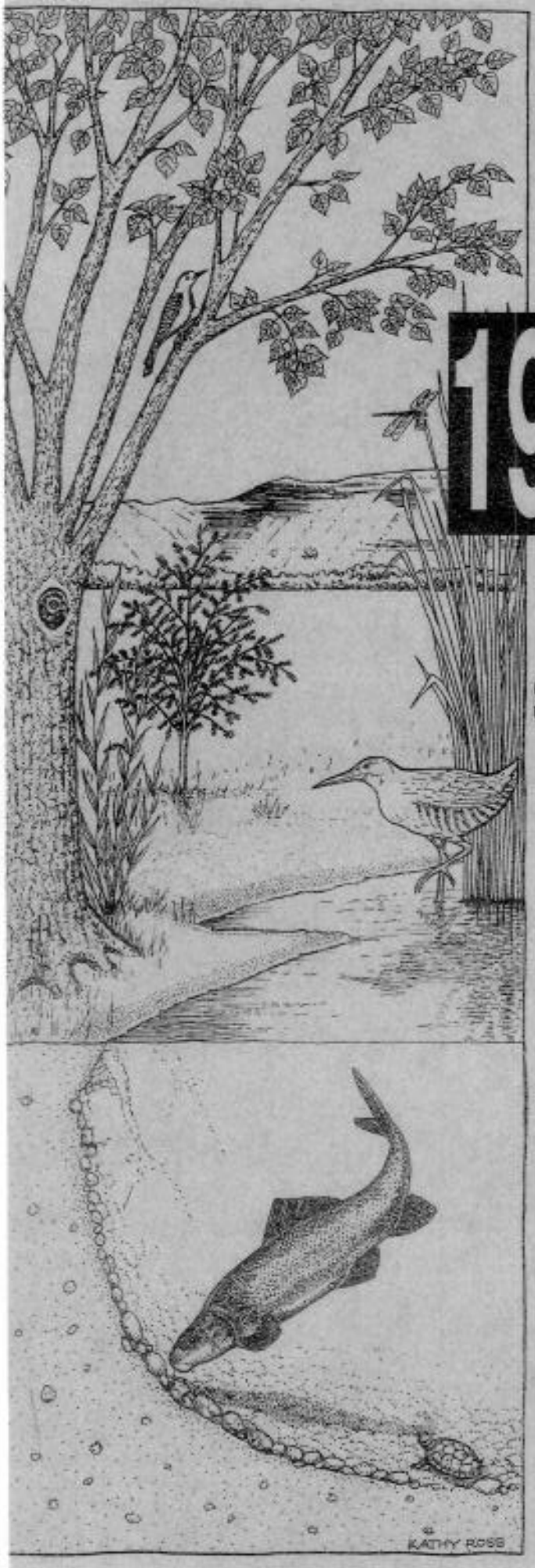


# 1991

# Annual Report on the Status of California State Listed Threatened and Endangered Animals and Plants

State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

This report is dedicated to the memory of

**Walter Charles "Chuck " Graves**

who died on March 12, 1992 after a year-long fight with cancer. Chuck's commitment to conserving California's wildlife resources was reflected throughout his 27-year career with the Department of Fish and Game. Chuck was a leader, an innovator, an advocate. His vision for a wild California lives within all whom he touched.

**THE STATE OF CALIFORNIA**
***Pete Wilson, Governor***
**RESOURCES AGENCY**
***Douglas P. Wheeler, Secretary for Resources***
**DEPARTMENT OF FISH AND GAME**
***Boyd Gibbons, Director***

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Our goal is to publish an accurate and informative document. Should you discover an error, or if you have new information you would like to share with us, please contact:

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# ACKNOWLEDGEMENTS

The names of the contributing biologist responsible for the lead on a particular species account appears at the end of each species account for the first time this year. These persons are listed below by division of the Department to which they belong:

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Additionally, we would like to thank all those who contributed their advice and/or reviewed and commented on the drafts prior to final production.

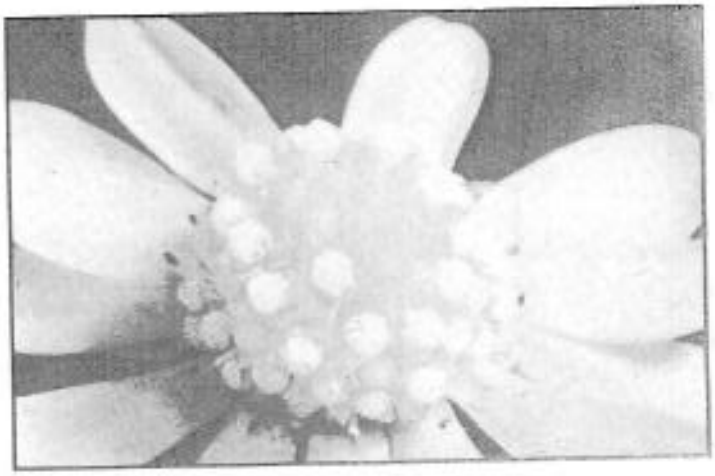
# EXECUTIVE SUMMARY

This is the 1991 annual California Department of Fish and Game report summarizing the status of 72 animals and 210 plants listed as rare, threatened, and endangered by the Fish and Game Commission. Five species of plants and one animal designated as candidates for listing are also reviewed. Legislation affecting endangered species, funding programs and habitat preservation programs are also discussed.

In 1991 the Fish and Game Commission listed the native wildflower Sonoma sunshine as an endangered species and did not advance to candidacy the California gnatcatcher.

California condor - photo courtesy of National Audubon Society

Recovery of listed species progressed slowly during 1991; however there were a few bright spots. The captive breeding program for the California condor continued to recruit healthy young condors into the captive population; the total captive population is now 52 birds. Final arrangements for the release of two young birds into the wildlands of southern California were completed late in the year. The least tern, bald eagle, peregrine falcon and the light-footed clapper rail continue to respond positively to active management programs which address the causes of their decline. Additionally, two plant species, the Tiberon mariposa lily and the Humboldt milk vetch are showing population increases. Very few populations of each of these two species exist, however.

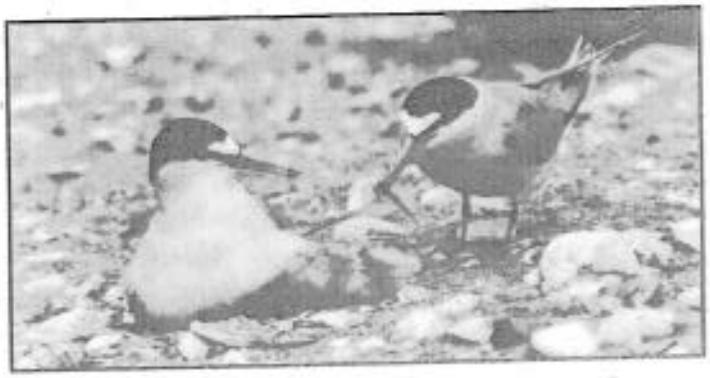


Sonoma sunshine - photo by Dan Cheatham

Many endangered species survive as small fragmented populations, and under these conditions there is no certainty they will survive for long. For the third year, an analysis of the recent trends in populations of State-listed plants and animals was undertaken. Overall, 19 percent of California's listed plants and animals and candidates are stable or increasing (but are not necessarily safe); however, 70 percent of the listed plant and animal species and candidates are declining, signaling further degradation in the health of California ecosystems. These declines result from the destruction and degradation of endangered species habitat through a variety of direct and indirect human impacts described in this report. An additional 11 percent of the listed species were identified as having unknown population trends.

California commits more funds to endangered species protection than any other state, yet our effort has been inadequate to counter the demands that more than 30 million residents place on our natural resources. We must improve the process and become more anticipatory if we are to preserve our rich natural heritage -- California's flora, fauna and the habitats upon which they depend.

This is the sixth annual report to the Commission, the California Legislature and the Governor's Office as required by the California Endangered Species Act.



Least terns - photo by Arnold Small

# INTRODUCTION

A legislative mandate in 1984, the California Endangered Species Act (CESA), expanded Department of Fish and Game's (DFG) responsibility for California's threatened and endangered fish, wildlife and plants. The Legislature's concerns were expressed within the Act itself:

*The Legislature hereby finds and declares all of the following:*

> *(a) Certain species of fish, wildlife and plants have been rendered extinct as a consequence of man's activities, untempered by adequate concern and conservation.*
>
> *(b) Other species of fish, wildlife and plants are in danger of, or threatened with, extinction because their habitats are threatened with destruction, adverse modification or severe curtailment, or because of overexploitation, disease, predation or other factors.*
>
> *(c) These species of fish, wildlife and plants are of ecological, educational, historical, recreational, esthetic, economic and scientific value to the people of this State, and the conservation, protection and enhancement of these species and their habitat is of statewide concern.*

The Act requires DFG to prepare an annual report summarizing the status of all State-listed endangered, threatened and candidate species for the Commission, the Legislature and the Governor. This sixth annual report describes California's listed species including 73 animals and 210 plants, as well as five plant species currently considered candidates for listing **(see Appendix A)**. The State lists of rare plants, threatened and endangered plants and animals are updated during the year as changes are made by the Commission. The current lists are available from DFG, Natural Heritage Division, 1416 Ninth Street, Sacramento, California 95814.

Species listed in this report do not comprise all California species that are threatened or endangered in a biological sense. The federal list of threatened and endangered species contains additional species which occur in California, some of which are not state listed (see **Appendix B**.) The California Native Plant Society (CNPS) publishes an inventory of plants using DFG definitions and criteria for rare, threatened and endangered status. DFG's Natural Diversity Data Base maintains records on "special plants" from the CNPS inventory that may become State candidate species. Lists of bird, mammal, fish, reptile, and amphibian "species of special concern" have been compiled by DFG, and the Data Base inventories these species and numerous other "Special Animals" that could become candidates as well. A preliminary assessment by DFG's biologists indicates that approximately 565 additional animals (this figure includes invertebrates this year) and 400 additional plants could presently meet the criteria for listing.

The California Endangered Species Act (Sections 2050-2098, Fish and Game Code) sets forth the procedure by which an interested person may petition the Commission to add or remove species from the list. Persons wishing to do so should contact the Fish and Game Commission, 1416 Ninth Street, Sacramento, California 95814. The petition format and the criteria for listing are described in Section 670.1, Title 14, California Code of Regulations.

