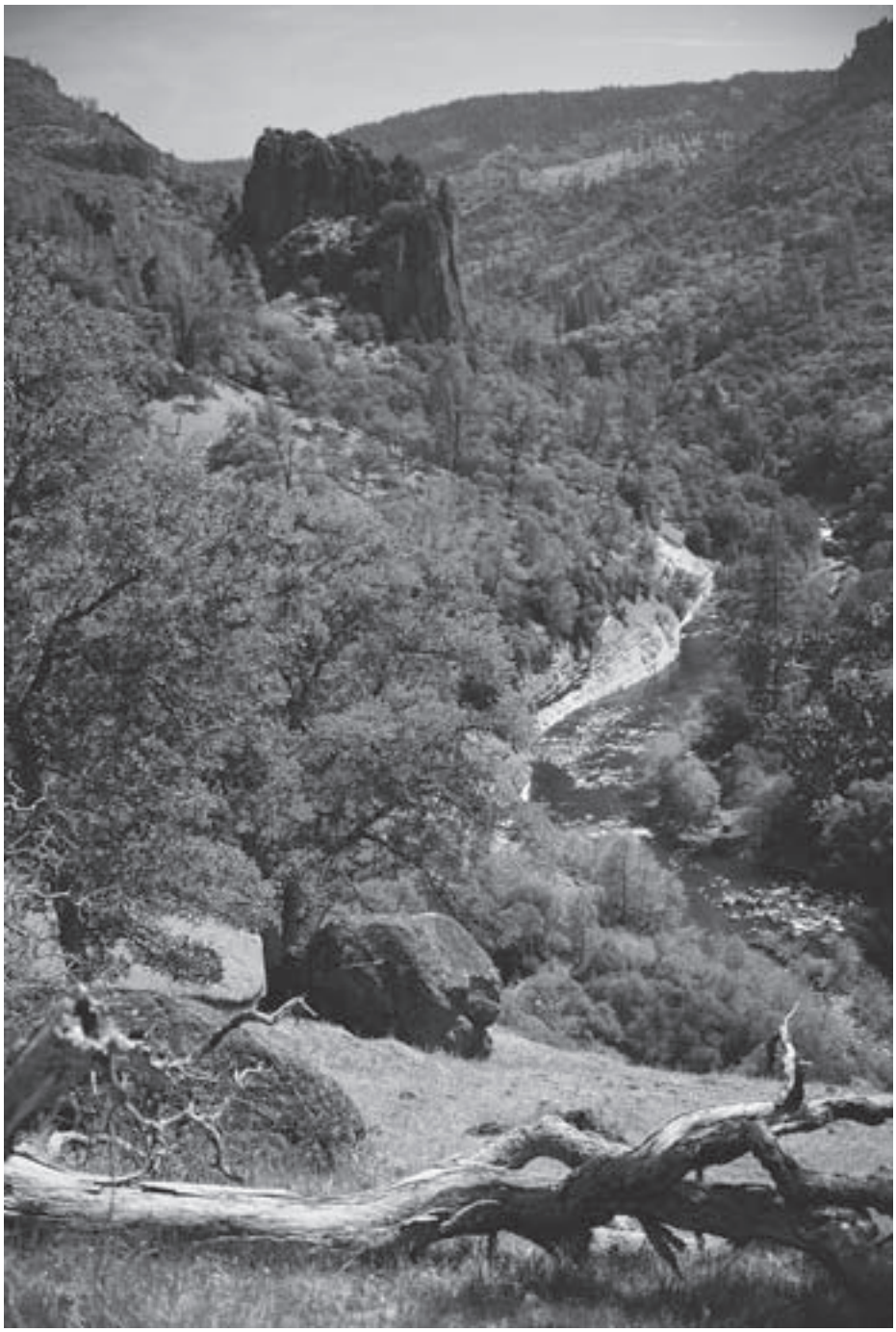
THE CALIFORNIA NATURAL DIVERSITY DATABASE: A NATURAL HERITAGE PROGRAM FOR RARE SPECIES AND VEGETATION

by Roxanne Bittman

The California Natural Diversity Database (CNDDB), now over 20 years old, is a highly valuable repository of rare plant information maintained by the Habitat Conservation Division of the California Department of Fish and Game (CDFG). The primary function of CNDDB is to gather and disseminate data on the status and locations of rare and endangered plants, animals, and vegetation types. The goal of the program is to help conserve California's biological diversity by providing government agencies, the private sector, and conservation groups with information to promote better-informed land-use decisions and improved resource management. The California Native Plant Society (CNPS), through its many chapters and members—which conduct surveys of native rare plant populations throughout the year—is a substantial contributor to the database. CNPS's collaboration with CDFG helps to keep the database current so its data can be used to inform policy decisions that may impact native plant habitat.



