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PROTECTING RARE PLANTS

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California Native Plant Society

Bob Hass, Editor

Nick Jensen, Aaron E. Sims,
Advisors

Beth Hansen-Winter, Designer

Ileene Anderson, Brad Jenkins, and
Mary Ann Showers, Proofreaders



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PLANT SOCIETY

*Protecting California's Native Flora
Since 1965*

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CALIFORNIA NATIVE PLANT SOCIETY

CNPS, 2707 K Street, Suite 1; Sacramento, CA 95816-5130

Phone: (916) 447-CNPS (2677) Fax: (916) 447-2727

Web site: www.cnps.org Email: cnps@cnps.org

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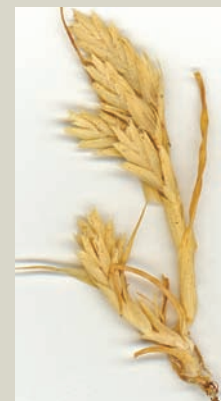
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THE COVER: Mount Diablo fairy lantern (*Calochortus pulchellus*) is a prime example of the beautiful rare flora of California that is threatened primarily by development and grazing. It is also part of the logo that appears on the cover of *The Jepson Manual*. Photograph by Neal Kramer.

CNPS RARE PLANT PROGRAM: PAST AND PRESENT

by Nick Jensen and Aaron E. Sims

The CNPS Rare Plant Program (RPP) got its start in 1968 when legendary botanist and geneticist Dr. G. Ledyard Stebbins began compiling a list of plants having a distribution of less than 100 miles, using the distributions in Dr. Philip Munz's *A California Flora*. This original and important attempt to document the state's rarity was recorded on a set of notecards, and served as the foundation for the first *CNPS Inventory of Rare and Endangered Plants* (the *CNPS Inventory*), published in December 1974.

At this time, the *CNPS Inventory* was the most detailed assemblage of rare plant data for any state in the nation, and it quickly became the most widely used reference on the subject in California (*Fremontia* October 1990). Over the past 40 years the *CNPS Inventory* and RPP have continued as a model of scientific accuracy and integrity, serving as a tool for education, research, conservation, and advocacy.

By 1980 CNPS hired its first full-time Rare Plant Botanist (RPB), Rick York, whose salary initially came from a one-year contract with The Nature Conservancy (TNC) in return for access to CNPS's rare plant information. At that time the Cali-

fornia Natural Diversity Database (CNDDB) was a cooperative effort of TNC and the California Department of Fish and Game (now known as the California Department of Fish and Wildlife, or CDFW). By combining staff time and data in a collaborative effort, the success of the effort exceeded all expectations. In late May of 1981, however, the CNDDB became a part of the Planning Department of CDFW, no longer involving TNC. With this shift in management and end of the initial contract, a new agreement was

proposed. It maintained the same working relationship between CNPS and CNDDB, but stipulated that CNPS would have to fund the RPB position. The benefits of this relationship were numerous so the motion passed unanimously, and the cooperative agreement between CNPS and CNDDB continues to this day.

CNPS has now funded the RPB position for more than 33 years. This long-term commitment to the RPP provides continuity in the maintenance of the state's primary catalog

The recent addition of five newly described rare monkeyflowers to the *CNPS Inventory* exemplifies the Rare Plant Program's reliability in providing the state with the most up-to-date conservation status on the California flora. CLOCKWISE FROM TOP LEFT: Sierra Nevada monkeyflower (*Erythranthe sierrae*), limestone monkeyflower (*Erythranthe calcicola*), Carson Valley monkeyflower (*Erythranthe carsonensis*), Santa Lucia monkeyflower (*Erythranthe hardhamiae*), and Red Rock Canyon monkeyflower (*Erythranthe rhodopetra*). All were described in late 2012 and added to the *Inventory* in 2013. All photographs by Naomi Fraga.



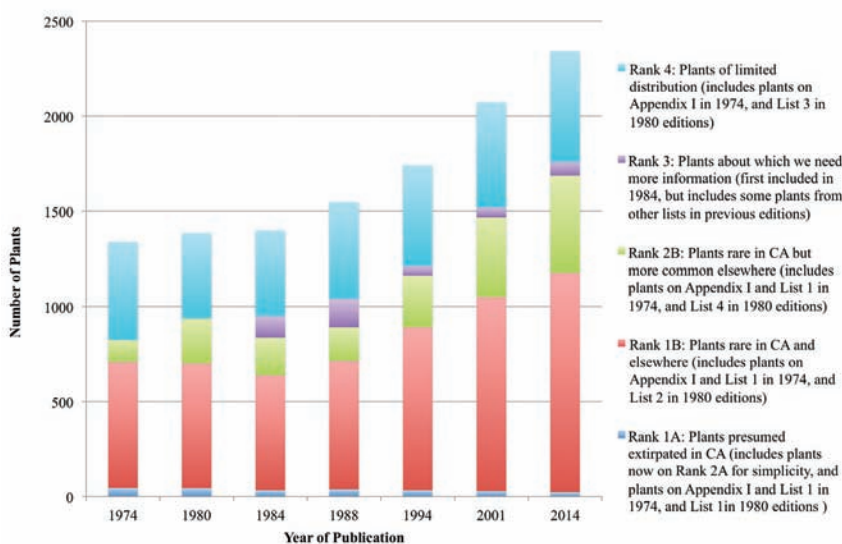
of rare plants. Although the content and composition of the *CNPS Inventory* has changed (see Figure 1, right), the RPB's primary role of maintaining the state's rare plant information has remained constant. These 33 years also serve as a landmark for celebrating CNPS's extensive commitment to collaboration with the state's natural heritage program, the CNDDDB. This close relationship, which includes data sharing and cooperation in the rare plant status review process, is a model of collaboration between a nonprofit organization and a government agency. For more information on the CNDDDB, see the July/October 2001 *Fremontia*, a special double issue on rare plants, and also the tribute on page 28 of this issue by Kristi Lazar on the tremendous long-term commitment of former CNDDDB lead botanist, Roxanne Bittman.

Since 2001 when the last rare plant issue of *Fremontia* was published, the RPP has undergone several major changes. In 2001 the last print edition of the *CNPS Inventory* was published. In the same year, the *Online CNPS Inventory, 7th Edition*, was developed (see sidebar, page 5). Since then, the Society has focused on maintaining the *CNPS Inventory* as a free, online, continuously updated and searchable database.

Another major change occurred in 2005 when the rare plant status review process—the procedure through which plants are added to, removed from, or re-ranked within the *CNPS Inventory*—transitioned from reviews during in-person meetings to an email group and online forum-based process. This reduced the cost associated with conducting status reviews, improved transparency, and fostered the involvement of hundreds of expert reviewers from various occupations throughout California and the world (see Figure 2).

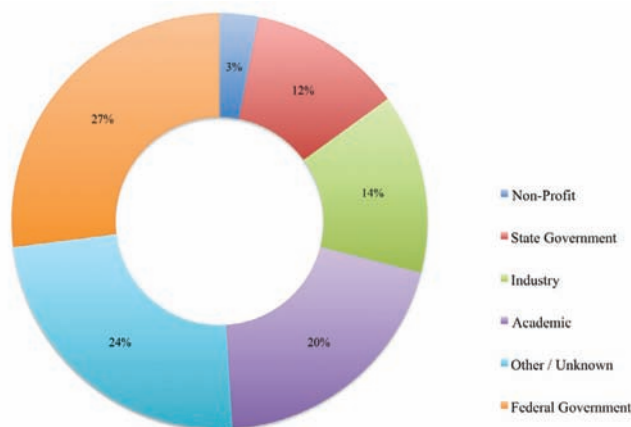
Also, the incorporation of now widely available online data into the status review process, such as

FIGURE 1: COMPOSITION OF THE CNPS RARE PLANT INVENTORY OVER THE PAST 40 YEARS.



Source: CNPS 2014.

FIGURE 2: CONTRIBUTORS TO THE STATUS REVIEW PROCESS.



Affiliations of the more than 400 CNPS rare plant status reviewers. The diversity of qualified reviewers ensures that the final determinations of California Rare Plant Ranks are strong and well vetted.

Source: CNPS 2014.

specimen data in the Consortium of California Herbaria (CCH), has made the ranking of the state's rare plants more efficient and accurate. (See Table 1, page 4, for a list of the California rare plant ranking system categories.) For example, Yolla Bolly Mountains bird's-foot trefoil (*Hosackia yollaboliensis*) was added to California Rare Plant Rank (CRPR) 4, plants of limited distribution, in the first edition of the *CNPS Inventory* based on reviewers' consensus of its rarity during an in-person meeting. Yet a 2013 review of the plant's rarity using CCH specimen data indicated that the trefoil is actually known from

fewer than ten occurrences. For that reason it was subsequently re-ranked to CRPR 1B, plants rare, threatened, or endangered in California and elsewhere.