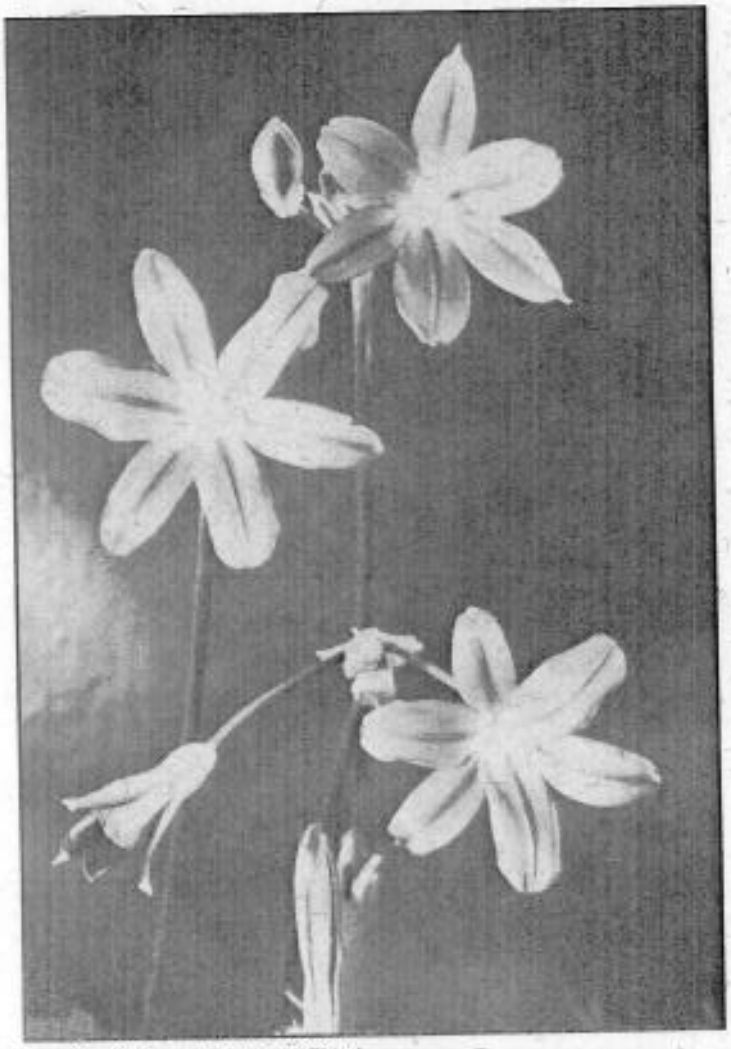
The Act also requires the DFG to review species listed as endangered or threatened by the Fish and Game Commission every five years to determine if the conditions that led to the original listing are still present and to ensure that the listing accurately reflects the most current status. Five-year reviews contain specific information including population trends, range, distribution, abundance, life history, factors affecting the ability of the population to survive and reproduce, the degree and immediacy of threats, the impact of existing management efforts, suggestions for future management and sources of information. The first set of 113 reviews were submitted to the Commission in July 1987, accompanied by a report summarizing the results. Sixteen reviews were submitted to the Commission in 1988, six in 1989, and eighteen in 1990. Reviews were not submitted to the Commission in 1991 due to a prolonged vacancy in the Endangered Species Coordinator position responsible for their production. However, eight draft reports were completed and are currently under review. It is anticipated that all scheduled reviews will be completed by the end of 1992.

Public access to information on threatened and endangered species was significantly advanced by the publication of California's Wild Heritage, a book containing species accounts and color photographs of all the State and Federally listed animals in California. Copies are available through bookstores and from DFG Natural Heritage Division at the address given above. For your convenience, an order form is located in the back of this report. Thousands of copies will be distributed to environmental education instructors in 1992 through the implementation of the Endangered Species Education Act (Sections 52760 - 52764, Education Code.)

# LEGISLATIVE BACKGROUND AND FUNDING

The California Legislature was the first in the United States to prohibit the importation, take, possession and sale of endangered and rare species. The Endangered Species Act of 1970 expressed the Legislature's concern over California's threatened wildlife, defined rare and endangered wildlife and gave authority to the Commission to identify such animals in California. The 1970 California Species Preservation Act directed DFG to inventory all threatened fish and wildlife, develop criteria for rare and endangered species and report to the Governor and the Legislature every two years on the status of these animals. In 1971 the Commission declared the first group of 43 animals endangered or rare, and in 1972 DFG submitted its first biennial report.

The California Native Plant Protection Act of 1977 directed DFG to preserve, protect and enhance native plants. It gave the Commission the power to designate native plants as endangered or rare and to require permits for collecting, transporting or selling such plants. The first plants were listed by the Commission in 1978.



Thread-leave brodiaea - photo by Gerald Welsted

Photo by Marvin Knox

In 1984, AB 3309 and AB 3270 replaced the 1970 legislation and became known as the California Endangered Species Act. The definitions and procedures in the Act paralleled those of the Federal Endangered Species Act. The highlights include:

- A policy "that state agencies should not approve projects as proposed which would jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species..."

- A requirement that state lead agencies consult with DFG whenever a project might impact a listed species. DFG and state lead agencies are required to develop reasonable and prudent alternatives consistent with conserving the species.

- A requirement that the Commission adopt guidelines by which an interested person may petition the Commission to list a species. The Act outlines a petition process and describes the information that must be provided for DFG to determine if action may be warranted. DFG is required to report to the Commission within 12 months, indicating whether the petitioned action is warranted.

- A procedure for a comprehensive Department review of listed species "every five years to determine if the conditions that led to the original listing are still present."

- The requirement of an annual report summarizing the status of all State-listed endangered, threatened and candidate species, and the time frames for five-year status reviews. This report fulfills that requirement.

Peregrine falcon
Photo courtesy of the Santa Cruz Predatory Bird Research Group (The Peregrine Fund, University of California, Santa Cruz)

Other State legislation to protect and restore endangered wildlife includes the Environmental Protection and Research Act of 1970 which created an Environmental Protection Fund from the sale of personalized automobile license plates. Through contributions to the Endangered Species Tax Check-off Program, DFG has received about $7 million since 1984 for programs benefitting threatened and endangered species. Proposition 19, the Fish and Wildlife Habitat Enhancement Act, a bond act in 1984, provided $5 million for acquisition of threatened and endangered species habitat. Proposition 70, a bond act in 1988, will ultimately provide $131 million, much of it for threatened and endangered species habitat.

In 1988 Assembly Bill 3873 sponsored by Assemblyman Costa was enacted. It enabled DFG to establish educational programs and facilities at ten areas managed by DFG. These educational programs provide users with information on wildlife and native plants, including the State's threatened and endangered species. Through this program funds are generated and volunteers are recruited to support habitat restoration projects benefiting wildlife, including threatened and endangered species. In order to generate some of the funds for these programs, the bill provides for the implementation of day use fees at specified departmental wildlife areas and ecological reserves for recreational users not possessing hunting, trapping or fishing licenses.

Photo by Richard A. Bury

In 1990 the California Wildlife Campaign was initiated to encourage public and corporate donations in support of DFG's wildlife protection efforts. Revenues from these donations will directly benefit wildlife and native plants, including threatened and endangered species through the funding of research, restoration projects and public education programs and facilities.

DFG and the U.S. Fish and Wildlife Service (USFWS) entered into a cooperative agreement in June 1976 under which DFG agreed to manage Federal and State listed endangered, threatened and rare species and became eligible to receive Endangered Species Act grant-in-aid funds.

Bald Eagle - photo by
B. "Moose" Peterson - WRP

The California Environmental Quality Act (CEQA), enacted in 1970, is intended to "ensure that the long-term protection of the environment shall be the guiding criterion in public decisions." Changes in 1983 added definitions for rare and endangered plants and animals, and language providing for their protection. As the trustee agency for State fish and wildlife resources, DFG reviews and comments on thousands of CEQA documents (such as environmental impact reports) annually. DFG's Environmental Services Division coordinates this process. The Environmental Services Division, with support from the DFG staff in the regions, consults with state agencies when their activities may affect endangered and threatened species. A biological opinion, as specified in the California Endangered Species Act, is prepared once DFG determines whether a state sponsored or permitted project would jeopardize the continued existence of a State-listed endangered or threatened species. If jeopardy is found, the DFG then prepares reasonable and prudent alternatives so that jeopardy may be avoided. In 1991, 18 state agencies initiated 61 formal consultations with DFG. No jeopardy determinations were made for 1991. Early informal consultation by state agencies with the DFG has resulted in an increasing number of projects for which listed species concerns are resolved without formal consultation.

# HABITAT PRESERVATION AND ENDANGERED SPECIES MANAGEMENT

The key element in programs to conserve endangered species is the protection of natural ecosystems: the habitat (or suitable living space) without which California's flora and fauna cannot survive. The DFG land acquisition program has protected threatened and endangered species since 1970 through the establishment and management of 70 ecological reserves totalling more than 69,680 acres (see Appendices G and H). The DFG also provides 406,520 acres for threatened and endangered species protection on 86 wildlife areas (see Appendices G and I) and 28 DFG marine refuges and reserves (see Appendix J). To date, the DFG manages over 556,471 acres of land -- much of which provides some degree of protection for threatened and endangered species.

Spring bird habitat - photo by Darlene McGriff

In 1991 the Wildlife Conservation Board added over 31,975 acres to the DFG lands inventory. These additions came through a variety of protection efforts including fee acquisition, conservation easements, leases, cooperative agreements and memorandums of understanding (MOUs). These additions provide habitat protection for the Tipton kangaroo rat, salt-marsh harvest mouse, San Joaquin antelope squirrel, San Joaquin kit fox, Sierra Nevada red fox, great gray owl, peregrine falcon, blunt-nosed leopard lizard, Modoc sucker, many-flowered navarretia, Bogg's Lake hedge hyssop, DeDeckers' lupine and other species.

Desert habitat - photo by Celeste Cushman

With the passage of Proposition 70 in June 1988, the Wildlife Conservation Board and DFG received $131 million for land acquisition and habitat improvement projects. The money was spent on threatened and endangered species habitat, unique or threatened habitats and game and nongame species habitat.

Within DFG, four programs are responsible for overseeing threatened and endangered species. They are the Nongame Bird and Mammal Section in the Wildlife Management Division (for birds and non-marine mammals); the Marine Resources Division (Guadalupe fur seal, sea otter); the Threatened and Endangered Species Project in the Inland Fisheries Division (invertebrates, fishes, amphibians and reptiles); and the Endangered Plant Program in the Natural Heritage Division (plants). These units are supported by the Endangered Species Unit in the Environmental Services Division and by the Legal Advisor's Office in the implementation of project mitigation activities. In addition, a unit of the Bay-Delta Division is largely dedicated to the role of coordinator in threatened and endangered species mitigation on Department of Water Resources projects. The Legal Advisor provides a variety of technical advice to each unit on a project-by-project basis. With the establishment of the Natural Heritage Division in 1989, DFG formally recognized its expanding role in the conservation of biological diversity in California. The Natural Heritage Division is responsible for overall policy direction and coordination of endangered species programs. In fiscal year 1990 - 91 the DFG launched a new program which established a Natural Heritage function in each regional office. Fifteen new positions dispersed among five regions focus on the protection, management, restoration and recovery of endangered plants and animals.

DFG staff surveying habitat - photo by Jack white

Wildlife biologists, fisheries biologists and plant ecologists, in these projects and the regions, administer contracts for studies, review and prepare permits for studies and coordinate surveys and inventories emphasizing status, distribution and abundance of plant and animal species of special concern and listed species. Using such information, they determine the ecological requirements and nature of threats to plants and animals, and they formulate plans for management and recovery. These biologists also coordinate endangered species conservation efforts with other State, Federal and local agencies.

Habitat identified through these efforts as being essential for the survival of an endangered species may either be acquired directly by the Department, acting through the Wildlife Conservation Board, or accepted as mitigation from a project proponent. The Department's regional staff, working with the Natural Heritage Division, implements comprehensive acquisition strategies for biologically important lands. These lands are then managed by the Department as ecological reserves, wildlife management areas, or under contract with other public and nonprofit entities. The Department maintains conservation easements over mitigation lands managed by other agencies.

