural habitat. Some California plant taxa are now extinct, and others may be doomed to extinction from impacts that have already taken place. As new threats to native plant species emerge, CDFW programs and staff continue to shift their focus to try to address these threats. As outdoor marijuana cultivation increased in northern

California, staff in the Northern Region of CDFW that previously were associated with timber harvest review shifted their focus to the new concerns and rising threats associated with marijuana cultivation. As renewable energy development is fast-tracked within California, the CDFW Climate Science and Renewable Energy Program moved to evaluate and address these threats to desert ecosystems, and a Desert Renewable Energy Conservation Plan is currently in development.

In the future, CDFW will confront what may be the biggest threat to the botanical resources of the state yet: a changing climate. CDFW demonstrated its commitment to reducing the impacts of climate change on California's resources, including plants, by forming the Climate Science Program in 2008. Nevertheless, climate change continues to pose a looming threat that will certainly be difficult, and perhaps impossible, to fully mitigate. The Biogeographic Data Branch, in conjunction with the California Landscape Conservation Cooperative, completed a climate change vulnerability assessment in 2012 for 156 rare plant taxa in California, and that assesses the potential impacts of climate change on those taxa (Anacker et al. 2013). The results of such vulnerability assessments can help guide future monitoring, management, and conservation plans for rare plants.

Managing and responding to the multitude of threats to California's biological diversity will require a continued commitment to California's botanical programs, and a renewed commitment to maintain botanical expertise among CDFW offices throughout California. From monitoring and managing plant populations on CDFW lands, to conducting research on emerging threats, and coordinating conservation activities with landowners and local agencies, there is still much that needs to be done.

Many people and organizations have contributed to the awareness and progression of native plant conservation within California over the past 45 years. A combination of enthusiastic, dedicated botanists in CNPS and the enactment of conservation legislation helped pave the way for the establishment of botanical programs within CDFW. CDFW botany programs and staff are essential aspects of California's commitment to conserve and manage natural resources and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public, now and into the future.

ACKNOWLEDGMENTS

We thank R. Bittman, D. Hickson, J. Horenstein, T. Keeler-Wolf, S. Rae, C. Roye, K. Smith, and J. Vondracek for providing information or reviewing early drafts of this paper. We also thank S. Cochrane Levitsky for providing extensive feedback that substantially improved the quality of this paper.

LITERATURE CITED

- ANACKER, B., M. GOGOL-PROKURAT, K. LEIDHOLM, AND S. SCHOENIG. 2013. Climate change vulnerability assessment of rare plants in California. *Madrono* 60:193-210.
- BALDWIN, B. G., D. H. GOLDMAN, D. J. KEIL, R. PATTERSON, T. J. ROSATTI, AND D. H. WILKEN, editors. 2012. *The Jepson manual: vascular plants of California*. Second edition. University of California Press, Berkeley, USA.
- BITTMAN, R., AND R. YORK. 1988. *The Natural Diversity Data Base*. Page v in J. P. Smith, Jr., and K. Berg, editors. *Inventory of rare and endangered vascular plants*. Fourth edition. California Native Plant Society, Sacramento, USA.

- BITTMAN, R. 2001. The California Natural Diversity Database: a natural heritage program for rare species and vegetation. *Fremontia* 29(3-4):57-62.
- BITTMAN, R. 2014. California Natural Diversity Database: a history. Unpublished report, California Natural Diversity Database, Sacramento, USA.
- CEQA (CALIFORNIA ENVIRONMENTAL QUALITY ACT). 2005. Public resources code 2100-21177 and the CEQA guidelines (California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 1500-15387) [Internet]; [cited 7 March 2014]. Available at: <http://ceres.ca.gov/ceqa/guidelines/>
- CNDDDB (CALIFORNIA NATURAL DIVERSITY DATABASE). 2014. RareFind 5 [Internet]. California Department of Fish and Wildlife. [cited 3 March 2014].
- COCHRANE, S. A. 1986. Endangered plants and California state laws. Pages 33-37 in T. S. Elias, editor. Conservation and management of rare and endangered plants, proceedings from a conference of the California Native Plant Society. California Native Plant Society, Sacramento, USA.
- COCHRANE, S. A. 1988. Endangered plant protection under state law and the Endangered Plant Project. Pages v-vii in J. P. Smith, Jr., editor. California Native Plant Society's Inventory of rare and endangered vascular plants of California. Fourth edition. California Native Plant Society, Sacramento, USA.
- MOREY, S., AND D. IKEDA. 2001. Conserving plants with laws and programs under the Department of Fish and Game. Pages 12-16 in D. Tibor, editor. California Native Plant Society's Inventory of rare and endangered plants of California. 6th edition. California Native Plant Society, Sacramento, USA.
- NCCPA (NATURAL COMMUNITY CONSERVATION PLANNING ACT). 1991. California Fish and Game Code, 2011 edition, Sections 2800-2835. Available at: <http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=fgc>
- POLLAK, D. 2001. Natural Community Conservation Planning (NCCP), the origins of an ambitious experiment to protect ecosystems, part 1 of a series. California Research Bureau, Sacramento, USA.
- POWELL, W. R. 1975. The CNPS rare plant project. *Fremontia* 2(4):14-19.
- SAWYER, J. O., AND T. KEELER-WOLF. 1995. A manual of California vegetation. California Native Plant Society Press, Sacramento, USA.
- SAWYER, J. O., T. KEELER-WOLF, AND J. M. EVENS. 2009. A manual of California vegetation. Second edition. California Native Plant Society Press, Sacramento, USA.
- SIGNIFICANT NATURAL AREAS PROGRAM. 1981. California Fish and Game Code, 2011 edition, Sections 1930-1933. Available at: <http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=fgc>
- SMITH, J. P., JR. 1986. California's endangered plants and the CNPS Rare Plant Program. Pages 1-6 in T.S. Elias, editor. Conservation and management of rare and endangered plants, proceedings from a conference of the California Native Plant Society. California Native Plant Society, Sacramento, USA.
- WAGNER, K. G. 2006. Protecting rare plant communities using the California Environmental Quality Act (CEQA). *Fremontia* 34(4):11-15.
- YORK, R., J. P. SMITH, JR., AND S. COCHRANE. 1982. New developments in the rare-plant program. *Fremontia* 9(4):11-13.

Received 30 December 2013

Accepted 18 February 2014

Corresponding Editor was C. Burton