Other changes to the *CNPS Inventory* in recent years include the addition of CRPRs 2A and 2B, in recognition that some plants on CRPR 1A, presumed extinct, are actually found outside of California and are not endangered. The creation of CRPR 2A as the list containing plants extirpated in California, but common outside of the state, calls attention to some of the threats to plants at the edge of their range.

Additionally, in 2013, in collabo-



TOP: The review of newly available online data revealed that Yolla Bolly Mountain bird's-foot trefoil (*Hosackia yollaboliensis*) was much rarer than originally thought, and it was subsequently reranked. Photograph by Kate Ludwig, Shasta-Trinity National Forest. • ABOVE LEFT: Green-flowered wintergreen (*Pyrola chlorantha*) is one of five species that were recently included in the novel Rank 2A—plants presumed extirpated in California, but common elsewhere. Photograph by Amadej Trnkoczy. • ABOVE RIGHT: Although some plants are found to be more rare after further investigation (as was seen with the Yolla Bolly Mtns. bird's-foot trefoil), Brandegees' clarkia (*Clarkia biloba* subsp. *brandegeae*) was found to be more common than previously thought, through the work of Rare Plant Treasure Hunt volunteers. Subsequently its status was changed from CRPR 1B to CRBR 4. Photograph by Keir Morse.

ration with the California Lichen Society, CNPS made the decision to include rare lichens in the *CNPS Inventory*. This addition and the associated survey protocols (in development) call attention to rare and important members of ecosystems

that are often ignored in biological survey work. Changes such as these are made possible through the guidance of the Rare Plant Program Committee. Created in 2009 and chaired by Jim André, the committee consists of 14 esteemed botanists from

different parts of the state and plays a central role in helping to set RPP priorities. Furthermore, the group is responsible for reviewing changes in rare plant occurrences and helping to achieve consensus when there is disagreement during the status review process.

In recent years collaboration has increased between the RPP, the CNPS Education Program, CNPS Chapters, and members of the public. The Rare Plant Treasure Hunt Project, initiated in 2010, provides

TABLE 1. THE CALIFORNIA RARE PLANT RANKING SYSTEM (CRPR).

- CRPR 1A: Plants Presumed Extirpated in California and Either Rare or Extinct Elsewhere
- CRPR 1B: Plants Rare, Threatened, or Endangered in California and Elsewhere
- CRPR 2A: Plants Presumed Extirpated in California, But More Common Elsewhere
- CRPR 2B: Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
- CRPR 3: Plants About Which More Information is Needed—A Review List
- CRPR 4: Plants of Limited Distribution—A Watch List

THREAT RANKS

- 0.1: Seriously threatened in California (over 80% of occurrences threatened; high degree and immediacy of threat)
- 0.2: Moderately threatened in California (20–80% occurrences threatened; moderate degree and immediacy of threat)
- 0.3: Not very threatened in California (<20% of occurrences threatened; low degree and immediacy of threat or no current threats known)

Source: California Native Plant Society, 2014, cnps.org/cnps/rareplants/ranking.php.

CNPS INVENTORY: FROM PRINT TO PIXEL

In 1983 Rick York, Rare Plant Program Botanist, began the task of computerizing more than 15 years of CNPS rare plant data on nearly 1,400 taxa. At the time, one of the claims for computerizing the data was that it would allow users to generate lists of plants by county and by quadrangle (*Fremontia* January 1982). Fewer than ten years later, CNPS released the *Electronic Inventory*, which was acclaimed by then CNPS Vice President for Rare Plants, Dr. Bruce Pavlik, as “one of the most sophisticated natural heritage and inventory software programs in the world.”

The *Electronic Inventory* continued for nearly a decade, alongside the publication of the *CNPS Inventory, 5th Edition*, in 1994, and *6th Edition* in 2001, which would be the last in print format. However, the need for it to be continuously updated and publicly available was becoming increasingly apparent, and North Coast Chapter Delegate, Larry Levine, took it upon himself to develop the *Online CNPS Inventory, 7th Edition*. With no formal training in programming, Larry developed the *7th Edition* using free academic software developed in Slovenia that he discovered through an Internet search.

The *7th Edition* is still in use today, but new programming tools and mapping software led to the need for a revised version in December of 2010, and the current *Online CNPS Inventory, 8th Edition*, was born. The *8th Edition* not only allows users to create lists of rare plants by selecting a location from a map (something past rare plant botanists could only have dreamed of), but allows one to perform a search based on nearly 60 different criteria, as well as by natural communities and key search terms.



Longtime member of CNPS North Coast Chapter and current Chapter Council Vice Chair, Larry Levine, independently developed the first *Online Inventory* in 2001 with no formal training. This was a momentous accomplishment that set the precedent for immediate public access to the most up-to-date information on California's imperiled flora. Photograph by Johanna Rubba.

citizen scientists with the training and background information necessary to search for and document his-

torical occurrences of rare plants throughout California. To date, the project has involved nearly 700

volunteers who have clocked over 12,000 hours while visiting more than 2,100 rare plant occurrences statewide. This is just one example of the tremendous amount of work that volunteers do for the RPP each year.

The value of the thousands of hours spent by CNPS members searching for, documenting, and monitoring rare plants cannot be understated. Yet, as discussed in Bartosh and André's article in this issue of *Fremontia*, protections for California's rare plants are still inadequate, and a lot more needs to be accomplished if we are to protect them. Nevertheless, we remain positive and confident that the RPP and all of its partners will continue to do their part to help preserve California's botanical legacy.



Whiteworm lichen (*Thamnolia vermicularis*) is one of fourteen rare lichens now included in the *CNPS Inventory* thanks to recent collaboration between CNPS and the California Lichen Society. It is growing with curled snow lichen (*Flavocetraria cucullata*), a greenish-yellow shrub-like lichen. Photograph by Stephen Sharnoff.

Nick Jensen, 1500 North College Avenue, Claremont, CA 91711, njensen@rsabg.org; Aaron E. Sims, 2707 K Street, Suite 1, Sacramento, CA 95816, asims@cnps.org



Eastern Merced County was part of an NCCP planning effort initiated in 2002. Due to lack of political leadership, there is still no conservation plan for this area. Photograph by Carol Witham.

REGIONAL CONSERVATION PLANNING AND RARE PLANTS

by Carol Witham

The Natural Community Conservation Planning (NCCP) Act requires taking a broad based ecosystem approach to planning that focuses on protection and perpetuation of biological diversity within a region. An approved NCCP (Natural Community Conservation Plan) allows destruction of endangered species and their habitat in certain locations provided that they are conserved in others.

In its earliest form the NCCP Act lacked standards for development or approval. After some conservation plans in Southern California that contained vague and discretionary provisions failed to achieve

expected conservation goals (Rolfe 2001), the NCCP Act was reformed by the California legislature in 2002 to require standards for approval. This revised NCCP Act set the stage for many new regional-scale planning processes.

The three articles that follow give an overview of CNPS's participation in three large-scale NCCP planning endeavors, each at a different stage of development. Katie Barrows talks of the Coachella Valley Plan, which was adopted in 2008 and is well into its implementation phase. Kevin Bryant discusses the Santa Clara Valley Habitat Plan, which was adopted in 2013. Greg Suba covers the plan-

ning and negotiation phase of the yet to be completed Desert Renewable Energy Conservation Plan. Even though these are located in different areas of the state and involve different conservation priorities and planning issues, several themes are common to all three accounts.

The plans themselves are a good idea.

They can protect rare plants and habitats, and ecological processes that might otherwise be lost during individual project planning and permitting. While plants can be overlooked if the focus of the plan is on animal species, they and their natural habitats must be included in or-



der to maintain integrity of the landscape. Plant advocates should also insist upon the best available science and use of precautionary principles when faced with uncertainties. The Coachella Valley Plan makes good use of partnering with scientists both during the planning phase and now into the implementation phase.

Participation in the planning effort is both necessary and time-consuming. To ensure that rare plants and their habitats are conserved as part of the planning process, advocates for native plants must be at the table during all phases of the planning effort. Negotiations on these plans can last years and usually require building respectful relationships with odd bedfellows in order to find common ground. It is also important to gain the interest and support of elected officials such as in the Santa Clara Valley Plan. Without a political champion to help drive the

effort, these plans can take decades to develop.

Advocates should ask for maximum protection of rare plants and their habitats. This is especially important when faced with uncertainty regarding the distribution of any covered species. Covered species are those that may be destroyed as long as they are protected elsewhere in the planning area. As in the Desert Renewable Energy Conservation Plan, a well-prepared vegetation base map may need to suffice for more detailed species distribution information. Remember that during the negotiation process of plan development, acreage in conservation will get whittled away. Once something is given up, it may be impossible to get it back even if the other side reneges on their part of the deal.