The Department of Parks and Recreation actively protects endangered species on 16 State reserves (30,729 acres), 48 natural preserves (14,590 acres) and seven State wilderness areas (439,610 acres) within nearly 1.4 million acres of State Park lands. The U.S. Fish and Wildlife Service, U.S. Forest Service, National Park Service, the Bureau of Land Management and U.S. Navy manage numerous research natural areas and similar categories of lands which contribute toward endangered species preservation. Various local agencies such as the City of Palo Alto, City of Chico, City of Livermore, Santa Barbara County, Riverside County, San Diego County, and East Bay Regional Park District protect and manage habitat for endangered species.

Private organizations, particularly The Nature Conservancy and the National Audubon Society (along with local chapters) are prominent in efforts to acquire endangered species habitat. The Nature Conservancy was instrumental in helping establish within the DFG's Natural Heritage Division a California Natural Diversity Data Base (CNDDB), whose purpose is to identify and catalog locality data for the rare flora and the threatened and endangered native flora and fauna of the State, to enable government agencies and the public to better protect these native species and their habitat. A new computerized Geographic Information System (GIS), which became operational early in 1990, tracks about 20,000 locations of 2525 different plants, animals and natural communities in the CNDDB inventory.

Photo by Clyde Parks

# PETITIONS AND LISTING ACTIONS UNDER THE CALIFORNIA ENDANGERED SPECIES ACT IN 1991

The Fish and Game Commission listed one species in 1991, rejected one petition and accepted six petitions for Candidates which are currently under review by the DFG for a final recommendation. The Commission's actions are summarized below:

## Candidate

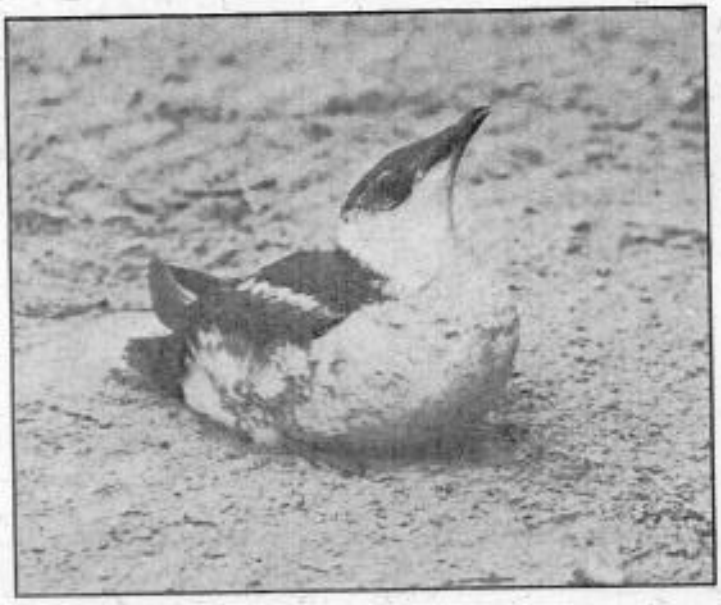
- Marbled murrelet (*Brachyramphus marmoratus*)
- Morro manzanita (*Arctostaphylos morroensis*)
- Chorro Creek Bog thistle (*Cirsium fontinale* var. *obispoense*)
- San Mateo woolly sunflower (*Eriophyllum latilobum*)
- Marin dwarf flax (*Hesperolinon congestum*)
- White-rayed pentachaeta (*Pentachaeta bellidiflora*)

## Rejected

- California gnatcatcher (*Polioptila californica*)

## Listed

- Sonoma sunshine (*Blennosperma bakeri* )



Marbled murrelet - photo courtesy of the California State Department of Parks and Recreation

# DEFINITIONS AND DESIGNATIONS

This report provides information on State-listed species. For clarity, State-listed species which have been determined by the U.S. Fish and Wildlife Service to be endangered or threatened under the Federal Endangered Species Act of 1973 are indicated. State-listed species names are followed by the State designation (candidate, rare, threatened or endangered) and the Federal designation, if any (candidate 1, candidate 2, candidate 3, proposed threatened or endangered). Additional species of California's flora and fauna have been placed on the Federal list by the U.S. Fish and Wildlife Service but are not included on the State list. Those species are shown in **Appendix B.**

## State designations

- A native California species or subspecies of a bird, mammal, fish, amphibian, reptile or plant is a **candidate** when the Fish and Game Commission has formally noticed it as being under review by the Department to determine whether listing as threatened or endangered is warranted, or when it is the subject of a proposed rulemaking by the Commission to list as threatened or endangered (Section 2068, Fish and Game Code).

- A native California plant (species, subspecies or variety) is **rare** when, although not presently threatened with extinction, it is in such small numbers throughout its range that it may become endangered if its present environment worsens (Section 1901, Fish and Game Code). Since 1985 this designation applies to plants only.

- A native California bird, mammal, fish, amphibian, invertebrate, reptile or plant (species or subspecies) is **threatened** when, although not presently threatened with extinction, it is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts. Any animal listed as "rare" by the Commission on or before January 1, 1985 is now included as a "threatened" species (Section 2067, Fish and Game Code).

- A native California bird, mammal, fish, amphibian, reptile or plant (species or subspecies) is **endangered** when it is in serious danger of becoming extinct throughout all, or a significant portion of, its range due to one or more causes, including loss of habitat, change of habitat, overexploitation, predation, competition or disease (Section 2062, Fish and Game Code).

## Federal Designations

Federal designations appear in the Species Accounts and are defined in **Appendix C.**

Abbreviations and technical terms used in this report are shown in **Appendix C.** The mandated five-year status reviews of species that are listed by both the Commission and the U.S. Fish and Wildlife Service are conducted in conjunction with the five-year review process of the U.S. Department of the Interior. Reviews of those species listed by the Commission before January 1, 1982 that are not listed by the Federal government were undertaken and completed by July 1, 1987. Reviews of those species listed by the Commission after January 1, 1982 that are not listed by the Federal government will be undertaken and completed within five years of the date the species was originally listed by the Commission. **Appendix D** lists species for which five-year reviews were completed in 1987, 1988, 1989 and 1990. No reviews were submitted to the Fish and Game Commisssion in 1991; however, 11 draft reports are currently under review and are so noted in the Appendix.

The 1991 Annual Report species accounts include a brief statement of the general habitat or habitats in which each taxon is typically found. The habitat types listed are very broad and are based on the hierarchical vegetation classification in use by the Natural Diversity Data Base (**see Appendix F**); each taxon occupies only a portion of the general type. **Appendix E** explains the terms used in the General Habitat section.

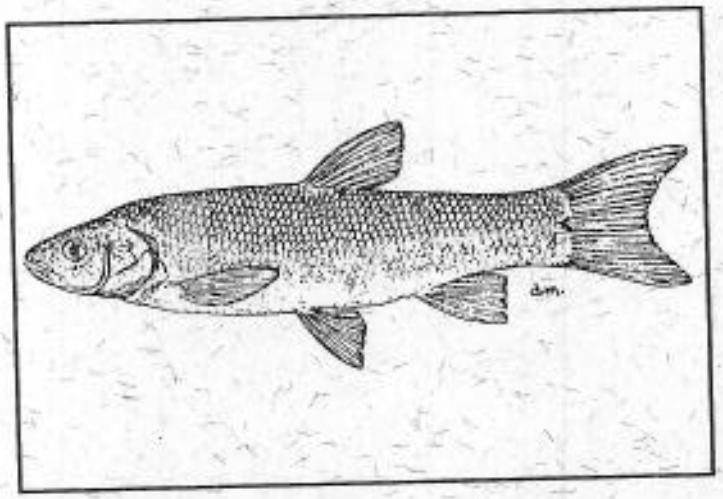
Animals are listed by accepted common name in taxanomic order. Plants are listed alphabetically by scientific name with common names shown in bold type.

Photo by Karen Eberhardt

# STATUS AND TRENDS

In this annual report, for the third time, the status of all State-listed plants and animals has been reviewed using the species accounts contained in this report and available five-year reviews (**Appendix D**). An analysis of the status of all State-listed plants and animals indicates that all species currently meet the criteria for listing as rare, threatened or endangered. Beyond that, it is difficult to characterize the condition of so many organisms with many different needs and problems. Generally, people want to know if a given endangered species will survive and how many individuals we need to ensure survival. The simple answer is -- no one knows. The new science of conservation biology endeavors to construct models which can make such predictions, but the very specific life history information needed for each organism to generate a minimum viable population size estimate is usually lacking.

Many of our endangered species survive as very small, fragmented populations in habitat degraded by human activities. Under such conditions there is no certainty that they will survive for long. Additional impacts by human activities or even natural catastrophic events (e.g., drought or floods) could cause extinction and have already caused the extinction of about 34 animal and 30 plant species and subspecies in California since European settlement.



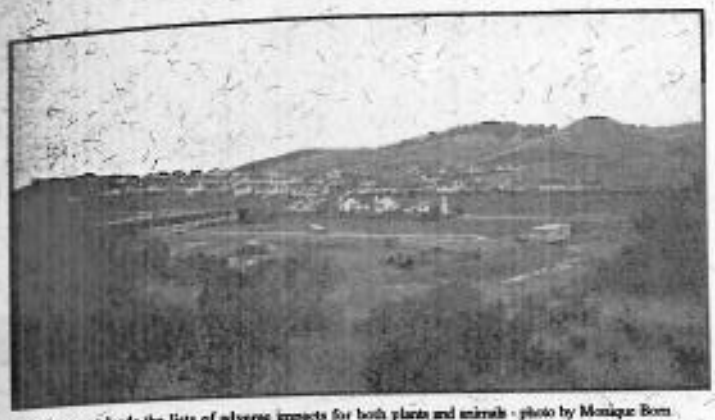
Thicktail chub. Although this species was once plentiful in the Delta and Central Valley, they are now thought to be extinct - illustration by Alan Marciochi, courtesy of the University California Press

The grizzly bear is thought to have been extirpated from California in the 1920's - photo by Bob Stafford

One index of the condition of State-listed species is the change or trend (increase or decrease) in the size and numbers of their remaining populations. Utilizing the species accounts contained within this report and five-year reviews (**Appendix D**) each plant and animal was assigned to the categories shown in **Table I**. This analysis indicates that 53.5 percent of California's State-listed animal species are declining, and 76.3 percent of California's State-listed plant species are declining. Why is this happening, given all the resources committed to tackling the problem?

California is one of the most biologically rich areas in the world, with about 1,700 vertebrate animals, almost 5,200 native plants and about 30,000 species of insects. The incredible diversity of climates, geology and topography and all of the barriers to migration such as rivers, mountains and deserts have led over thousands of years to the evolution of a large number of isolated species, many of which are found only here in California with about 380 (Holland, 1986) distinct natural communities (assemblages of plants and animals).

Overlay this pristine scene with 30 million people, along with the tremendous demands they place on our natural resources, and the potential for major disruption of natural ecosystems is evident. Many of our most productive ecosystems (e.g. wetlands) have suffered losses ranging from 80 percent to 99 percent of their original acreage. As a result, California has more than twice as many Federally listed threatened and endangered species (125) as any other continental western state and more than any state in the continental United States. According to the USFWS, California also has more species under consideration for Federal-listing than any other state.



Development leads the lists of adverse impacts for both plants and animals - photo by Monique Born

California spends five times more on nongame and endangered species than any other state and commits a greater portion of its total budget to these resources than all other states except one. Even this commitment, however, has not kept pace with the far-reaching effects of a rapidly growing human population. Tables II and III summarize the wide range of human activities that directly and indirectly impact our imperiled flora and fauna, as described in the account for each species.