Ishi Wilderness, northern Sierra Nevada. CNDDB updated all of the sensitive taxa in the entire Sierra bioregion in support of the Sierra Framework planning effort. Photograph by M. Hoshovsky.

PART OF A CONSERVATION NETWORK

CNDDB is a rich source of highly accurate, quality-checked data on the locations and status of rare and endangered plants, animals, and natural communities (collectively known as "*elements*") in California. CNDDB was originally conceived and developed by The Nature Conservancy (TNC)

ACRONYMS

CDFG	California Department of Fish and Game
CNDDB	California Natural Diversity Database
GIS	Geographic Information System
TNC	The Nature Conservancy
WCB	Wildlife Conservation Board

science staff in 1979. The science branch of TNC is now part of a new organization called NatureServe. CNDDB is part of a nationwide network of natural heritage programs across the United States, Canada, and Latin America which collaborate with NatureServe.

The function of NatureServe is to manage and distribute information critical to the conservation of the world's biological diversity. It provides regional data sets (that cross state lines) to federal agencies, and promotes the mission of conservation nationwide through products, services, decision support tools, publications, and the website NatureServe Explorer (*www.natureserve.org/explorer*). NatureServe recently published the book *Precious Heritage* (Stein et al. 2000), which discussed the status and trends of the biological diversity of the United States. This volume represented a successful test as to whether heritage data from across all 50 states could be compiled and analyzed to offer a broad scale picture for the entire nation.

North Coast semaphore grass (*Pleuropogon hooverianus*) is a rare plant from Marin, Mendocino, and Sonoma counties. CNDDB recently worked with the local CNPS chapters and the DFG Habitat Conservation Planning Branch to update all known records of this plant in support of a petition to uplist the species from Rare to Endangered under CESA. Photograph by P. But.

NATIONWIDE DATA COMPATABILITY

One of the strengths of the natural heritage network and of the individual programs that comprise it, such as CNDDB, is that all programs use similar tools and virtually the same methodology to enter and analyze the data on rare species and vegetation types. They use the same element codes, element ranking system, and mapping conventions, as well as very similar data entry forms. (*Element ranking* includes the use of Global (G) and State (S) ranks to reflect an element's relative rarity and endangerment status.)