Along with other CNPS advocates, I worked on the legislation that reformed the NCCP Act in 2002; have participated in the South Sacramento Plan for nearly two decades; and have been observing the development of several other plans in the Sacramento Valley. It is my opinion that politics will drive most plans. If the planning process has a strong political advocate, then the final plan is less likely to be modified during the eleventh hour by influential constituents. All stakeholders should be at the table and fully engaged during the entire process. Only then will the entire group be vested in the negotiated common ground. However, it is important to remember that politics can also drive the implementation of the plan. If the language of the plan allows too much discretion, political influence and low quality science will determine the conservation outcome.

Regardless of the unsavory political aspects of regional conservation planning, the outcome can be a

Natural Community Conservation Plans California, August 2014



science-driven regional preserve system that protects not only covered animals and plants, but also the ecosystem processes necessary to maintain them in perpetuity. The alternative would continue to be postage stamp avoidance areas with little long-term conservation value. So my advice is to get out there and be the “voice of the plants” in these planning processes. The following additional perspectives are from others also experienced in the ins and outs of negotiations to conserve native plant communities. We hope you will find them useful, and invite you to contact any of us to discuss challenges in your own conservation work.

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Carol Witham, 1141 37th Street, Sacramento, CA 95816, carolwwitham@gmail.com



The endangered Coachella Valley milkvetch (*Astragalus lentiginosus* var. *coachellae*) is adapted to the dynamic and rare sand dune ecosystem. Photograph by Kathleen Fleming.

COACHELLA VALLEY NCCP

by Katie Barrows

Conserving the rare and endemic plants and animals inhabiting the deserts of the Coachella Valley re-

quires more than protecting the land where they occur. To do so requires maintaining ecological integrity and protecting ecosystem processes—

hydrological regimes and sand transport—in an environment of active desert washes and blowing sand dunes.

When the Coachella Valley Multiple Species HCP/NCCP (CVMSHCP) was begun in 1996, NCCPs provided the proactive planning tool that allowed this ecosystem approach to work over a 1.1 million-acre area from Palm Springs to the Salton Sea. This tool was used to develop a reserve design to protect 27 species including 2 federally endangered and 3 unlisted endemic plant species, and 27 natural communities including native fan palm oases, desert dry wash woodland, and mesquite hummocks (honey mesquite growing in large mounds of sand).

Since the CVMSHCP started acquiring land, over 85,000 acres have



The tiny local endemic Little San Bernardino Mountains linanthus (*Linanthus maculatus*, left) and the small shrub, Mecca aster (*Xylorhiza cognata*, right) are two of the unlisted species receiving protection through the Coachella Valley NCCP. Linanthus photograph by Kathleen Fleming. Aster photograph by Colin Barrows.

been conserved. In time, 230,000 acres will be added to the network of existing conservation lands that include the Santa Rosa and San Jacinto Mountains National Monument, BLM wilderness areas, and parts of Joshua Tree National Park. Before state and federal permits were signed in 2008, stakeholders and a team of independent science advisors were involved in Plan development. Now, implementation involves local, state, and federal partners working together to reach conservation goals.

How is it working? Given the limitations for protection of plants in the federal Endangered Species Act, without an NCCP plants have little protection. For the Little San Bernardino Mountains linanthus (*Linanthus maculatus*), an unlisted local endemic, the emphasis on natural communities allowed for protection of the braided washes that are habitat for this species. With conservation objectives requiring protection of a specific number of acres of species habitat, a proposed development that threatened this tiny plant was abandoned for lack of funding. Now, over 60% of the habitat for this plant has been permanently conserved and more acquisition is in the works.

The federally endangered Coachella Valley milkvetch (*Astragalus lentiginosus* var. *coachellae*), which inhabits blowing sand dunes and desert washes, is another species that

received protection through this NCCP. To ensure its persistence, conservation objectives required protection of a set number of acres of both habitat and sand transport areas. Conservation proponents fought hard to protect this sand dune ecosystem, and their victory will ensure that the dynamic nature of this habitat is maintained.

What are the key elements of success? Certainly, having scientists and nonprofit partners involved on an ongoing basis is essential. Local elected officials, in this case the Coachella Valley Conservation Commission as the implementing agency, have an investment in the CVMSHCP's success. Ongoing monitoring, research, and adaptive re-

acquisition and management of conservation lands will be limited.

What could we have done better? Because NCCPs require that many people be involved in the decision-making process, these plans take time. In a rapidly developing area, opportunities for conservation can be lost. The NCCP is a "big picture" planning tool for ecosystem level conservation. Developing a shared vision among all participants early on is highly desirable, because it speeds the process and facilitates more effective conservation.

Katie Barrows, 73710 Fred Waring Drive, #200, Palm Desert, CA 92260, kbarrows@cvag.org



Recent acquisition of lands on this alluvial fan, formerly proposed for development, will ensure the conservation of desert riparian habitat and an important biological corridor. Photograph by Bill Havert.

source management focus on conceptual models to identify environmental stressors and factors that affect each species' survival. Reserve management committees and a biological working group are responsible for monitoring ecosystem health in the conservation areas and implementing best management practices. Adequate funding is also key. Initially a mitigation fee collected on new development was only used to acquire conservation lands. Several years ago, the Conservation Commission approved a revised fee so it can now also be used for biological monitoring and land management. Still, funding remains a challenge; without adequate funds, ac-

SANTA CLARA VALLEY NCCP

by Kevin Bryant

While representing CNPS as a member of the Stakeholder Group for the Santa Clara Valley Habitat Plan (both an HCP and an NCCP, adopted in 2013), I learned that the path toward plan approval and adoption is often a highly politicized process, depending more on the formation of coalitions and the creation of political pressure than on best available science.

This complex conservation plan aims to protect and preserve plant and animal species across more than 500,000 acres of southern Santa Clara County, in a diverse area that includes over 10,000 acres of fragile serpentine grassland, most of this on Coyote Ridge (see *Fremontia* 36:1 Winter 2008). Four federally endangered rare plant species and at least 16 CRPR IB plant species are known to occur within the Plan boundaries.

The Stakeholder Group, con-

vened in 2005, was comprised primarily of environmental groups, despite the Plan manager's efforts to enlist and retain representatives of development-minded and property rights organizations. Over the course of five years, a process involving reasonable negotiations and generally scientifically-based decisions was carried out in consultation with the Stakeholder Group regarding all aspects of the Plan, and in 2010 a Draft Plan was released to the public.

It included 15 rare plants as covered species (those species addressed in the Plan for which conservation actions will be taken), with a conservation strategy of acquiring over 48,000 acres to be added to a Reserve System managed for the protection and recovery of these species. The prospects of such a comprehensive landscape-level conservation plan that was centered on the protection of rare serpentine habi-

tats had environmental groups such as CNPS eager to support it.

A series of public meetings held after the release of the Plan brought out very vocal opposition to the Plan. This came mostly from property rights and pro-development groups, and they caught the attention of several local politicians from the partner agencies who would need to vote to approve the Plan. Suddenly these organizations began attending the monthly Stakeholder Group meetings, and also talking behind closed doors with the Plan managers and local politicians.

The compromises that resulted, including removing six covered plant species from the Plan, decreasing the amount of land to be acquired for the Reserve System from 48,000 to 33,000 acres, and allowing exemptions for smaller developments in rural lands, made several environmental organizations (including CNPS) less enthusiastic about the Plan. However, the long view became clear to all of us: the revised Plan would still be a vast improvement over the existing piecemeal mitigation, and many species beyond those covered by the Plan would benefit.

Despite the compromises, strong opposition to the Plan continued, and several politicians spoke publicly about greatly reducing or eliminating the Plan altogether, usually citing its perceived high financial cost. To counter this opposition, CNPS members helped to form a diverse coalition, known as Habitat Conservation Now, dedicated to creating the political pressure needed to ensure the Plan would be approved. A year-long effort included many direct contacts with key politicians, mail-in campaigns featuring postcards of beautiful natural scenes from the Plan area, and email cam-



Mt. Hamilton thistle (*Cirsium fontinale* var. *campylon*), CRPR 1B.2, is a covered species in the Santa Clara Valley Habitat Plan, and grows in serpentine seeps within the Plan area. Coyote Ridge, April 2010. All photographs by the author.



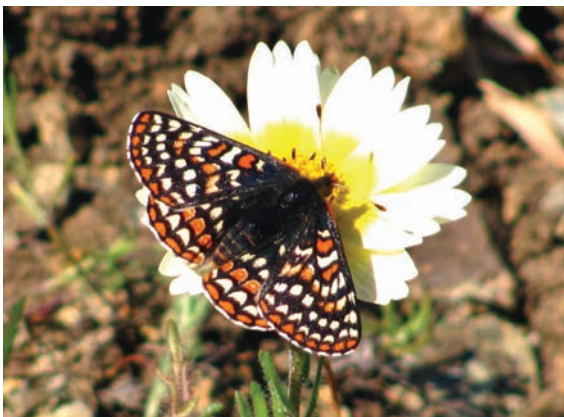
Coyote Ridge is situated immediately adjacent to the heavily urbanized Santa Clara Valley, with portions of the ridge within the boundaries of the city of San Jose. This serpentine grassland is a refuge for dozens of threatened and endangered plant and animal species. The Santa Clara Valley Habitat Plan will help to protect this unique wildland area. Coyote Ridge, April 2009.

paigns to contact local decision-makers and urge them to approve the Plan. These efforts finally paid off when the Plan was approved by

the last partner agency, the City of San Jose, in January 2013, and formally adopted in April 2013.