Several categories of impacts, such as off-road vehicles, feral animals, pollution, collecting, and live-stock grazing, represent serious chronic problems that can be corrected through public education, policy changes within responsible agencies and the adoption and enforcement of regulations. Such impacts do not usually result in the permanent loss of wildlife habitat. Other categories of impacts however, such as development, water projects and agriculture, result in permanent losses of endangered species habitat which accelerates the declining trend. Development leads the list on **Tables II and III.** However, when agriculture is examined in association with its supporting water projects, the use of insecticides, rodenticides and other pesticides, the conversions of native grasslands, riparian woodlands, vernal pools and other wetlands to agricultural uses, it is apparent that these activities have caused the greatest impact on our native flora and fauna over the past few decades. More recently, urban sprawl has posed the greatest threat to the continued survival of California's endangered species.

While as a matter of law CESA prohibits the take of endangered species (and the habitat upon which the species depends), implementation of the Act's legal prohibitions have been limited and inadequate. Local lead agencies often do not consult with the Department of Fish and Game when projects will impact endangered species. The Department has not had the administrative or legal resources to mount an effective enforcement program. In the absence of coordinated land-use planning and increased visibility for endangered species enforcement activity, habitat will continue to be fragmented or lost. Given current trends, we can expect many more species to decline to the point of requiring listing. State and Federal wildlife agencies have taken the initial steps to employ habitat conservation plans and other mitigation planning programs to permit urbanization activities while preserving the best remaining habitat. These few successful planning efforts must receive greater institutional support and acceptance by both State and Federal governmental agencies.

Given the tremendous cost of recovery for any single species there will be insufficient funding to address the needs of all listed species. Despite our best efforts it is likely that species will continue to become extinct. Recognizing this dilemma many wildlife advocates now support an approach which would supplement endangered species recovery programs with a broad-based approach aimed at insuring the integrity of the best remaining examples of natural communities and ecosystems in order to conserve biological diversity and to prevent other species from becoming endangered. The goals of biodiversity planning are to anticipate future patterns of development and modifications in land use, to identify gaps in our current network of wildlife reserves, to secure protection of new reserves and to develop new strategies on managed wildlands in order to save most of the remaining species and natural communities and to maintain areas large enough to retain the maximum biodiversity. This year the Department and Resources Agency initiated a voluntary, cooperative, biodiversity planning process -- Natural Communities Conservation Planning (NCCP). The goal of NCCP is to conserve long-term viable population of California's native animal and plant species and their habitats, in areas large enough to ensure their continued existence. The pilot project for the NCCP process is the coastal sage scrub ecosystem of Southern California and the over 90 sensitive animal and plant species associated with the habitat. Although research and recovery actions are still needed for individual threatened and endangered species, clearly the biodiversity concept can provide for wildlife, resource conservation that will reduce the number of species approaching endangered status.

Impacts by alien (introduced) plants and animals continue to pose extremely serious threats to the survival of many native plants and animals. Many aliens such as salt cedar (Tamarix sp.) and Tilapia sp. (an African fish) may never be eradicated and can only be controlled at great expense on an area by area basis. Habitat for the endangered beach layia (Layia carnosa) has been reduced by invasions of ice plant and European dune grass. Field work conducted in 1990 confirmed the extinction of the High Rock Springs tui chub and the elimination of all native fish and invertebrates from the tui chub's habitat due to the introduction of two species of Tilapia. Range expansions of the alien red fox jeopardize populations of the light-footed clapper rail, California clapper rail and San Joaquin kit fox. Non-listed bird species including the burrowing owl, snowy plover, Caspian tern and many other ground nesting water birds have been harmed by this newcomer as well.

Captive breeding programs are in place for the bald eagle, peregrine falcon, California condor and the Morro Bay kangaroo rat and are being planned for the light-footed clapper rail, and off-site propagation programs have been proposed for many plant species.

The role of captive breeding and reintroduction in the preservation of biodiversity has been questioned by those who point to the lack of cost effectiveness and to the larger picture, the need to save intact ecosystems. It has been suggested that captive propagation provides false reassurances that endangered species problems are solvable through out-of-habitat methods, that people will erroneously view species as separate from their habitat, and that such programs may represent the path of least political resistance for government agencies avoiding controversies involving land and water use. Clearly, however, captive breeding programs have generated tremendous educational benefits by focusing public attention on wildlife conservation and heightening public awareness of larger environmental issues. It is likely that captive breeding will continue to be employed as a stopgap measure when time is short, when other strategies cannot immediately be brought into play, when such programs are part of comprehensive planning to protect and restore habitat and augment recovery programs, and to develop procedures and gain experience before a critical situation is reached.

In 1987 a report was prepared at the request of the California Senate Committee on Natural Resources and Wildlife. The recommendations listed below remain the guidelines for today's programs. The purpose of that report, Sliding Toward Extinction, as stated was to:

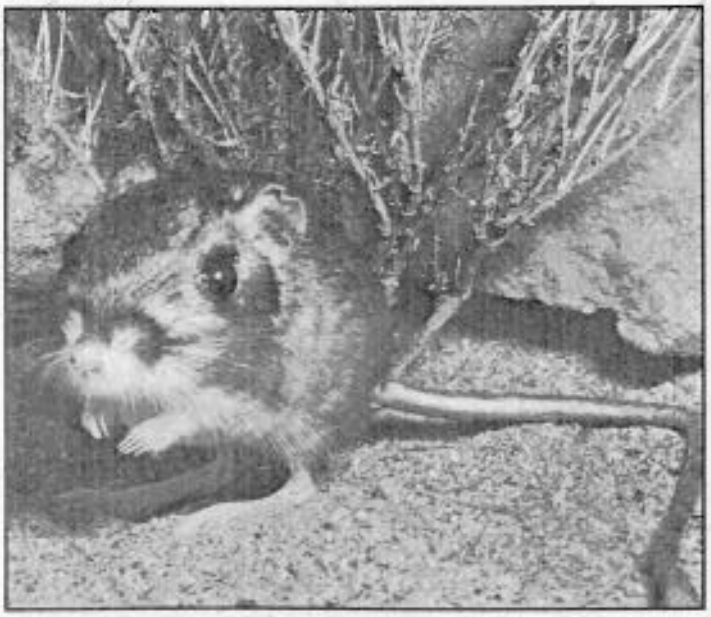
> *...inform the people of the State that biotic destruction is accelerating and may soon reach a crisis point. Decisive action is needed now to protect the habitats and species that are sliding toward extinction.*
>
> *California's threatened and endangered species are indicators of the State's environmental health. The quality of natural habitats is ultimately tied to the health of all Californians.*
>
> *Millions of acres of native grasslands, tidal marshes, vernal pools, oak and redwood forests have already been lost. In the pursuit of food, shelter, livelihood and pleasure, Californians have eliminated and altered a significant proportion of the State's wildlands.*
>
> *The issue is how to balance the needs and activity of a rapidly increasing human population - 33 million predicted by the year 2000 - with protection for the State's unique and exhaustible natural resources. Steps can be taken now to ensure that California's irreplaceable biological diversity survives in ways that sustain both the State's rich natural heritage and its economy. If we wait, conflicts will only accelerate.*

The report recommended the following 14 measures for ensuring the protection of California's remaining natural diversity:

- **Increase habitat acquisition.**
- **Increase environmental review capabilities of agencies.**
- **Accelerate the process for listing State and Federal endangered species.**
- **Expand the scope of the California Endangered Species Act.**
- **Protect instream water flow.**
- **Encourage habitat protection in tax and other incentive programs.**
- **Develop incentive programs for landowner protection and the creation of important habitats.**
- **Establish legal protection for rare natural communities.**
- **Increase control of nonnative plants and animals.**
- **Review effectiveness of existing laws and regulations to protect diversity.**
- **Evaluate laws and programs detrimental to biological resources.**
- **Evaluate compliance and effectiveness of mitigation measures adopted under CEQA and National Environmental Protection Act (NEPA).**
- **Prepare periodic reviews of the status of natural diversity in California.**
- **Include status of California's natural heritage in Governor's annual State of the State Report.**

The Department and Resources Agency have taken action on some of these recommendations, for example, reviewing the effectiveness of existing laws and regulations to protect diversity and encouraging habitat protection. Assembly Bill 2172, which authorized the Natural Communities Conservation Planning (NCCP) process, gave the Department additional authority to enter into voluntary, cooperative, and anticipatory land use planning efforts to conserve California's biological diversity.

In addition to these measures, many more resources should be applied to the baseline research which will be necessary for recovery planning and developing effective management plans. These recommendations still stand as the definitive action plan.



Morro Bay kangaroo rat - photo by Glenn Stewart

# TABLE I

## 1991 Trends Summary for State-listed Animals and Plants (Candidates, Rare, Threatened, and Endangered)

### Trend*

| | Increasing | Stable/ Increasing | Stable | Stable/ Declining | Declining | Extirpated | Unknown | Total |
|---|---|---|---|---|---|---|---|---|
| Plants | 2 (0.9%) | 5 (2.3%) | 36 (16.7%) | 34 (15.8%) | 131 (60.9%) | 0 (0.0%) | 7 (3.3%) | 215 (100%) |
| Animals | 0 (0.0%) | 5 (6.9%) | 7 (9.6%) | 15 (20.5%) | 23 (31.5%) | 1 (1.4%) | 22 (30.1%) | 73 (100%) |
| TOTAL | 2 (0.7%) | 10 (3.5%) | 43 (14.9%) | 49 (17.0%) | 154 (53.5%) | 1 (1.4%) | 29 (10.1%) | 288 (100%) |

**Unknown** Insufficient information to describe a trend.

**Increasing** Significant progress towards recovery; remaining populations may be small but are secure and increasing; still meets the criteria for listing as threatened.

**Stable/Increasing** Some progress towards recovery; populations may be small, but most are secure and some are increasing.

**Stable** No change in status in recent years; populations may be unprotected, threatened and at critically low, unsafe levels.

**Stable/Declining** Some populations are declining; significant threats have been identified, and adverse impacts have been documented in recent years.

**Declining** Populations are declining; major losses have been documented in recent years.

**Extirpated** All populations eliminated from California within recent years.

*Number of species and percent of total in each category.

# TABLE II

## Frequency of Categories of Adverse Impacts on State-listed Plants as cited in the Annual Report (1991)

| Category of Impact | Frequency Cited |
|---|---|
| Development (residential, industrial, commercial)[1/] | 79 |
| Livestock Grazing[2/] | 60 |
| Off-road Vehicles | 46 |
| Roads (construction and maintenance)[5/] | 38 |
| Agriculture[3/] | 37 |
| Exotic Plants[4/] | 37 |
| Water Projects [7/] | 22 |
| Trampling (by humans and equestrians) | 19 |
| Fire Management[6/] | 19 |
| Feral Animals (pigs, goats and introduced deer) | 15 |
| Mining (sand, gravel, clay, minerals) | 14 |
| Landfills, (and garbage dumping) | 12 |
| Collecting (horticultural use) | 7 |
| Logging | 5 |
| Flood Control Activities[8/] | 4 |
| Energy Development (and associated activities including pipeline and powerline construction) | 4 |
| Water Quality Degredation | 4 |
| Hybridization | 4 |
| Vandalism | 3 |
| Disease | 2 |
| Climatic Effects | 1 |

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[1/] Includes the construction of golf courses and other recreational facilities associated with residential development.

[2/] Cattle and sheep and associated indirect impacts including soil erosion and trampling.

[3/] Conversion of native habitats to agricultural uses other than for livestock.