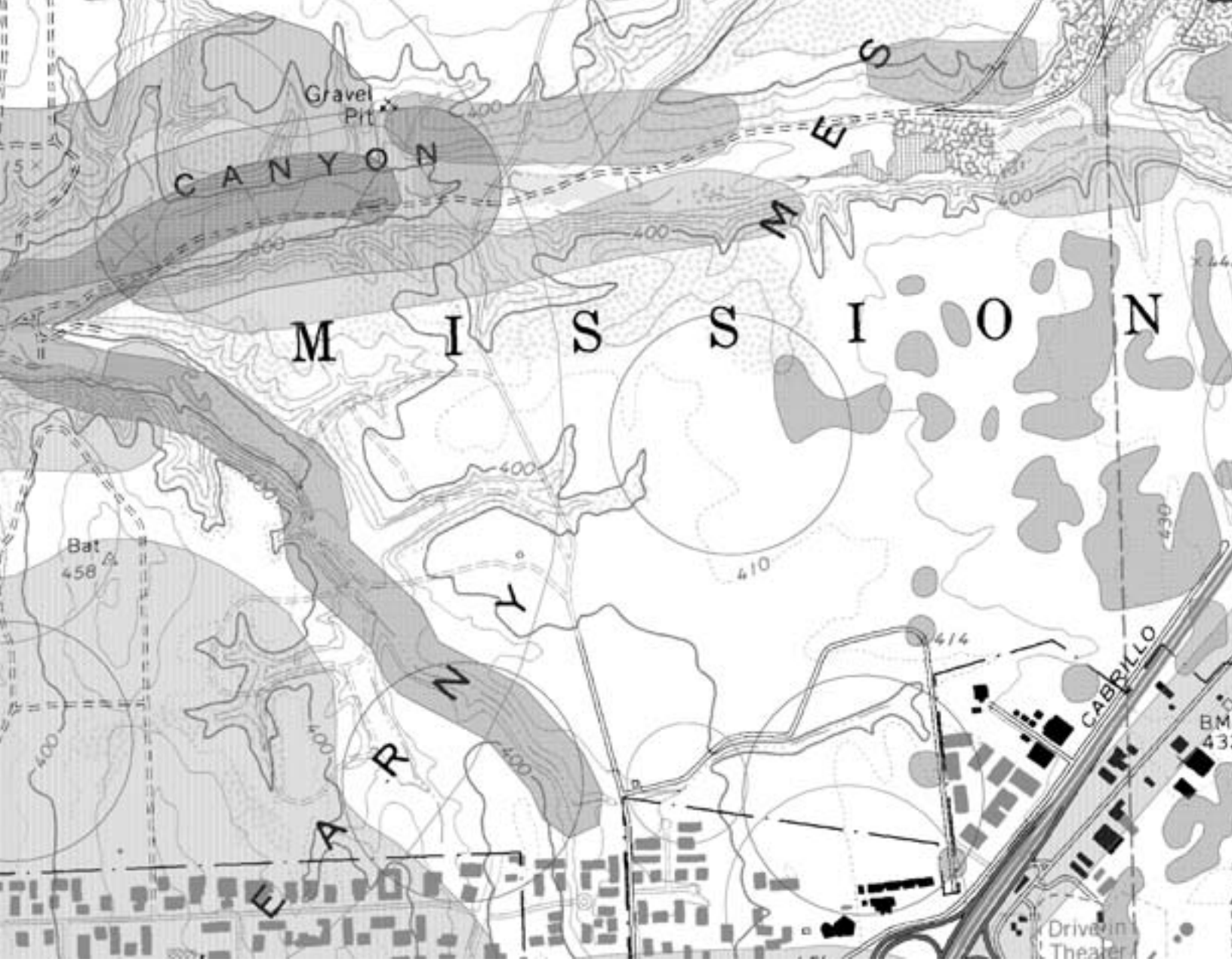
For consistency, all scientific names are fully cross-referenced in a central database. Data are mapped as precisely as they are received by all participating heritage programs. For example, if we receive a label from an herbarium specimen with imprecise location data, we map it as a larger, non-specific circle (of varying sizes). If we receive a field survey form (see p. 63) with a map precisely locating the extent of a population, we map the population precisely. Plant populations within one-quarter mile of each other are considered part of one occurrence.

Each occurrence is input by one biologist and quality controlled by another to maximize accuracy. This methodology, with minor variations, is consistent throughout the network. The nationwide data compatibility makes it possible for NatureServe to do cross-state analyses and to produce multistate products, such as *Precious Heritage*.

USES LATEST TECHNOLOGY

As part of the nationwide network of heritage programs, CNDDB enjoys a special position. The California program is not only well-established, with over 40,000 location records in its database, but it was the first in the country to integrate its program with the use of a Geographic Information System (GIS). GIS makes it possible to map, store, retrieve, and analyze geographic data on a computer.

This migration to new technology initially cost the program valuable data entry time, since the conversion to a digital mapping system was time-consuming and contributed to the accumulation of an unprocessed data backlog. However, the use of GIS allows this and other heritage programs to do analyses that would never be possible with paper maps or more traditional databases alone. In addition, the California program takes great care to fully reference each occurrence in its database. Every mapped location has a full bibliography associated with it and the



CNDDB digitizes each occurrence into a GIS layer, with some mapped as non-specific circles and others as very precise polygon features. This example shows a portion of the USGS La Jolla 7.5' quadrangle in San Diego County. The multiple polygons on the right represent a mixture of several very rare vernal pool plants, while the long polygon to the left represents southern riparian scrub, a rare vegetation community. Map by CNDDB.

references are logically filed within the CNDDB office. Thus, the documentation for each location is readily accessible.