Involvement in the development of the Santa Clara Valley Habitat Plan through the Stakeholder Group allowed CNPS to “speak for the plants,”

The federally threatened Bay checkerspot butterfly (*Euphydryas editha bayensis*), collecting nectar on *Layia* sp., is a keystone species in the Santa Clara Valley Habitat Plan.



bringing the best available science to the table. And while we argued for the inclusion of many more species that were rejected for largely political reasons, the landscape-level conservation provided by the NCCP portion of this plan is likely to benefit not only the rare species that were included, but all species of plants and animals living within the Plan boundaries. The future of serpentine grasslands in the southern Santa Clara Valley is much more certain now than it was a decade ago thanks to the NCCP Act.

Kevin Bryant, 303 Vine Hill Road, Santa Cruz, CA 95065, mtngreen17@gmail.com



A conservation priority is transitional habitats like this Joshua tree stand at the interface between the Mojave Desert and Great Basin Desert ecosystems, Inyo County California. Photograph by Greg Suba.

THE DESERT RENEWABLE ENERGY CONSERVATION PLAN NCCP

by Greg Suba

Initiated by state and federal authorities in 2010, the goal of the Desert Renewable Energy Conservation Plan (DRECP) is to provide certainty and expedited permitting for renewable energy developers while ensuring the ecological needs of desert species and plant communities are met, and ecological processes are preserved. The DRECP, if approved, will guide state and federal desert land management actions for decades. Without a

DRECP, California's sensitive desert vegetation and wildlife will continue to be destroyed as long as there is interest in building large-scale desert solar projects.

Dwarfing the geographical size of all other Natural Community Conservation Plans (NCCPs) to date, the DRECP's 23 million-acre area presents a challenge to planners and stakeholders. How can we create a plan that meets the conservation standards of the NCCP Act

over such a vast area? How can we identify lands for development that contain comparatively less biological value given the significant gaps in our knowledge of where desert rare plant species are located and of their environmental requirements, so they will persist not only today, but also in an uncertain future of climate change? These questions must still be answered.

To improve the chances of achieving effective plant conserva-



Plants at risk from desert energy development include those yet to be discovered within the DRECP area. The following are just six of several newly described desert plants recently added to the CNPS Rare Plant Inventory. LEFT TO RIGHT: Rosamond eriastrum (*Eriastrum rosamondense*). Photograph by Don M. Davis. • Limestone monkeyflower (*Erythranthe calicicola*). Photograph by Naomi Fraga. • Joshua Tree poppy (*Eschscholzia androuxii*). Photograph by Shannon Still. • Orocopia Mountains spurge (*Euphorbia jaegeri*). Photograph by Keir Morse. • Pioneertown linanthus (*Linanthus bernardinus*). Photograph by Duncan Bell. • Lilliptian linanthus (*Linanthus maculatus* subsp. *emaculatus*). Photograph by Duncan Bell.

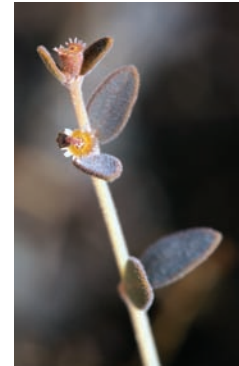
tion through the DRECP, CNPS became involved in the planning process early on by helping gather information on the distribution and life history of plant species in need of protection. As of this writing, the plan nears its first public draft and CNPS continues to identify and advocate for the protection of areas where rare plant species and rare plant communities occur.

Many rare plants are at risk. There are currently over 300 California Rare Plant Rank (CRPR) 1B and 2 plants documented within the DRECP area. Of these, 63 CRPR 1B species have 75% of their California distribution within the plan area, and 75 CRPR 2 species occur nowhere else in California beyond the DRECP boundary. What's more, each year botanists discover and describe new rare plants across remote areas of the planning region. As planning progresses, we update rare plant maps, highlighting those occurrences that overlap the latest iteration of proposed development areas. We then incorporate this information into priority conservation reserve maps drafted by DRECP's environmental stake-

holder coalition. Much of this ongoing work was made possible through funding from the Giles W. and Elise G. Mead Foundation.

The vegetation maps originally proposed for use in the DRECP were based on spatially inaccurate vegetation models (LandFIRE, GAP 2008 maps) that misidentify vegetation types and miscalculate their acreages across much of the plan area. Multiple DRECP stakeholders, including an independent science advisory panel, identified the need for a new DRECP vegetation map as a critical first step in the desert planning process. After more than a year of persuading, planning agencies agreed to fund new mapping, even though early drafts of several plan components had already been developed with the old maps. Today we have a new vegetation map for much of the plan area that meets or exceeds state standards.

The new DRECP vegetation map identifies with high accuracy the locations and the areal extent of rare and common plant communities alike. It establishes a pre-development baseline for the location and quality of Joshua tree stands, micro-



phyll woodland communities, rare dune plant communities, and more in the plan area. With this information, planners can identify lands to include in core conservation areas, while prioritizing additional lands containing ecologically valuable habitat that warrant protection.

Greg Suba, CNPS, 2707 K Street, Suite 1, Sacramento, CA 95816, gsuba@cnps.org

RARE PLANT MANAGEMENT SUCCESS STORIES IN CALIFORNIA

by Linnea Hanson and Julie Kierstead Nelson

Federal agencies manage more lands in California than any other entity, and are required by various federal laws to protect botanical diversity and rare plants. Rare plant programs and policies differ among federal agencies, but all use the California Rare Plant Ranks (CRPR) established by CNPS and the California Natural Diversity Database (CNDDB) as the basis for selecting the California rare plants

in need of conservation. The principal federal land management agencies in California are the US Forest Service (USFS), the Bureau of Land Management, and the National Park Service. These and other federal agencies also contribute funds and expertise to restore rare plants and their habitats on private lands.

Fremontia readers may be particularly interested in the methods and results of rare plant and habitat management projects. Our purpose here is also to bring attention to the legal compliance, environmental impact analysis and planning, and funding necessary to make these projects successful.

Conservation methods on federal lands and on private lands preserved through land trusts include field surveys to determine the extent of species and habitats, species restrictions to distinct habitats, and the response of plants to distur-

bance. Rare and listed species are then identified that need management assistance. Most rare plant management projects start with a formal environmental analysis process, including public comment. The law governing the analysis of environmental effects on federally authorized, funded, or implemented projects is the National Environmental Policy Act (NEPA). Compliance with the California Environmental Quality Act (CEQA) is generally not required for federal rare plant projects.

Active management of species listed under the Endangered Species Act requires consultation with the US Fish and Wildlife Service (USFWS). Non-listed species do not require USFWS involvement. Rare plant management work may be paid for by allocated agency funds, grants, and partnerships with various state and federal agencies, non-governmental organizations (NGOs), and private parties.

Three of our four case studies are located on federal lands in Northern California. The fourth case study involves a state and federally listed Endangered plant located on preserve land in central California.

CASE STUDIES

Webber's milkvetch (*Astragalus webberi*) Habitat Enhancement and Population Augmentation Project, Plumas National Forest (Jim Belsher-Howe, botanist, Mount Hough Ranger District, and Michelle Coppoletta, ecologist, Sierra Cascade Province)

Webber's milkvetch is an extremely rare species (CRPR 1B.2) endemic to the upper Feather River



ABOVE: Jim Belsher-Howe sowing seeds of the CRPR 1B.2 Webber's milkvetch (*Astragalus webberi*) on Mount Hough in the Plumas National Forest. Photograph by Michelle Coppoletta. • TOP: Close-up showing the plant's cream-colored flowers and habit. Photograph by Jim Belsher-Howe.

region of the northern Sierra Nevada in central Plumas County. In 2003 an inventory of the 13 known occurrences documented fewer than 2,000 individuals. Comparisons with past survey information revealed that many of the occurrences were in decline; the number of individuals in some locations had decreased by almost 22% over 20 years. Monitoring suggested that since Webber's milkvetch habitat is found in forest openings, increasingly dense forest growth that shades out the forest floor was severely threatening the persistence of plants and restricting the potential for expansion at known sites. These findings prompted Forest Service botanists and ecologists to initiate a series of projects focused on expanding the number of Webber's milkvetch occurrences and individuals. Currently the species has sensitive species status on Forest Service lands in California, including Plumas National Forest (NF).

Jim Belsher-Howe worked in close collaboration with Kyle Merriam and Michelle Coppoletta of the USFS Sierra Cascade Ecology Program. NEPA environmental analysis documents were completed for all of the ground disturbing activities associated with this series of projects.