[4/] Competition from and displacement of native plants by non-native introduced plants.

[5/] Construction and maintenance of roads including herbicide application.

[6/] Adverse impacts of fire suppression on fire-dependent species; the construction of fire breaks and mowing for fuel control.

[7/] Includes the construction of reservoirs, ground water pumping and diversion of natural surface flows (primarily for agriculture).

[8/] Includes stream channelization, levee construction and rip-rapping.

# TABLE III

## Frequency of Categories of Adverse Impacts on State-listed Animals as Cited in the Annual Report (1991)

| Category of Impact | Frequency Cited |
|---|---|
| Development[1/] | 35 |
| Water Projects[2/] | 30 |
| Introduced Predators and Competitors[3/] | 29 |
| Agriculture[4/] | 26 |
| Livestock Grazing[5/] | 17 |
| Off-road Vehicles | 17 |
| Human Disturbance | 15 |
| Pesticides, Poisons, Contaminants (rodenticides, lead poisoning) | 14 |
| Flood Control[6/] | 14 |
| Exotic Plants (degradation of native plant communities supporting listed animals) | 10 |
| Climate (drought, natural flooding) | 10 |
| Energy and mineral development ( oil extraction, power plants) | 8 |
| Roads | 8 |
| Logging | 8 |
| Disease | 6 |
| Habitat Fragmentation | 6 |
| No Habitat Left | 5 |
| Hybridization | 4 |
| Water Pollution | 4 |
| Collecting | 3 |

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[1/] Residential, industrial and commercial development-associated impacts including the inducement of erosion and associated recreational facilities such as golf courses.

[2/] Includes the construction of reservoirs, groundwater pumping, diversion of natural surface flows and entrainment by pumping (primarily for agriculture).

[3/] Examples include the non-native red fox, African clawed frog, European starling, *Tilapia* ssp. (an African fish), as well as interal parasites. Includes impacts on endangered species habitat by feral ungulates and impacts from native species of wildlife such as ravens and cowbirds, whose populations have dramatically increased in recent years.

[4/]Conversion of endangered species habitat to agricultural uses other than for livestock.

[5/]Degradation of endangered species habitat by cattle and sheep, and associated indirect impacts including soil erosion.

[6/]Includes stream channelization, levee construction and rip-rapping.

# MAMMALS

Island fox - photo by Lyndal Laughrin

# Mohave ground squirrel

*(Spermophilus mohavensis)*

CA - Threatened (1971)
FED - Candidate 2 (1985)

General Habitat:
- Mojavean Desert Scrub
- Joshua Tree Woodland.

This squirrel is cinnamon-gray in color with white underparts. Juveniles are cinnamon-colored and molt to the gray pelage as they mature. The species lives in underground burrows, in which it spends about seven months of the year (usually from August to February) in estivation. The squirrel eats fruits and seeds of desert plants. The species is resident in the western Mojave Desert. It occurs in southwestern Inyo County, eastern Kern County, northwestern San Bernardino County, and extreme northeastern Los Angeles County. The squirrel inhabits plant communities which are dominated by either creosote (*Larrea tridentata*), joshua tree (*Yucca brevifolia*) or shadscale (*Atriplex confertifolia*).

The major threat to the existence of the Mohave ground squirrel continues to be the destruction or degradation of its habitat. The species suffers from piecemeal loss of habitat and resulting isolation of populations. Some squirrels are protected in the Desert Tortoise Natural Area near California City, but this preserve was established with the habitat requirements of the tortoise in mind. There is no active habitat management where this species occurs, and the species is virtually ignored in Federal land use decisions. Adverse-impact categories (see Table III) include development; agriculture; pesticides, poisons and contaminants; livestock grazing; off-road vehicles; energy development; and climate.

The squirrel is designated as a category 2 (also called candidate 2) species in the latest (November 21, 1991) Federal Register notice of review of vertebrate species. This means that the FWS currently has information which indicates that the squirrel may deserve to be proposed as Endangered or Threatened, but that conclusive data on biological vulnerability and threat are not available. The notice of review lists the status of the squirrel as "Declining", which indicates decreasing numbers and/or increasing threats.

The first DFG five-year status report for the squirrel was written in 1987. In the report, the DFG recommended to the FGC that the Threatened classification be retained.

Mohave ground squirrel survey guidelines were developed in 1988 and revised in 1989, 1990, and 1991 to help standardize field methods and results. The survey guidelines were used for several field seasons by biological consultants in the planning and execution of studies to determine the presence or absence of the squirrel on project sites. However, it became clear to the DFG in early 1991 that trapping studies, even when done according to the guidelines, could not be relied upon to provide a definitive statement that the squirrel is absent from a site. We had no confidence that a study which resulted in no squirrels being captured really indicated that the species was absent from the site. The negative result could mean that the species was indeed absent or that no animals entered traps.

Absence from a site within the known range of the squirrel does not mean that the site does not provide habitat for the species. Indeed, the DFG believes that the species may use any natural habitat within its range. During a drought, the species responds to lack of sufficient local rainfall by failing to reproduce. Thus, a drought which extends for several years (the current drought began in 1986-1987 and has continued for five years through 1990-1991) will result in local extirpation of Mohave ground squirrel populations, as adults die and no young are born. The range of the species becomes contracted. However, the habitat in such areas does not change in a substantive way. If the Mohave ground squirrel can find its way back into these areas, then it will repopulate. In any event, the vegetation of the areas remains habitat for the squirrel.

As a substitute for trapping studies, the DFG has developed a cumulative human impact assessment methodology. A project site is rated by assigning numerical scores to the degree of human impact for ten different impacts. The rating is used to help develop a mitigation plan for the project. The concept is that less mitigation will be required the more human impact has already downgraded a project site. A criticism of the methodology is that a degree of human impact recognized by a rater may not be "recognized" by a Mohave ground squirrel. As an example, the quality of habitat for the squirrel may not be diminished by a power line crossing a site or by a small amount of garbage dumping. However, the human rater would downgrade the value of the site based on the presence of the power line and the dump.

On November 20, 1991, the FGC received a petition from the Kern County Department of Planning and Development Services to delist the Mohave ground squirrel. The FGC determined that the petition was in the proper format, which is specified by the California Code of Regulations, and referred it to the DFG for an evaluation. The evaluation, which must be completed within 90 days of receipt of the petition, is to determine whether the petition contains sufficient information to indicate whether the petitioned action may be warranted.

The BLM has begun a process to develop a habitat management plan in the western Mojave Desert, to benefit the Mohave ground squirrel, desert tortoise, and other species. The DFG will participate in the process. The DFG also is establishing a working group comprised of DFG biologists and consulting biologists to develop management recommendations for the squirrel.

Management needs for the squirrel are as follows: protection of habitat which currently supports the squirrel through positive consideration of the species by local, State, and federal agencies in review of proposed wild land alterations; permanent protection of habitat which supports the squirrel by establishing a series of preserves in public ownership; determination of the status of the squirrel, in terms of distribution and numbers, throughout its range during one or two field seasons; periodic surveys (at least every three years) to repeat the status determination; studies to determine various aspects of the life history of the squirrel, including food habits and habitat use, throughout its range and in all occupied plant communities; preparation of a State management plan which would incorporate the elements of protection and restoration of habitat, the establishment of preserves, and surveys and studies; restoration of degraded habitats by controlling grazing and recreational vehicle use on public lands and by planting with preferred plants; and investigation of the impacts of rodenticides on the squirrel.

**The population trend is considered to be declining due to loss of habitat to urban and agricultural development, overgrazing by livestock, highway construction and ORVs.**

*John Gustafson*

## San Joaquin antelope squirrel

*(Ammospermophilus nelsoni)*

CA - Threatened (1980)
FED - Candidate 2 (1991)

General Habitat:
- Chenopod Scrub
- Valley and Foothill Grassland.

The San Joaquin antelope squirrel is one of five species of antelope squirrels. These five members of the genus *Ammospermophilus* are confined to arid grasslands and shrublands in the southwestern U.S. and northern Mexico. *A. nelsoni* is considered to be monotypic. The species is omnivorous with a diet consisting primarily of grass and forb seeds and insects. Insects, especially grasshoppers, are eaten when available and may be an important component of the diet in summer months. Antelope squirrels are fossorial animals that are not seen above ground when ambient temperatures drop below 50°F, but these diurnal animals have been observed all hours of the day when temperatures are in excess of 108°F. The general active period during spring and summer months coincides with air temperatures of 68°F to 86°F. Burrows used by this species are either dug by them or by other rodents including giant kangaroo rats (*Dipodomys ingens*).

Historically, San Joaquin antelope squirrels ranged from the western and southern portions of the Tulare Basin, San Joaquin Valley and areas to the west in the Cuyama Valley, Carrizo Plain and Elkhorn Plain. They were distributed from western Merced County on the northwest, southward along the western San Joaquin Valley to its southern end. They occupied the valley floor in Kern County and along the eastern edge northward to Tipton, Tulare County. Within the above distribution, squirrel relative abundance was tied to differences in soil texture and salt concentration, vegetative composition and precipitation.

Habitats of antelope squirrels consist of grasslands with moderate shrub cover which includes such species as salt bush (*Atriplex* spp.), ephedra (*Ephedra viridis*), bladder pod (*Isomeris arborea*), goldenbush (*Haplopappus* spp.), snakeweed (*Gutierrezia californica*) and others. Low density populations have also been located in iodine bush (*Allenrolfea occidentalis*) and spiny salt bush (*Atriplex spinifera*) dominated habitats with alkaline soils. Antelope squirrel populations of moderate density have also been found in areas lacking shrubs, but containing populations of giant kangaroo rats. A recent study supported by endangered species check-off funds confirmed that approximately 80 percent of the original geographic range of *A. nelsoni* has been converted to agricultural developments. No prime habitat remains within the remnant habitats of the San Joaquin Valley. Populations now exist primarily in marginal habitats of the low foothills and mountains of the western edge of the valley. Significant populations exist only in western Kern County at Elk Hills and on portions of the Carrizo and Elkhorn plains.

Densities of San Joaquin antelope squirrels in open *Ephedra* scrub and shrubless habitats on the Elkhorn Plain range from 0.8 to 8.0 antelope squirrels per 2.5 acres. Densities on shrubless, grass-dominated sites are equal to or higher than those on sites with shrub cover.

The density of antelope squirrels on a study plot in the Panoche Hills area was 0.9 animals per 2.5 acres in 1989. A study plot on The Nature Conservancy's Paine Preserve, on the floor of the San Joaquin Valley in northern Kern County, had a density of 2.0 antelope squirrels per 2.5 acres in 1988.

Home range sizes of San Joaquin antelope squirrels on the Elkhorn Plain range from 12 to 49 acres, with a mean of 35.6 acres. Densities in good habitat in the Elkhorn Plain area are generally four animals per 2.5 acres, and are lower in most other areas. This is in

the low range of densities reported in the literature. Loss of habitats to agricultural developments and other habitat altering causes continue to threaten antelope squirrel populations throughout their range (**see Table III**). Rodenticide use is common in the entire range of the species, poses a significant threat, and may be responsible for major population declines (**see Table III**). Conversion of habitat by intense agricultural practices may be the single greatest long-term threat to populations (**see Table III**).