A POSITIVE SIGHTING DATABASE

It is very important to understand that CNDDB only records actual sightings of rare species and natural communities. If an area is surveyed for a species and it is *not* found, this is not recorded, unless the species was known previously to be present on that site. This means that no inference can be made regarding lands that have never been surveyed. It is never appropriate to state that an area contains no rare taxa simply because a search of CNDDB was made and nothing resulted from the query. Large tracts of land in the state have never been surveyed for rare plants and animals and retain the potential to support rare elements; this fact needs to be clearly stated in all environmental documents. Put simply, a lack of records in CNDDB does not mean that no rare plants or animals occur in a given area.

DATABASE USES AND FORMATS

Clients of CNDDB include federal and state agencies, county and local governments, private consulting firms, environmental groups, land protection entities, and academic researchers. We provide data to thousands of clients each year

and this user base is growing. Their activities and needs vary greatly, including environmental document preparation or review, land protection and management activities, state and federal listing processes, plant status review, and research.

CNDDB provides the data in a variety of formats to accommodate user needs, including our personal computer application *Rarefind*, GIS layers, hardcopy maps and overlays, and reports and descriptive information from our extensive element files.

To support clients' diverse needs CNDDB provides a variety of levels of detail. Some may only need the US Geological Survey 7.5-minute topographic quadrangle level of accuracy for mapped information, while others require exact detail at a precise scale. Some users primarily need location information, with minimal text information, whereas many must have more detailed information to support difficult conservation decisions.

It is therefore critical that CNDDB attempt to collect the highest possible quality data on both population location and distribution, population and habitat condition, threats, land use, and other information related to occurrence rank. (Occurrence ranks range from Excellent, Good, Fair, Poor, Unknown, or None—the latter for extirpated occurrences—and reflect the quality of both the population's health and the associated habitat at a particular site.) Without this level of detail, conservation groups such as The Nature Conservancy, the state Wildlife Conservation Board (WCB), various land trust agencies, and others would have inadequate information with which to make critical land protection decisions.

RECENT CHANGES AND IMPROVEMENTS

What are areas for improvement at CNDDB? Concerns expressed in the past include the charge that CNDDB is too expensive, that data entry is too slow, that there is a large backlog of unprocessed infor-

Jepson Prairie, Solano County. Recently, largely through efforts of the Solano Land Trust, several hundred acres were purchased by WCB as an addition to the larger Jepson Prairie protected area. Documentation by CNDDB of the diversity of rare species on site helped justify the permanent protection of this important natural area. Photograph by O. Pollak.

mation, that the data are too inaccessible, and that there is not an online field survey form which can be submitted via the internet.

CNDDB costs approximately $500,000 per year to run. This pays for 10 permanent and temporary staff, three of which work on plants, along with hardware and software maintenance and materials. This level of staffing is far lower than the per-species staffing levels common in the heritage network. The enabling legislation (California Fish and Game Code § 1932) for CNDDB required that some cost recovery system be in place to offset program costs.

For many years, CNDDB charged private industry clients $2500 per year for a data subscription (and $1250 per year for not-for-profit clients). Although this fee system provided needed income that helped run the program, it was also a disincentive for small companies, local agencies, many county planning agencies, and others unable or unwilling to afford the cost. Additionally, the legitimate complaint was made that users were expected to contribute data to the system and yet were expected to pay to retrieve their own data as an end product. Although there is some validity to this criticism, it is also true that CNDDB makes the data substantially more useful and usable, and is not just a simple compendium of observations.

Recent changes have allowed CNDDB to greatly reduce its charge for subscriptions to $300 per year for new subscribers and $200 per year for renewals. This new pricing structure is the same for both for-profit and not-for-profit users and should make the products available to just about anyone. Some groups maintain memoranda of understanding with CNDDB that provide for data exchange arrangements allowing for free subscriptions. Two examples are the US Forest Service and CNPS. University researchers often qualify for this type of arrangement as well.