The first project, initiated in 2007, focused on enhancing existing Webber's milkvetch habitat and the creation of five additional acres of suitable habitat alongside the edge of an existing Webber's milkvetch occurrence. The project took three years, from the initial planning phase to implementation, and included thinning small diameter conifer trees, pile burning, prescribed burning, and outplanting. Greenville High School students scarified seeds, grew and monitored plants in the greenhouse, and planted seedlings in the newly created forest openings. Students and teachers will continue to be active partners throughout the life of this project.

Seeds collected from the adja-



Stakes, labels, and irrigation infrastructure for saltbush scrub restoration on the Panorama Vista Preserve. This is one of the habitats associated with Bakersfield cactus (*Opuntia basilaris* var. *treleasei*). Photograph courtesy of River Partners.

cent occurrence were used to test germination requirements in the field; seeds were also sown in the greenhouse and cultivated for outplanting. Monitoring of seed trials demonstrated that prescribed fire alone was not sufficient for germination of the existing seedbank or sown seeds. In contrast, seeds in the greenhouse readily germinated after mechanical scarification. Within the thinning and prescribed fire treatment units there was an increase in Webber's milkvetch, which was most likely the result of inadvertent mechanical seed scarification while doing the forest thinning and burning. After being grown in cultivation, 74 plants were successfully planted into the treated site and over 70% have survived to date.

These encouraging results prompted a second project in 2010. It included thinning around two additional Webber's milkvetch occurrences to create more suitable habitat. Researchers conducted genetic analysis of all known occurrences to determine levels of genetic variation and to assist in developing seed transfer and reintroduction guidelines. They also initiated a study to

define the species' ecological requirements. Seeds were collected from six occurrences and grown in the Greenville High School greenhouse by students. In the fall of 2013, 420 Webber's milkvetch plants were planted within the two treated sites and will be monitored over time to determine survival and vigor.

In 2012 researchers began a third project. They identified three new sites where Webber's milkvetch would be introduced. These sites were thinned to create suitable habitat and then planted with scarified seed and greenhouse-grown seedlings. Results of this project will determine the most efficient, cost effective method of establishing Webber's milkvetch in the wild. It will also help define the ecological requirements of this extremely rare species.

These projects have taken over eight years to plan and implement (2007–2014). Accomplishments include over 27 acres of Webber's milkvetch habitat enhanced through thinning and burning; about 550 greenhouse-grown plants transferred to the wild; and over 1,700 seeds sown in the field. This has



TOP: The state and federally listed Bakersfield cactus is now part of a restoration effort to enhance remnant populations and establish new ones. Photograph by Brian Cypher. • BOTTOM: A close-up photo of the diminutive, prostrate Cooke's phacelia (*Phacelia cookei*), a CRPR 1B.1 species that is the object of a restoration project near Mount Shasta. Photograph by Brenna Montagne.

increased the total number of plants by 20% and almost tripled the amount of suitable habitat near existing populations. Funding for these projects came from Plumas NF annual budgets for wildlife, fish, and rare plants, and from wildfire restoration funds.

Bakersfield cactus (*Opuntia basilaris* var. *treleasei*) Habitat Restoration on the Panorama Vista Preserve with River Partners (Andrew Rayburn, restoration ecologist, Tom Griggs, senior restoration ecologist, and Julie Rentner, director of special projects)

The state and federally listed endangered Bakersfield cactus is found in limited distribution in central Kern County near the city of Bakersfield. Known habitat associations of the cactus include grasslands, oak and riparian woodlands, and saltbush scrub. Decline of Bakersfield cactus has primarily been due to conversion of these communities to irrigated agriculture, urban and residential development, and petroleum production. What suitable habitat remains has been heavily invaded by exotic annual grasses and other weeds. Remnant cactus populations are highly fragmented, and further threatened by off-highway vehicle activity, high-intensity fires, trash dumping, and sand and gravel mining.

Two small populations of Bakersfield cactus occur on the 936-acre Panorama Vista Preserve in Kern County. The preserve is located adjacent to the 10,000+ acre Kern River Oil Field, and is owned wholly by the Kern River Corridor Endowment and Holding Company, Inc. (KCRE) based in Bakersfield. River Partners, a statewide California nonprofit specializing in riparian habitat restoration, currently coordinates the Lower Kern River Saltbush Scrub and Riparian Habitat Restoration Project on the preserve. In the first phase of this long-term project, River Partners assisted with planning for a 30-acre riparian forest restoration project implemented in 2010 by KCRE. Under the funding conditions, both federal (NEPA) and state (CEQA) processes were completed for this project, with the Bureau of Reclamation and the City of Bakersfield as lead agencies. Native woody species, including cottonwood, sycamore, a variety of willows, and elderberry were planted to create a diverse habitat mosaic.

The second phase of the project will restore 129 additional acres of riparian woodland and saltbush scrub habitat. This restoration process includes aggressive weed con-

trol and planting of thousands of native trees, shrubs, and vines, and will increase restored habitat connectivity to existing riparian and saltbush scrub habitat including the Kern River Parkway. A dense native understory will also be established to further enhance habitat and to limit weed invasion. Throughout the process, emphasis has been placed on local engagement and partnership building with local, state, and federal stakeholders.

Restoration efforts directly support conservation efforts for the Bakersfield cactus by limiting competition from exotic weeds and creating habitat conditions suitable for expansion of remnant populations. Restored habitats will also provide safe sites for cactus reintroduction, which is a specific goal of the planting design. Removal of annual grasses should limit high-intensity fires that are thought to play a major role in cactus mortality.

Restoration work at Panorama Vista Preserve has been made possible through grant agreements with multiple funders and participants, including federal and state agencies, NGOs, and private parties.

Cooke's phacelia (*Phacelia cookei*) Special Treatments in the Bolam Timber Stand Improvement and Fuelbreak Project, Shasta Trinity National Forest (*Rhonda Posey, botanist, Shasta-McCloud Management Unit*)

Special treatments for Cooke's phacelia, a CRPR 1B.1 species, were incorporated into the Bolam Timber Stand Improvement and Fuelbreak Project on the north side of Mount Shasta. Cooke's phacelia is geographically restricted to a small area at the northern foot of the mountain, on either side of the boundary between the Shasta-Trinity and Klamath National Forests, where it grows in full sun on sandy volcanic soil.

From annual monitoring of the

species by Shasta-Trinity and Klamath NF botanists since 2005, it was apparent that some action was needed to improve and/or increase habitat for this species. Its numbers had dropped from a high in the late 1970s of 100,000 plants to

to a proposed project on the Shasta-Trinity NF that involved building a fuelbreak (thereby creating increased soil disturbance) and thinning ponderosa pine and nearby shrubs. The project avoided as much as possible mulching phacelia habitat with



Mastication—the shredding of smaller trees and shrubs—was used in an area of the Shasta Trinity NF that had been overgrown with vegetation to create sunny, disturbed ground, habitat preferred by the extremely rare Cooke's phacelia. Post-project monitoring has shown a significant increase in numbers of this species. Photograph by Rhonda Posey.

fewer than 2,000 plants in 2008. Two populations in the Shasta-Trinity NF have not been found in recent years and are presumed extirpated.

Monitoring observations, combined with recent research findings by Melissa Patterson of California State University, Chico, led us to conclude that too much vegetative cover and lack of soil disturbance were likely inhibiting seed germination and contributing to the decreasing numbers of Cooke's phacelia. A fortuitous opportunity arose to benefit Cooke's phacelia populations due

chipped woody vegetation, and extended the tree and shrub thinning work 50 feet from the road to create additional favorable phacelia habitat in the project interior.

Environmental Assessment planning started in 2008 and the tree and shrub thinning work was completed in 2013. Funding came from timber stand improvement and fuels funds allocated to the Shasta-Trinity NF. Data from post-project monitoring transects showed that Cooke's phacelia increased in numbers and extent following the vegetation thinning and soil disturbance.

Most encouragingly, phacelia plants were found as far as 50 feet away from the road; before the project work, phacelia plants were primarily limited to roadsides. Monitoring will continue as needed.

Greene's tuctoria (*Tuctoria greenei*) at Murken Bench vernal pool, Lassen National Forest (Don Lepley, assistant forest botanist)

Among the many rare plant species in California is a small group of grasses that are only found in vernal pools. One is Greene's tuctoria, a small, hairy annual grass whose florets are protected by veiny bracts tipped by numerous tiny teeth. Most occurrences are thinly scattered through the Central Valley and adjacent foothills, and the species is so rare that the USFWS listed it as endangered in 1997. Its CRPR is 1B.1.