No recovery plan has been written for this species, but the animal is being considered in southern San Joaquin Valley regional planning efforts involving State and Federal agencies, industries and local governments. Habitat for this species is protected and preserved to varying degrees at Elkhorn Plain Ecological Reserve and the Carrizo Plain Natural Heritage Reserve, certain lands administered by the BLM, mitigation lands at Semi-tropic Ridge and certain preserve lands of TNC. Additional lands are being acquired using funds earmarked for mitigation of project-induced habitat losses in portions of the southern San Joaquin Valley. Habitat inventories carried out by the staff of the California Energy Commission have identified a number of suitable habitat areas for this species, and this information is being used to assist in acquisition and protection programs.

**Populations of this animal are considered to be declining**

*Ron Schlorff*

# Morro Bay kangaroo rat

*(Dipodomys heermanni morroensis)*

CA - Endangered (1971)
FED - Endangered (1970)

General Habitat: • Coastal Scrub.

This rodent, like all kangaroo rats, has long hind legs, small front legs and feet and a white belly. It is considered to be the darkest of all kangaroo rats in color. The lack of a complete white hip stripe distinguishes the Morro Bay kangaroo rat from other kangaroo rats. It burrows into the ground for living sites and is nocturnal. Food probably consists of seeds of grasses and shrubs during the dry season, and grass and herb cuttings during the wet season. Small amounts of food are probably stored in the burrows. The Morro Bay kangaroo rat is completely isolated geographically from other subspecies of the Heermann's kangaroo rat. It is found only in several small areas of less than one-half square mile in total size near Los Osos in San Luis Obispo County. It currently inhabits, as a completely wild population, just one small area known as Bayview, which remains in native vegetation. Habitat for this kangaroo rat is coastal scrub vegetation on old sand dune substrate.

This species is California's most endangered mammal, as populations continue to decline due to habitat loss. It is estimated that as few as 50 of these kangaroo rats are in the wild. Habitat loss and habitat maturation are certainly the major contributors to the decline, but other unknown factors may be operating. Adverse-impact categories (see Table III) include development, exotic plants and off-road vehicles, and may include pesticides, poisons and contaminants, and disease.

Management actions include preparation of a recovery plan; manipulation of habitat on State property to establish a less mature stage of vegetation; habitat protection through establishment of the Morro Dunes Ecological Reserve and the commitment by the DPR to manage adjacent portions of Montana de Oro State Park as kangaroo rat habitat; and a captive breeding program which began at California Polytechnic State University in San Luis Obispo but is now at the National Zoo in Washington, DC where it could receive greater staff attention. The DFG has participated in the development of an HCP for the Morro Bay kangaroo rat in San Luis Obispo County by serving on an advisory committee established by the county board of supervisors. Unfortunately, the county has allowed the process to prepare the HCP to lapse due to lack of funds. The captive breeding program and construction of an experimental enclosure were funded by the FWS. The DFG contracted for field monitoring programs in 1988 and 1989 to determine whether the kangaroo rats transferred from the captive colony to an enclosure built over wildland soil and vegetation at the Pecho area could survive in semi-natural conditions. The Pecho area has some privately owned parcels, but it primarily encompasses the ecological reserve and the State park. Four animals were introduced into the enclosure in 1988; at least one animal escaped and others may have done so, but none could be found inside or outside the enclosure after several months. A five-year status report for the kangaroo rat was written in 1990. In the report the DFG recommended that the Endangered status be retained.

The WCB appraised the Bayview site in 1991 to establish the current value of the property. In 1991, using Section 6 monies, the DFG contracted for a survey of Morro Bay kangaroo rat habitat. The survey was a systematic ground search for signs of the presence of the species in as many areas as possible within the historic range. The areas are those known to have been occupied at some point since 1971 and which currently have elements of native vegetation known to be used by the species. No final report is available to date.

Management needs include devising and implementing an annual scheme of vegetation management on the Pecho area, in order to retard the maturation of the coastal dune scrub habitat; continued monitoring of small mammal communities on the study plots at Pecho and continued vegetation sampling of the cleared and burned plots at Pecho in order to follow the maturation of the plots back to pre-manipulation conditions; acquiring the remaining privately-owned kangaroo rat habitat at Pecho by the WCB or the

DPR; acquiring habitat at other sites; conducting an intensive field survey of habitat at Pecho and possibly other sites to determine whether the kangaroo rat still occupies any portion of these areas; conducting a rigorous captive breeding program by the National Zoo, in order to produce sufficient kangaroo rats to introduce to managed native vegetation at Pecho; constructing additional enclosures in managed habitat at Pecho, in order to receive kangaroo rats from the captive breeding colony or from the Bayview area; completing the HCP by the County of San Luis Obispo, in order to provide the rationale for a program of acquisition and management of the necessary habitat areas to protect the kangaroo rat in perpetuity; halting the issuance of building permits by the County of San Luis Obispo for construction within kangaroo rat habitat, until the HCP has been implemented; gaining access to the Bayview area, in order to determine the status of the kangaroo rat on the only area known to have a population of this species, and to obtain animals if necessary for the captive breeding program or for translocation to Pecho; assigning by the FWS of a biologist on a full-time basis to issues regarding the conservation of the kangaroo rat; and commitment by the FWS to a long-term fully funded program of recovery for the kangaroo rat, in order to fund tasks identified in the recovery plan and other tasks as they are identified.

**The population trend is declining.**

*John Gustafson*

## Giant kangaroo rat

*(Dipodomys ingens)*

CA - Endangered (1980)
FED - Endangered (1987)

General Habitat:
- Valley and Foothill Grassland
- Chenopod Scrub.

Giant kangaroo rats are small mammals with elongated hind limbs for hopping and external cheek pouches for carrying food (principally grass seeds) to their burrows. The giant kangaroo rat is the largest of all kangaroo rats and weighs from 4.6 to 6.4 ounces. The total length is 12.2 to 13.7 inches, with a tail that is 6.2 to 7.8 inches. The presence of five toes on the hind foot in conjunction with the size and weight of this species are diagnostic characteristics. Giant kangaroo rats subsist almost entirely on the seeds of annual plants such as brome grasses (*Bromus* spp.) and filaree (*Erodium* spp). The animals harvest, stack and dry caches of grasses and forbs near the entrance of their burrows. Giant kangaroo rats inhabit a territory (known as a precinct) that averages 20 feet in diameter where a shallow burrow system (about 12 inches deep) is constructed. Each rat maintains and defends an individual territory in a colony that may consist of from two to thousands of precincts.

Historic population distribution and abundance is difficult to deduce because of the spotty distribution of colonies. However, it is estimated that about 1,303,700 acres of habitat of varying quality existed prior to the widespread cultivation of much of the San Joaquin Valley. About half of this acreage may have been subject to periodic inundation and was therefore not suitable for permanent populations of giant kangaroo rats. The historic range extended from Merced County south to Kern County, then west to eastern San Luis Obispo and northern Santa Barbara counties. Populations were most numerous in areas with sparse vegetative cover and low annual precipitation. Intense livestock grazing often was associated with the range of this species. Between 1972 and 1980 most of the habitats inhabited by giant kangaroo rats were converted from native vegetation to cultivated agricultural crops due, in part, to an abundance of irrigation water supplied by the recently completed water delivery systems of the State Water Project and the Central Valley Project (see Table III). Today, only remnant acreages of suitable habitat still remain in an undisturbed state. Huge colonies described in the literature no longer exist. Small colonies are found in portions of western Kern County and on the Elkhorn and Carrizo plains in eastern San Luis Obispo County. The loss of original habitat to agricultural conversion may be as much as 97-98 percent. Five relatively small areas totaling 12 square miles remain that support population densities typical of those existing prior to 1950.

Giant kangaroo rats require native annual grassland and shrubland habitats with sparse vegetative cover and soils that are well-drained, fine sandy loams with slope generally less than ten percent. Areas of low annual precipitation and infrequent flooding are preferred by this species for establishment of permanent colonies. Recent DFG studies have documented dense populations on the Elkhorn Plain Ecological Reserve, eastern San Luis Obispo County, in habitat consisting of Arabian grass (*Schismus arabicus*) and ephedra (*Ephedra viridis*). Habitat is protected and preserved to varying degrees at Elkhorn Plain, Carrizo Plain Natural Heritage Reserve, certain BLM lands, certain TNC reserves and certain State and Federal lands within the remnant range of the giant kangaroo rat. A five-year study to investigate the impact on giant kangaroo rats and other wildlife of livestock grazing at the Elkhorn and Carrizo plains was completed in 1991. In addition to gathering data on population density and habitat use, a successful attempt to translocate a small colony from the Elkhorn Plain to the Carrizo Plain was made. A new colony of over 100 individuals continues to expand from an original translocation of 30 individuals in 1989. An

emergency effort to provide supplemental food (seeds) was implemented during 1991 because drought conditions threatened the continued existence of certain populations. Tax check-off funds supported the research and management actions. Some DFG staff time, also supported by the check-off funds, is assigned to develop conservation programs for the giant kangaroo rat.

An inventory of native lands of the southern San Joaquin Valley conducted from 1986 to 1988 by the California Energy Commission identified a number of habitats suitable for giant kangaroo rats and also documented small colonies at some locales. This information will be used to assist in developing priorities for land acquisition. This information will also be useful in regional planning and endangered species recovery efforts. However, no recovery plan for the giant kangaroo rat currently exists.

The giant kangaroo rat continues to be endangered by habitat loss, primarily due to conversion of native habitat to intensive agriculture. In addition, the widespread application of rodenticides within the range of this species could have a significant impact on small populations. In most cases the "target" animal in rodent control programs is the California ground squirrel (*Spermophilus beecheyi*); however, there are also attempts to eradicate kangaroo rat populations because they are believed to seriously compete with cattle for forage. If extinction of this species is to be prevented, use of rodenticides within its range on both public and private lands needs to be curtailed and additional habitat must be acquired and preserved.

**Populations of this animal are considered to be declining**

*Ron Schlorff*

# Stephens' kangaroo rat

*(Dipodomys stephensi)*

CA - Threatened (1971)
FED - Endangered (1988)

General Habitat:
- Valley and Foothill Grasslands
- Coastal Scrub.

This species, like all kangaroo rats, has long hind legs, small front legs and feet and a white belly. It burrows into the ground for living sites and is nocturnal. It eats seeds and probably fruits, leaves, stems, buds and insects. This kangaroo rat is found in the San Jacinto Valley and adjacent areas of western Riverside, southwestern San Bernardino (at least formerly) and northwestern San Diego counties. Sites from which the species has been recorded since 1973 can be grouped into the following eight general areas: (1) March Air Force Base to the Moreno Valley, (2) Lake Perris to the eastern side of the San Jacinto Valley, (3) Lake Mathews to Estelle Mountain, (4) the Lakeview Mountains, (5) the vicinity of Lake Elsinore, (6) Lake Skinner to Temecula, (7) Fallbrook Naval Weapons Annex to the San Luis Rey River and (8) the vicinity of Lake Henshaw. The first six areas are in Riverside County, and the last two are in San Diego County. This kangaroo rat inhabits annual grassland with sparse perennial vegetation.

The major threat to the continued existence of the Stephens' kangaroo rat is the destruction or degradation of its habitat. Adverse-impact categories (see Table III) include water projects; development; agriculture; pesticides, poisons and contaminants; livestock grazing; exotic plants; and off-road vehicles.

There is no active habitat management, but habitat has been protected through the establishment of the San Jacinto Wildlife Area (SJWA) and Lake Mathews Ecological Reserve (LMER) in Riverside County. The kangaroo rat was classified as a Federal Endangered species on October 31, 1988. The first DFG five-year status report for the kangaroo rat was written in 1987. In the report DFG staff recommended that the kangaroo rat be reclassified to Endangered from Threatened. To date no action has been taken on that recommendation.