Adobe lily (*Fritillaria pluriflora*). WCB succeeded in negotiating a conservation easement for the wildflower-rich Bear Valley in Colusa County, a popular spring botanizing spot. This area has one of the largest known populations of adobe lily, a rare plant from the North Coast Ranges tracked for many years by CNDDB. Photograph by J. Game.

Improvements in technology have recently made possible some exciting changes to CNDDB. CNDDB now has full digital topographic coverage for the state as well as other useful background coverages. (GIS *background coverages* are geographic data sets or overlays containing features such as roads, towns, soil types, watersheds, or rivers that can be can be used for reference during data entry.) The resulting increase in speed of data entry and quality control has led to a steady decline of our backlog of unprocessed data over the last year.

We are also beginning to accept digital data sets with companion tabular data, and we are developing expedited ways of handling this increased data flow in an automated fashion. Currently, digital datasets require more processing time than paper field survey forms, but we expect this to change. A *Windows* version of *Rarefind* is due for release in fall 2002, and will replace the existing DOS version.

As always, data currently housed in CNDDB files that have not yet been entered into the computerized database are available for review by interested parties. This includes updates to existing occurrences, as well as files on wholly unprocessed plants, which are mostly comprised of CNPS List 3 and 4 species. There are also some as yet unprocessed List 1B and 2 taxa which were newly added to the latest edition of the CNPS *Inventory of Rare and Endangered Plants of California* (CNPS 2001).

In addition to improvements outlined above, CNDDB anticipates the development of an online field survey form with point and

polygon mapping capability. Currently, data contributors can fill out an online field form from our website. However, they cannot save or submit it over the Internet since online digital mapping is not yet perfected. Contributors should provide precise location information with their survey forms.

APPROPRIATE USE OF SENSITIVE DATA

The question as to how much sensitive locational data should be freely available to the public has been debated since heritage programs first began compiling such data. All heritage programs contacted in a recent survey indicated that their policy on data security was either parallel to that of CNDDB or was stricter. CNDDB screens each client to ascertain what they need the data for in order to tailor the product to their needs.

CNDDB and other heritage programs retain the right to refuse release of the most detailed information under certain circumstances. This stems from the concern that there is still not widespread understanding of the importance of rare species among the general public. Population loss or degradation by deliberate destruction of habitat is a problem, as is over-collection of certain classes of sensitive plants such as bulbs, orchids, insectivorous plants, and succulents. This list has grown to include plants used in commercial ventures to make craft products containing wood, lichen, branches, leaves, fruit, and the like. These plant materials come from a variety of species, both common and rare.

There is a large amount of information on the basic ecology and aesthetic value of rare plants that could be displayed on the Internet. We also either currently provide or intend to provide online lists of rare plants with their status and location to the county or 7.5-minute quadrangle level. CNPS currently makes this information available on their website (*www.cnps.org*). However, we do not advocate putting up the most precise location information for sensitive species (which includes all species on CNPS Lists 1-4).

Notwithstanding the approach described above, CNDDB is committed to providing widespread access to the data it collects and analyzes. As stated, more general information will be provided on the CNDDB website, through publications such as the upcoming *Atlas of the Biodiversity of California* (in prep 2002), and through links to other sites such as Calflora (*www.calflora.org*) and the CNPS website. Access to CNDDB data is also planned for the future via online, password-protected methods.

HOW TO CONTACT CNDDB

To learn more about our program, visit our website (*www.dfg.ca.gov/whdab*). Lists of rare, threatened, and endangered plants are found here, as well as the online field survey form, information on the appropriate way to survey for plants, and more. There is also equivalent information for rare animal taxa and natural community types. A section titled Data Products contains an online order form and product support information, along with commonly used links. To contact CNDDB directly, use the email addresses listed on the CNDDB website under Staff.

HIGHLIGHTS OF CNDDB

- Contains over 40,000 records on rare plants, animals, and natural communities, including nearly 20,000 records on rare plants alone, covering over 1000 taxa.
- Subscriptions cost $300 per year, and $200 to renew, with free six-month updates.
- Our website (*www.dfg.ca.gov/whdab*) contains an online field survey form for submitting new data, with a link to an online mapping tool for use with coordinate information such as UTM and latitude/longitude.
- For more information, contact CNDDB using the email addresses listed on the website under Staff.

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