Greene's tuctoria is also known from the mountains of Modoc and Shasta counties. The sole Shasta site is at Murken Bench, a volcanic terrace roughly 25 miles north of Lassen Peak. An estimated 2,000 tuctoria plants were found there in 1991, in a vernal pool at the foot of a lava field. By 1995, only 1,000 plants were found, and numbers declined precipitously thereafter: 35 in 1998 and none at all in 2010. The occurrence itself is on private land, but Lassen National Forest—manages the surrounding watershed, which USFWS designated as critical habitat in 2003. Therefore, Lassen NF acted to support the survival of the tuctoria colony.

Murken Bench, which has little or no available surface water for most of the year, has been used for early-season grazing for about a century. Ranchers dug water holes for cattle to use and installed fences to help divide resources among their herds. One of the water holes was inside the Murken Bench pool, little more than 100 feet from the tuctoria, and was large enough to hold water that would otherwise have covered the



Aerial view of the vernal pool habitat on the Murken Bench of the Lassen National Forest, home to the federally listed annual grass, Greene's tuctoria (*Tuctoria greenei*). Photograph by Don Lepley.

pool. Cattle using the waterhole intensified the drawdown (one cow consumes about 30 gallons of water daily), and their trampling of the pool soil was sometimes heavy.

When Lassen NF followed the

NEPA planning process and consulted with USFWS to renew the grazing allotment permits in 2009, agreements were made with the ranchers and with the USFWS to change conditions at the vernal pool.



In 2010 the pool perimeter was fenced to exclude cattle. Later the old fencing inside the pool was removed, and in 2011 the large waterhole was filled with local soil. Since then, early-season water has flooded more of the pool. Happily, almost 500 plants appeared in the summer of 2011 and 740 plants a

year later—a very encouraging trend. Perhaps with further improvements that restore the natural hydrology the tuctoria will continue to expand. Funds for this work came from the Lassen NF fish, wildlife, and rare plant budget.

Rare plant conservation has now been a part of public land manage-



Close-up of Green's tuctoria (*Tuctoria greenei*) showing annual growth habit. Photograph by Judy Perkins.

ment for several decades. Once we know the extent of rare species' distribution, habitat requirements and preferences, responses to disturbance, and current threats, we will be better able to identify rare plant species that need management assistance. Then we can plan and begin to implement rare plant management projects that will accomplish long-term conservation goals. Essential components of these management projects include the planning and environmental analysis process needed to ensure implementation success. The four case studies highlighted here illustrate how this process typically unfolds on federal and preserve lands in California.

Linnea Hanson, 2837 Mariposa Avenue, Chico, CA 95973, linneachanson@gmail.com; Julie Kierstead Nelson, Shasta-Trinity National Forest, 3644 Avtech Parkway, Redding, CA 96002, jknelson@fs.fed.us



View of the Tesla acquisition of Carnegie State Vehicular Recreation Area where off-highway-vehicle recreation expansion threatens unique habitat near the Livermore Valley.

FUTURE DIRECTIONS FOR THE CNPS RARE PLANT PROGRAM

by Heath Bartosh and James M. André

Before the Gold Rush, California was a bountiful land of infinite resources and opportunity. Over the past century, millions of people have poured across our borders, seeking prosperity within the idealistic dream-cape. And the dream continues, as population stands at 37.6 million, and is expected to reach 52.7 million by 2060 (California Department of Finance 2014).

Nature, too, is on the move today in California. The rate at which our famously scenic and biologically diverse ecosystems are being displaced and fragmented is intensifying amid California's burgeoning population. Uses of natural areas for recreation (see photograph above) and the extraction of water, timber, and mineral resources are concurrently expanding. Looming impacts from increased urbanization, climate

change, nitrogen deposition, altered fire regimes, invasive species, and energy development pose transformative landscape-level threats to species and ecosystems. And much of the projected increase in California's population is expected to occur in some of our most intact and cherished biodiversity hotspots.

As summarized in this issue of *Fremontia*, over the past four-and-a-half decades the CNPS Rare Plant

Program (RPP) has raised the bar nationally in rare plant conservation, and we celebrate these accomplishments. Moving forward, however, the RPP will be challenged to fulfill its mission amid the overwhelming pace and scale of threats to California's native plants. We discuss some obstacles and opportunities that lie ahead, and outline several expanding roles and potential new directions for the program.

THE INVENTORY OF RARE AND ENDANGERED PLANTS

The RPP will continue to emphasize its long-standing core responsibilities, especially the maintenance of the *CNPS Inventory of Rare and Endangered Plants* (CNPS 2001; 2014), which is the foundation of the program. The *CNPS Inventory* continues to grow and currently totals 2,327 rare species, comprising 35% of California's native vascular plants. With more than one-third of California's native flora now of conservation concern, we are clearly falling behind in our mission to maintain natural and functional biodiversity throughout the state. This alarming trend suggests the RPP has no alternative but to expand its scope. Ultimately, CNPS will need to work with regulatory agencies, conservation organizations, heritage programs in neighboring states, and other national and international programs to develop and implement conservation actions before species reach an endangerment threshold requiring their listing.

In addition to the 2,327 ranked species currently in the *CNPS Inventory*, 239 other plant species are currently proposed for new additions, deletions, or status changes. The review and processing of this substantial and growing backlog will take considerable time and commitment. Why the increasing backlog in listing? With a modest revival of field

exploration, reassessment of herbarium collections, and the recent emphasis on molecular phylogenetic studies facilitated by new molecular techniques, we are actually seeing an increase in taxonomic discovery in California.

In the past two decades the native flora of California has expanded by roughly 350 species, and many of these meet criteria for listing in the *CNPS Inventory*. As plant taxonomy relies more heavily on new molecular tools, there has been a concurrent and rapid progression of the phylogenetic species concept. And while the increased awareness of phylogenetic relationships among species is paramount to rare plant conservation in general, it also complicates the CNPS rare plant review and listing process.

PROTECTION BEYOND THE SPECIES UNIT

As concepts of taxonomic units undergo rapid change, we are reminded that rare plant conservation needs to encompass not only species, but also protect groups of interacting populations (metapopulations) and species within and across related taxonomic groups. For example, genetic relationships within and among populations of plants may influence regulatory or policy decision outcomes (Ellstrand 2014). The RPP will be exploring ways to use the increasingly abundant phylogenetic information to help maintain the integrity of both genetic and ecological relationships and processes for rare plants. Doing this will involve collaboration with scientists, the CNPS Conservation Program, as well as agencies overseeing regulatory processes and land management decisions.

Locally rare populations of more common California species also merit increased conservation recognition. The CNPS RPP is currently working to establish specific *local* rarity criteria that can be used at the

county level. The concept is certainly not new to CNPS. In the early 1990s, Dianne Lake (East Bay Chapter) referred to locally rare plant species as "unusual and significant." In the 2000s the North Coast Chapter's Gordon Leppig and Jeffrey White referred to them as "peripheral populations," while Ventura County's David Magney used the term "locally rare plants."

Research in evolutionary biology has shown that isolated populations or those on the periphery of their range often exhibit higher rates of speciation. Speciation is the evolutionary process by which new biological species arise. Locally rare species are also important for the preservation of biodiversity and ecological processes that are critical amid rapid climate change. These populations represent our "canaries in the coal mine." Clearly, locally rare plants are significant from several conservation perspectives. But what can we do to protect them?

Along with Benjamin Crane, Jeffrey White developed the L-Rank (L = Local) concept, which assigns rare or uncommon status to species within a local geographical boundary that are more common outside that boundary. The L-Rank designation is based on species abundance relative to the size of a given study area. For instance, in Napa County the level of local rarity is derived by counting the number of 1km x 1km grids in which a species is present. The fewer grids it occurs in, the more locally rare it's considered.

L-Ranks can be included in NatureServe's Natural Heritage Ranking System and applied to all corners of the state, as they have similar conservation ranks ranging from 1 to 5, preceded by a letter reflecting the appropriate geographic scale of the assessment (G = Global, N = National, and S = Subnational/State) (Table 1).

Currently, a list of L-Rank species has been applied to Napa County through the efforts of Crane and

White, with other county programs in various stages of development. CNPS, through the RPP and its volunteers, can help identify data gaps necessary to implement the concept of L-Ranks statewide by building a database of local or county level floras that need updating or completing. This is an excellent way to develop locally rare plant programs and bolster chapter-level conservation efforts, since governance and development scenarios are more similar within county boundaries than across county lines. Given its proven history of success with the *CNPS Inventory of Rare and Endangered Plants*, CNPS, and especially the RPP, is in a strong position to seek funding for these valuable endeavors.

REGIONAL PLANNING EFFORTS

Michael Soulé, the grandfather

of conservation biology, proposed four core principles on which the concept of biodiversity would be built (Soulé 1985): 1) a high diversity of organisms; 2) ecological complexity; 3) functioning evolutionary processes; and 4) the intrinsic value of biodiversity.

Noss and Cooperider (1994) built upon Soulé's work by developing conservation principles that operate at regional and landscape scales. Beginning in 1983, the concept of regional conservation planning has been implemented via the mechanism of Habitat Conservation Plans (HCPs), and later, Natural Community Conservation Plans (NCCPs), in an effort to attain the core principles of conservation biology. Since 1983 when the first HCP was developed for San Bruno Mountain, regional planning efforts have multiplied. Currently there are 44 HCPs/NCCPs statewide that have either been implemented or are be-

ing developed, and more are being conceptualized.