The DFG is participating in development of an HCP for the Stephens' kangaroo rat in Riverside County. The County of Riverside and the cities of Lake Elsinore, Perris, Moreno Valley, Riverside, and Hemet formed the Riverside County Habitat Conservation Agency (Agency) and hired a biological consulting firm to actually prepare the HCP. The City of Temecula subsequently joined the Agency. The consultant prepared a short-term HCP, which was submitted by the Agency to the FWS in September 1989 as part of an application for a permit to incidentally take Stephens' kangaroo rats. This HCP, which was accepted by the FWS in July 1990, will be in effect for two years while the long-term HCP is being prepared by the consultant. The FWS, in July 1990, issued a permit to the Agency authorizing the incidental take of kangaroo rats for a two-year period on lands located outside proposed reserve study areas, which were designated in the short-term HCP. One of the conditions of FWS approval of the short-term HCP and the issuing of a permit was that the Agency enter into an agreement with the DFG to authorize incidental take under the California Endangered Species Act. The agreement, in the form of a State endangered species take permit, was signed in October 1990.

The short-term HCP identifies ten study areas in western Riverside County which are potential preserves for the kangaroo rat. The State and Federal permits allow the Agency to take kangaroo rats incidental to otherwise lawful activity on properties outside of the study areas, as long as the take (in the form of habitat loss) does not exceed 4400 acres. The take also must be mitigated by the acquisition of one acre of habitat occupied by the kangaroo rat for every acre taken. Habitats acquired must be placed in public ownership and managed for the kangaroo rat. Acquisition is funded from

mitigation fees imposed by the jurisdictions (county and cities) on human development projects outside of the study areas but within the range of the kangaroo rat.

Both of the permits allowed the Agency to propose modifications of the boundaries of study areas during the life of the short-term HCP, although such changes must be approved by the DFG and the FWS. There have been two proposals to change boundaries, each of which contained a number of different changes. Neither proposal has been approved by either the DFG or the FWS. One proposal included the elimination of an entire study area; the rationale was not based on biological considerations but on the conclusion that it would be too expensive to acquire the private land within the study area for an ultimate preserve. The same argument was applied to a proposed change to the San Jacinto study area (which includes DFG's SJWA and DPR's Lake Perris State Recreation Area, as well as private land). A major portion of the study area has been proposed for elimination from future preserve consideration, because a large development is planned in that portion. An unrelated development project is planned for an adjacent portion of the study area. Both portions contain habitat occupied by the kangaroo rat, as well as agricultural land which was once habitat and could become so again if agricultural practices ceased. The DFG has written in letters of comment on proposed boundary changes that we cannot approve changes which allow the removal of occupied habitat from study areas in the absence of an analysis which demonstrates that removal would not affect the integrity of a final preserve.

Using Endangered Species Tax Check-off funds, the DFG contracted for a field study in 1988 to determine the current distribution of the kangaroo rat and to determine relative abundance as an indication of habitat quality. In 1989, also using tax check-off funds, the DFG contracted for a study to establish study plots on the SJWA and LMER which may be used to annually monitor the population status of the kangaroo rat. On the plots the contractor gathered baseline population data for the kangaroo rat and developed field methods which will be usable by qualified field biologists to assess kangaroo rat population status in subsequent years.

In the fall of 1991 the Metropolitan Water District of Southern California (MWD) began a project to determine whether Stephens' kangaroo rats can successfully be translocated from one site to another. MWD's biological consultant has captured kangaroo rats at sites scheduled to be taken under the Agency's permits from the DFG and FWS and has held them in captivity until sites for introduction are prepared. Preparation is done by discing or burning or both, and then artificial burrows are placed on the site. Animals are released directly into the burrows and are offered supplemental food for an initial period of time. This study is expected to continue for some years.

Management needs for the kangaroo rat are as follows: protection and management of habitat on public lands, including degraded habitat and former habitat recently converted to agricultural use; protection and management of habitat not currently in public ownership through establishment of a series of preserves, particularly in Riverside County; periodic surveys (at least every three years) to determine distribution, numbers, quality and extent of habitat at all sites and threats to the sites; preparation of a recovery plan which would incorporate the elements of protection and restoration of habitat, the establishment of preserves, and surveys and studies; studies to determine various aspects of life history; investigation of the impacts of rodenticides on the kangaroo rat; and reclassification of the kangaroo rat by the FGC to Endangered from Threatened.

**The population trend is considered to be declining due to loss of habitat in all portions of the range.**

*John Gustafson*

## Fresno kangaroo rat

*(Dipodomys nitratoides exilis)*

CA - Endangered (1980)
FED - Endangered (1985)

General Habitat:
- Chenopod Scrub
- Valley and Foothill Grassland

The Fresno kangaroo rat is one of three subspecies of the San Joaquin kangaroo rat (*Dipodomys nitratoides*). The subspecies has specialized hind limbs for hopping locomotion and external cheek pouches for transport of grass and forb seeds (the principal food items) to the underground burrow systems. Like all kangaroo rats, this subspecies has, in addition to long hind legs, a long, tufted tail for balance, a short neck and a comparatively large head. Efficient kidneys maximize retention of water to the point where animals seldom require moisture in the form of free water, obtaining what they require from the foods they eat. The Fresno kangaroo rat is the smallest of the San Joaquin kangaroo rats with a total length of 8.9 inches, including a 4.9-inch tail. Adults weigh about 1.2 ounces. Pelage is dark yellowish-buff dorsally and white ventrally. A white stripe extends along the flanks and on the sides of the tufted tail. San Joaquin kangaroo rats have four toes on the hind foot. Other similar species have five hind foot toes except for Merriam's,

which also has four.

The historic range of the Fresno kangaroo rat extended from northcentral Merced County, south through southwestern Madera and central Fresno counties. Current population distribution and population size are unknown but assumed to be restricted and small. A DFG-funded study was undertaken in 1988 to refine data on distribution and abundance of the subspecies, but results are not completely analyzed. It is difficult to assess population trends of this animal when basic information upon which to base that assessment is incomplete. Based on patterns of conversions of native habitats within the historic range of the species to intensive forms of agriculture and the increased use of pesticides, especially rodenticides within this range, it is likely that this subspecies has suffered a substantial loss of habitat and populations since the beginning of the cultivation era in California (see Table III).

Various studies have resulted in some population density information. Densities near Kerman, Fresno County, have ranged from 2.0 to 6.8 individuals per acre of grazed and ungrazed habitat. Densities of Tipton kangaroo rats (*D. n. nitratoides*) (1.1 per acre in high quality habitat to 0.6 per acre in areas subject to flooding) are thought to be comparable to Fresno kangaroo rat densities in similar habitats. Other studies have yielded Tipton densities ranging from 0.4 per acre to 20.2 per acre.

Fresno kangaroo rats occupy alkali sink habitats between 200 and 300 feet in elevation. Terrain is level to gently sloping and consists of alkaline clay based soils subject to seasonal flooding. Typical plants within this community include seepweed (*Suaeda fruiticosa*), iodine bush (*Allenrolfea occidentalis*), saltbush (*Atriplex* spp.), pepper-grass (*Lepidium nitidum*), filaree (*Erodium* spp.), wild oats (*Avena fatua*) and foxtail fescue (*Vulpia myuras*).

Loss of habitat and subsequent extirpation of resident Fresno kangaroo rat populations due to agricultural conversion of native habitats is the principal cause of mortality and population decline (see Table III). It was recognized by early researchers of this subspecies that Fresno kangaroo rat populations could be exterminated by agricultural cultivation. It was estimated that between 1974 and 1982 habitat decreased from 14,618 acres to 10,353 acres. About 932 acres of habitat for this subspecies exists on the Alkali Sink Ecological Reserve in Fresno County. However, many more acres on several other preserves and sensitive management programs will be necessary in order to ensure population viability of the Fresno kangaroo rat on public lands. While no total population estimate for the subspecies is available it has been estimated that about 167 acres of Alkali Sink Ecological Reserve habitat was capable of supporting 394 to 662 individuals. However, recent surveys funded by DFG have failed to locate extant populations on these lands. Review of existing management programs may be necessary in order to reestablish viable populations in suitable habitat. To ensure genetic fitness of a population, additional blocks of suitable habitat in excess of 800-2,800 acres will be required for preserves. Securing additional preserves of sufficient size must be the principal recovery strategy for this species. A recovery plan for the Fresno kangaroo rat is currently being written by the FWS. Tax check-off monies are being used to support staff assigned to develop research and management programs for the Fresno kangaroo rat. Recent research into the distribution of extant populations has been supported by Section 6 federal funds. A final report is being produced and will be distributed by the Department in 1992.

**Available information indicates the population of this species is in severe decline.**

*Ron Schlorff*

# Tipton kangaroo rat

*(Dipodomys nitratoides nitratoides)*

CA - Endangered (1989)
FED - Endangered (1988)

General Habitat: • Chenopod Scrub

Tipton kangaroo rats are small mammals with specialized hind limbs for hopping and external cheek pouches for transport of food, principally grass and forb seeds. They live in arid, open county where they construct underground burrows for shelter and food storage. Adult Tipton kangaroo rats weigh about 1.2 to 1.3 ounces. Total length of the animal is 8.7 to 9.4 inches including a 4.8 to 5.1 inch tail. The dorsal pelage is dark yellowish-tan, while underparts are white. A white stripe extends laterally across each flank and on the sides of the tufted tail.

The subspecies originally occupied a range that included the Tulare Lake Basin in portions of Fresno, Kings, Tulare and Kern counties. This geographic range encompassed about 1,716,500 acres. By July 1985 this historic range had been reduced, primarily by agricultural conversion of native habitats, to about 63,400 acres -- only about 3.7 percent of the original size. Today only about 6,400 acres of publicly-owned land divided among five separate parcels support low- to moderate-density populations of Tipton kangaroo rats. However, none of these parcels is sufficiently large to prevent continuing loss of genetic diversity and subsequent extinction.

Total population numbers during historic times are difficult to estimate due to lack of appropriate data collected during that era. However, a crude estimate of historic population based on today's density data and the estimated extent of former range is about 17,164,800 individuals. Today approximately 190,200 individuals, about 1%, remain. All of this habitat and population loss leading to the endangerment of the Tipton kangaroo rat was caused by the tremendous increase in conversion of native arid grassland and shrubland communities of the southern San Joaquin Valley to intensive,

irrigated agricultural crops (see Table III). The completion of water delivery systems associated with the Central Valley Project prompted much of this agricultural expansion (see Table III).

Tipton kangaroo rats are limited to arid land communities of the valley floor in the Tulare Basin in level to nearly level terrain at an elevation of 200 to 300 feet. Woody shrubs such as spiny saltbush (*Atriplex spinifera*), Iodine bush (*Allenrolfea occidentalis*), and mesquite (*Prosopis juliflora*) are sparcely scattered over the terrain with scant to moderate ground cover of grasses and forbs. Soils are typically fine-textured and alkaline. Tipton kangaroo rats sometimes colonize areas that are flooded in winter and spring. Favored areas may include seepweed (*Suaeda fruticosa*) shrublands which are flooded seasonally or where alkaline water lies close to the surface of the soil year-round. Kangaroo rats in these areas either drown or escape to higher ground during floods (see Table III).