One common failure of regional conservation planning is that the process lacks significant participation by rare plant stakeholders. Another problem arises when HCPs and other jurisdictional and legislative boundaries do not coincide. For example, the Bay Delta Conservation Plan (BDCP) is being developed for species affected by the operation of California's two biggest water delivery systems. It overlaps with one plan that is already implemented, and four other plans presently in their development stages. Delta region species ranges extend beyond the boundaries of these regional planning efforts. The BDCP will need to be carefully developed in concert with the conservation goals of the East Contra Costa HCP so that the same rare plant species are being covered, habitat modeling uses similar ecological parameters,

Endemic manzanita habitat of San Bruno Mountain, location of the first Habitat Conservation Plan in California. All photographs by Heath Bartosh unless otherwise noted.



and efforts are consistent with existing recovery plans for federally listed species.

CNPS needs capable volunteers embedded in the planning phases to produce the most effective regional planning efforts that involve rare plants. For example, the East Bay Chapter collaborated in developing the East Contra Costa HCP, and their input assured that the plan now covers relevant affected rare plant species. Other collaborators included environmental consultants, agency biologists, and knowledgeable activists. The East Bay Chapter's conservation analyst was especially helpful in guiding the development of this HCP by serving as the watchdog in situations where public comment and botanical expertise were necessary. He was able to take data from the plant science committees of the Chapter and use it to guide wise decisions for rare plant conservation. CNPS, through the RPP, should strive to develop this framework of collaboration in every chapter.



View of the East Contra Costa County Habitat Conservation Plan area with Mount Diablo in the background.

FACILITATING FESA/CESA LISTINGS

It has been 41 years since the passage of the federal Endangered Species Act (ESA). Since then we have enacted the Native Plant Protection Act (NPPA) and the California Endangered Species Act (CESA), although the NPPA provides little protection for our rare plants. During this time frame, 237 plant species received state and/or federal ESA protection, but the vast majority of these (226 species) were first listed prior to year 2000. Since 2000 only 11 species have been listed under ESA or CESA, and listings have dramatically slowed from 8 to 1 per year.

Conversely, since 2000 the number of species added to the *CNPS Inventory* has increased. The 237 ESA-listed species collectively represent just 4% of our native flora. By contrast, the *CNPS Inventory* lists 1,648 species (25% of our flora) as Rank 1B or 2B (plants that may meet criteria for FESA or CESA listing). Clearly there is a strong disconnect between the numbers of qualifying taxa and the reality of successful listing efforts.

Looking closely at rare plant data maintained by the California Department of Fish and Wildlife's Natural Diversity Database (our state's Natural Heritage Program), it's staggering how many rare plant species with a CNPS Rank of 1B or 2B are represented by only one or two populations and not listed under either ESA.

A total of 41 Rank 1B species are known from just one occurrence, and 48 species have only two occurrences. A total of 69 Rank 2B species have just one occurrence in California, and 39 are known from only two occurrences. These 197 rare species meet criteria for state and federal ESA status and should be on a fast track for listing.

What does this mean for the Rare Plant Program (RPP) in the years ahead? One potential role for the RPP and Rare Plant Program Committee (RPPC) will be to marshal resources and expertise to help the agencies determine which plants merit the highest listing priority. The RPP will also need to work with CNPS chapters, including their rare plant coordinators, volunteers, and regional experts, to develop petitions for ESA listing. Generally if the species in question is on federal land



Rare plants qualifying for CESA/FESA protection. ABOVE, LEFT TO RIGHT: Livermore tarplant (*Deinandra bacigalupii*) and Guggolz's harmony (*Harmonia guggolziorum*); and BELOW, LEFT TO RIGHT: Pungent glossopetalon (*Glossopetalon pungens*) and green spleenwort (*Asplenium viride*). Photograph of pungent glossopetalon by James M. André.

then FESA would be appropriate. Under all other situations, it's generally better to file under CESA. To achieve this, CNPS Chapters will need active and engaged rare plant committees and guidance from the RPP and RPPC.

RESEARCH AND INVENTORY NEEDS

Of the 2,327 rare plants presently listed in the *CNPS Inventory*, only a very small percentage have complete information about their distribution, fundamentals of their biology and ecology, and complexity of their threats. CNPS will continue to make funding the RPP and Rare Plant Treasure Hunt program a high priority, along with supporting other directives to inventory and map rare plant species. In addition to known rare plant species, the RPP recognizes that California remains a floristic frontier where more than 10% of the flora remains undescribed. Many of the newly-discovered species will be rare, and usually not afforded the necessary protections until their taxonomy is confirmed.

Unfortunately, a comprehensive

statewide inventory will take many decades to complete. Meanwhile the RPP will continue to partner with California herbaria by organizing efforts such as bioblitzes (intensive surveys of small areas involving many groups of scientists, naturalists, and volunteers) that target poorly documented regions. CNPS volunteers can also make a tremendous differ-

ence in this effort by offering their help to herbariums that are understaffed and have a substantial backlog of specimens that await processing and database entry.

Rare plant management plans are poorly developed because they lack basic information about the biology and distribution of rare plants. As outlined in previous editions of *Fremontia* (Moore and André, 2014), very few rare plant species in California are protected by established conservation management plans or long-term baseline monitoring and research programs. Many rare species remain on California Rare Plant Rank 3 (more information needed) or Rank 4 (a watch list), because the necessary additional information that research and monitoring would provide is unavailable. The RPP is well positioned to work with agencies and academia to help direct species-specific research needs for rare plants.

Landscape-level and global processes such as climate change may have significant impacts on local rare plant populations. And although species-specific research and management is also necessary, protec-





Catalina Island mountain mahogany (*Cercocarpus traskiae*), one of the rarest plants in California, was state and federally listed before 2000 and is known from only one population containing fewer than 15 individuals.



Protecting the habitat in which rare plants thrive is essential to protecting threatened species. CLOCKWISE FROM ABOVE: The narrowly distributed fringed false-hellebore (*Veratrum fimbriatum*) in Salt Point State Park, Mendocino County. • Looking south along the crest of the White mountains with bristlecone pine (*Pinus longaeva*) in the foreground. • Looking east at serpentine chaparral on the east slope of Walker Ridge, a biodiversity hotspot. Bear Valley and the Sutter Buttes in the distance. • One of the most brilliant orange flowers in the state, flame ragwort (*Packera greenei*), on Walker Ridge, Colusa County.



tion of large contiguous and functioning ecosystems that encompass the critical habitats of rare species is clearly the single most important objective of any rare plant conservation program.

Since the birth of our Society nearly 50 years ago, we have fought for the native and rare plants of California. The RPP has been the flagship endeavor of CNPS and has contributed to the protection of many of our treasured rarities. In order to keep up with the impacts of growth in the Golden State we will need to expand the sources of funding, personnel, and expertise of the RPP, while increasing the presence and functionality of rare plant committees at the chapter level.

Although the principal role of the RPP within CNPS is to serve as the science-based arm of the organization, we must also actively work with academic and agency partners,

fundraisers, and the state legislature to continue to facilitate and strengthen rare plant awareness and conservation at all levels.

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Heath Bartosh, Nomad Ecology, LLC
832 Escobar Street, Martinez, CA 94553,
hbartosh@nomadecology.com; James M.
André, University of California Riverside,
Department of Biology, UCNRS, Granite
Mountains Desert Research Center, HC1
Box 101, Kelso, CA 92309, granites@telis.org



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A TRIBUTE TO ROXANNE BITTMAN

by Kristi Lazar

For more than 25 years, Roxanne Bittman has been a passionate advocate for rare plant conservation. Roxanne earned her BS in environmental biology from UC Santa Barbara in 1978, and her MS in botany from Ohio State University in 1981. In 1983 Roxanne began her career in botany by volunteering at the California Natural Diversity Database (CNDDDB), a database that tracks the locations of rare plants, animals, and natural communities. In 1986 after working three years as a conservation planner for The Nature Conservancy, she was hired by the California Department of Fish and Game (now California Department of Fish and Wildlife) as lead botanist for the CNDDDB, and remained in that position for 26 years!

Roxanne was promoted to CNDDDB coordinator in 2012, overseeing both the botany and zoology sides of the program. She retired in early 2013, but has continued to work part-time with the CNDDDB botany program since then.

Roxanne's constant support for the CNDDDB helped guide the program through numerous changes, including the transition of the data-

base to a GIS system and the development of its RareFind program. Roxanne mentored numerous CNDDDB botanists and temporary staff who worked in the program over the years, and many of these people continued on to other botanical jobs in government and the private sector.

One of the most important aspects of Roxanne's career has been her strong advocacy for the close working relationship between the CNDDDB and CNPS. She recognized the increased efficiency, as well as other benefits, that resulted from this collaborative effort. Not only did Roxanne promote this working relationship through changing administrative climates, she has also been a colleague, friend, and mentor to all the CNPS rare plant botanists from Rick York in the 1980s to the current CNPS rare plant botanist, Aaron Sims.

Roxanne's steadfast commitment to the support and maintenance of essential programs to preserve California's rare flora over the course of



Roxanne Bittman, longtime rare plant advocate and lead botanist of the CNDDDB. Photograph by Diana Hickson.

her long career is exemplary. This work and commitment was recognized by CNPS when she was named the CNPS 2013 Agency Person of the Year.

Kristi Lazar, 1807 13th Street, Suite 202, Sacramento, CA 95811, Kristi.Lazar@Wildlife.ca.gov

BOOK REVIEW

Secrets of the Oak Woodlands: Plants and Animals Among California's Oaks by Kate Marianchild. 2014. Heyday Books, Berkeley, CA. 192 pages. \$18.00. ISBN# 978-1-59714-262-5. (Available at <http://store.cnps.org>.)

A wide range of nature enthusiasts will enjoy Kate Marianchild's informative and well-balanced natural history book. *Secrets of the Oak*

Woodlands provides insightful ecological life histories of prominent plants and animals living and interacting in one of our state's essential natural communities.

The organization and layout is well designed for naturalists who want to quickly prep for their next outing. As one reads through the text it's easy to connect the ecological dots because all of the species names described in the book are

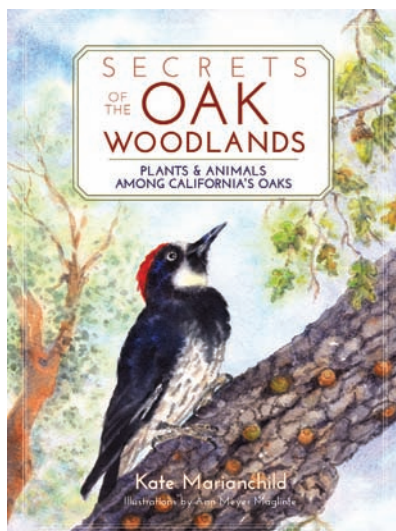
highlighted. This format is useful because it invites us to investigate the oak woodland community members that might not otherwise appeal to us.

Marianchild's articulate yet easy to understand writing style makes the book suitable for armchair readers to investigative scholars. The science is clear, research up-to-date, and depth satisfying at the level of a college textbook. At the same time

she inserts interesting relevant information and builds the readers' appreciation for intricately rich oak woodlands.

Topics covered include common animals such as the acorn woodpecker as well as less well known but biologically beneficial organisms such as mycorrhizal fungi. Each subject illustrates individual ecological concepts and how these concepts are interconnected. The reader is educated on the big picture, while enjoying behind-the-scenes stories.

Integrated into the ecosystem ecology are aspects of human ecology as, for example, Native American uses for plants such as poison oak, and aboriginal wisdom regard-



ing human connections to earth and what it provides us. Marianchild offers explanations for some human natural hazards found in these eco-

systems, without vilifying the flora and fauna that have evolved effective means for their survival.

I believe an underlying reason for our current environmental crisis is our disconnection from the earth that supports us. Marianchild's book turns on our natural biophilia. It helps readers strengthen that connection because of the science contained in it, which she makes understandably interesting, and because it helps us see ourselves as a part of nature instead of apart from nature. *Secrets of the Oak* is likely to be enjoyed by naturalists, nature docents, academicians, and nature enthusiasts of all types.

—Joe Mueller

WHAT SHAPED YOUR LOVE OF NATURE?

[Editor's Note: Fremontia readers were invited to send in their stories of what shaped their love of nature. If you are motivated to send us yours, it can be about 250 words, and should be emailed to bhass@cnps.org. Be sure to include a high-quality headshot, or a photograph of yourself in a natural place you love, and the name of the photographer who took it.]

MARGARETA (GRETI) SÉQUIN East Bay Chapter

My father's bountiful vegetable and flower garden at the outskirts of the city of Basel, Switzerland, brings back many happy childhood memories for me, including the tasting of fresh-pulled carrots and radishes. Though I grew up in a city, my family went hiking in the nearby Jura Mountains and the Black Forest region almost every weekend. My mother would point out wildflowers and medicinal herbs, while my father, armed with binoculars, identified birds. During our yearly summer vacations in the

Alps my sister and I explored creek beds, climbed trees, and scrambled up rocks.

When I later made my way to California, I was captured by the natural beauty of the Southwest and got fascinated by the very different flora. I soon discovered the Regional Parks Botanic Garden (RPBG) in Tilden Park, Berkeley, with its focus on California native plants, and later became a park docent. I also attended many botanical field trips in California to learn about the plants. The San Francisco Bay Area



Carlo Séquin

has been my home for almost 40 years, and I keep enjoying hikes in the coastal hills, the Sierras, and the desert as often as possible.

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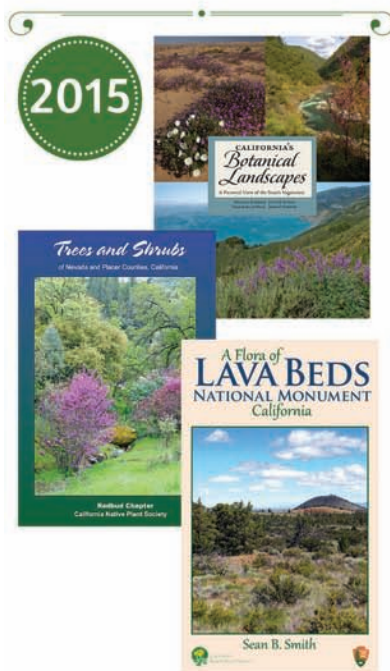
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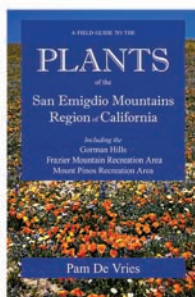
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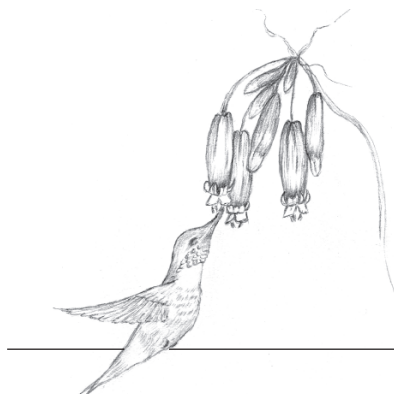
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CONTRIBUTORS (continued from back cover)

Aaron Sims is the Rare Plant Botanist of CNPS and manages the RPP. His main duties include maintaining and updating the *CNPS Inventory of Rare and Endangered Plants* and implementing the rare plant status review process.

Greg Suba is CNPS Conservation Director.

Carol W. Witham is a consulting botanist and a long-time participant in habitat conservation planning on behalf of the Sacramento Valley Chapter of CNPS.

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CONTRIBUTORS

James M. André is director of the UC Granite Mountains Desert Research Center, senior advisor to the CNPS Rare Plant Program (RPP), and chair of the RPP Committee.

Katie Barrows works for the Coachella Valley Conservation Commission and has been involved in the Coachella Valley NCCP/MSHCP since its inception. She is president of the Riverside-San Bernardino Chapter of CNPS.

Heath Bartosh is cofounder and senior botanist of Nomad Ecology, based in Martinez, a research associate at the University and Jepson Herbaria at UC Berkeley, and active member of CNPS.

Kevin Bryant was president of the CNPS Santa Clara Valley Chapter from 2006–2010, and chaired the CNPS Chapter Council in 2009–2010. He currently serves as chapter liaison for the Santa Clara Valley Habitat Plan.

Julie Kierstead Nelson is a botanist with the Shasta-Trinity National Forest and teaches native plant identification at Shasta College in Redding, California.

Linnea Hanson is a retired botanist with the Plumas National Forest, and is currently president of Northern California Botanists and a board member of the Friends of the Chico State Herbarium.

Nick Jensen is a past director of the CNPS Rare Plant Program (RPP), and a member of the RPP Committee. Currently he is a graduate student at Rancho Santa Ana Botanic Garden/Claremont Graduate University.

Kristi Lazar works for the California Department of Fish and Wildlife as the lead botanist with the California Natural Diversity Database.

Joe Mueller has been teaching biology at College of Marin for 25 years and offers courses on marine biology, ornithology, mammalogy, and other field related studies.

Margareta (Greti) Séquin is an organic chemist who has taught at San Francisco State University for more than 20 years and is the author of *The Chemistry of Plants: Perfumes, Pigments, and Poisons* (Cambridge, 2012).

(continued on inside back cover)

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CNPS members on field trip at Yolo Bypass. Photo: Gary Hundt



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Fremontodendron decumbens
by Mary Ann Showers, CDFW

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