Continued agricultural expansion into the remaining native habitats of the southern San Joaquin Valley threatens the Tipton kangaroo rat with extinction. This threat is further increased by the proposed State Water Project and increased water deliveries. Remnant habitats in southeastern Kings, southwestern Tulare and northwestern Kern counties could be cultivated by the year 2000, thereby eliminating the habitat of this subspecies.

No recovery plan is specifically anticipated for the Tipton kangaroo rat; however, cooperative efforts of state and federal agencies working with local governments and industries hope to protect and preserve some habitat through sensitive regional planning. Participants in this effort include DFG, FWS, TNC, California Energy Commission and appropriate city and county governments. However, Federal and State funds have not been available for needed population studies.

Although potentially difficult to accomplish, a ban of certain rodenticides within the range of the Tipton kangaroo rat will be critical to the conservation and recovery of this subspecies (see Table III). The Department must play an active role in the effort to accomplish this important task. Kangaroo rats are highly susceptible to many pesticides including compound 1080, zinc phosphide and anticoagulants. Present regulatory mechanisms are inadequate to prevent poisoning of Tipton kangaroo rats along with target species such as California ground squirrels (*Spermophilus beecheyi*). The most important need for preservation of this subspecies is to secure in public ownership all of the remaining large blocks of habitat on the valley floor in the Tulare Basin where populations of Tipton kangaroo rats still exist. Unfortunately, however, many of the remaining lands may be too small to support populations of this endangered subspecies indefinitely.

**This population is considered to be declining.**
*Ron Schlorff*

## Salt-marsh harvest mouse

*(Reithrodontomys raviventris)*

CA - Endangered (1971)
FED - Endangered (1970)

General Habitat: • Marshes and Swamps

This rodent has fur of a rich brown color, with underparts of cinnamon to buffy-white and a unicolored tail. It probably eats plant leaves and stems, particularly those of grasses. The species is endemic to the salt marshes of Suisun, San Pablo, central San Francisco and south San Francisco bays. It inhabits nontidal as well as tidal marshes.

The major threat to the mouse is destruction and degradation of its habitat. Over 3,600 acres of nontidal wetlands in south and central San Francisco Bay, much of it habitat for this species, have been filled or degraded since the mid-1970's. Since 1982, hundreds of acres of nontidal salt marsh in the South Bay have been disced. The impact of the alien red fox and the impact of rodenticide use on the Salt-marsh harvest mouse are unknown. Adverse-impact categories (see Table III) include development, agriculture, exotic plants and flood control, and may include introduced predators and competitors and pesticides, poisons and contaminants.

Discing of wetlands, an activity not regulated by the U.S. Army Corps of Engineers, has been employed by interests seeking to obscure the Corps' jurisdiction and circumvent the Clean Water Act and the Federal Endangered Species Act. On July 19, 1990, the U.S. Department of Justice and the USFWS announced that the Gentry-Pierce Business Park near Suisun City had agreed to plead guilty to violating Section 9 of the Federal Endangered Species Act and pay a $50,000 fine for take of Salt-marsh harvest mouse. The violation occurred when the developers disked a 157 acre site known to suport this speices. According to the Justice Department, this is the first prosection of an Endangered Species Act violation in California that involves a significant modification or degradation of endangered species habitat.

Management activities include protection of habitat in national wildlife refuges, State wildlife

areas and ecological reserves, and local refuges; review of Federal permit activities through a vigorous Section 7 consultation process (under the Federal Endangered Species Act) conducted by the FWS; preparation of a recovery plan which identifies tasks to accomplish recovery of the mouse; and periodic surveys in portions of the range to determine status.

Management needs include protection of much more habitat; emphasis on the protection of nontidal salt marshes, particularly in south San Francisco Bay, through the enforcement of the Clean Water Act and the Federal Endangered Species Act; and periodic surveys (at least every three years) to determine distribution, relative abundance, quality and extent of habitat at all sites and threats to the sites.

**The population trend is considered to be declining due to loss of habitat through development of residential, commercial and industrial uses in wetlands, flood control and mosquito abatement activities, and freshwater encroachment caused by increased sewage treatment plant discharge.**

*John Gustafson*

## Amargosa vole

*(Microtus californicus scirpensis)*

CA - Endangered (1970)
FED - Endangered (1984)

General Habitat: • Marshes and Swamps

This small mammal has upper parts of pallid neutral gray, underparts of smoky gray, a tail which is brown above and grayish below and feet of brownish-gray. The comparatively short tail, small rounded ears and short legs easily distinguish the vole from other mouse-like rodents. The vole probably eats green emergent vegetation (grasses and herbs) and grass seeds. The Amargosa vole is a completely isolated subspecies of the California vole. It is found only along the largely subterranean Amargosa River in Inyo County from the vicinity of Shoshone to the upper end of the Amargosa Canyon near Tecopa. It is discontinuous in distribution, being found in wetland pockets of bulrushes (*Scirpus olneyi*), cattails (*Typha* sp.), saltgrass (*Distichlis spicata*) and willows (*Salix* sp.). The flooding of potential vole habitat during late-summer thunder-storms and extended periods of winter rainfall probably allow permanent occupation of marshes only on the margins of the river's floodplain.

The marsh habitat of the vole has been reduced by burning and grazing of livestock and modified by human encroachment and pumping of ground water. Competition from the exotic house mouse may be a factor endangering the vole. The introduction and establishment of tamarisk (*Tamarix* sp.) into the river's drainage is diminishing vole habitat quality through gradual replacement of bullrush and other marsh plants. Salt from tamarisk leaves on the ground prevents the native marsh plants from reproducing. Most of the known occupied habitat is in private ownership. Adverse-impact categories (see Table III) include water projects, development, introduced predators and competitors, human disturbance, exotic plants, off-road vehicles and climate.

Critical Habitat has been designated by the FWS. A draft recovery plan written by the FWS was circulated for review by interested parties in 1987. The first DFG five-year status report for the vole was written in 1989. In the report, the DFG recommended to the FGC that the Endangered classification be retained. The BLM has established the Grimshaw Lake Area of Critical Environmental Concern (ACEC), to protect the natural values of the springs and marsh areas on Federal land in the vicinity of Tecopa. A management plan has been written for the ACEC. Land exchanges currently being negotiated by the BLM will result in the Federal ownership and addition to the ACEC of a private parcel which has occupied vole habitat. TNC has acquired a property near Tecopa and has closed a ditch which diverted water from a spring. A marsh is gradually establishing itself next to the spring. A study conducted for TNC by the Center for Conservation Biology at Stanford University was completed in 1988. The investigators in this study emphasized in a report to TNC that protection of the higher springs and marshes is of paramount importance to the conservation of the vole.

Management needs include protection of habitat through public and private acquisition or easement; periodic surveys (at least every three years) to determine distribution, population size, extent and quality of habitat at each site and threats to the sites; investigation of vole life history and habitat requirements; enforced closure by the BLM of the south end of the Amargosa Canyon to ORVs; and completion and implementation of the recovery plan.

**The population trend is considered to be unknown due to lack of recent information.**

*John Gustafson*

## Sierra Nevada red fox

*(Vulpes vulpes necator)*

CA - Threatened (1980)
FED - Candidate 2 (1985)

General Habitat: • Many High Elevation Habitats

The Sierra Nevada red fox is one of 10 recognized North American subspecies of *Vulpes vulpes*. The Sierra Nevada red fox is distinguished from members of the introduced lowland population of red foxes by its slightly smaller size and darker colored fur. The Sierra Nevada subspecies exhibits cross, silver and black color morphs whereas the

lowland subspecies has only been observed in the red or silver morph. Sierra Nevada red foxes are rarely sighted and apparently very secretive by nature. They inhabit remote areas of the State where chance encounters with humans are uncommon. Relatively little is known of the life history of the Sierra Nevada red fox but it is assumed that its habits are similar to those of other red foxes insofar as choice of dens, hunting tactics and breeding behavior are concerned. The subspecies is known to inhabit vegetation types similar to those for marten (*Martes americana*) and wolverine (*Gulo gulo*). Sierra Nevada red foxes probably eat a variety of foods which, in their habitats, would include marmots, ground squirrels, mice, woodrats, pikas, hares, birds, insects and berries. Reproductive behavior is assumed to be the same as for other red foxes with four to five pups born after a 51-52 day gestation period. Sierra Nevada red foxes inhabit a variety of habitats in the subalpine and alpine zones of the Cascade Mountains and the Sierra Nevada in California. It is assumed that, like its lowland counterparts, the Sierra Nevada red fox is an adaptable and opportunistic animal able to exploit a variety of natural environmental conditions in order to survive. Without intensive study, however, much about the habits and ecology of this animal remains unknown.

Sightings of the subspecies have been reported from the 5,000 to 7,000 foot elevation range with extremes placed at 3,900 feet in Yosemite Valley and 11,900 feet at Lake South America in the southern Sierra Nevada. The range is described as the northern California Cascades eastward to the northern Sierra then south along the Sierra crest to Tulare County. Due to lack of reliable research information, it is difficult to determine what the range of the subspecies is today or whether there have been significant changes from historic times. The relatively low number of recent sightings of this animal in the wild suggests a population that is extremely small and possibly declining.

Preferred habitat for the Sierra Nevada red fox appears to be red fir and lodgepole pine forests in the subalpine zone and alpine fell-fields of the Sierra Nevada. The fox may hunt forest openings, meadows and barren rocky areas associated with its high elevation habitats.

Logging, recreation and cattle grazing continue to expand into the forest and mountain meadow habitat of the Sierra Nevada red fox (see Table III). Recently-drafted National Forest plans and developments within the range of this species have not adequately addressed the potential adverse impacts on this animal.

No management plans for this species have been prepared, partly because of the difficulty in collecting data and limited financial resources. Greater effort needs to be expended by concerned agencies to acquire the necessary biological information upon which to base management and recovery plans. A study of the wolverine initiated in FY 90-91 may eventually yield information that will result in further research on the Sierra Nevada red fox. Management needs include reduction or elimination of logging adjacent to mountain meadow habitats; reduction of intensive recreational use of certain areas with known or suspected fox populations; reduction or elimination of livestock grazing in mountain meadows; and investigation of life history and habitat requirements of the Sierra Nevada red fox. Habitat that is set aside as designated wilderness is protected from such destructive uses as logging and certain developments. However, certain disturbances such as livestock grazing and recreational uses may have adverse impacts on Sierra Nevada red foxes (see Table III). The nature and significance of these disturbances, along with the answers to several other research questions concerning this subspecies, remains unknown.

**The population trend of this animal is unknown.**

*Ron Schlorff*

## San Joaquin kit fox

*(Vulpes macrotis mutica)*

CA - Threatened (1971)
FED - Endangered (1967)

General Habitat:
- Valley and Foothill Grasslands
- Chenopod Scrub

The kit fox (*Vulpes macrotis*) is the smallest canid species in North America. The San Joaquin kit fox is the largest of the four or five recognized subspecies of kit fox in North America. San Joaquin kit foxes have an average body length of 20 inches, an average tail length of 12 inches and stand about nine - 12 inches at the shoulder. The slender-built animals are characterized by relatively long legs and large, conspicuous ears. Adult males weigh about five pounds, and adult females weigh about 4.6 pounds. Pelage color differs with season, being tan to buffy gray dorsally in summer and silver gray dorsally in winter. Ventral coloration is white year-round. The long bushy tail is black-tipped, and the insides of the ears are covered with white hairs. Kit foxes attain adult size and pelage at about five months of age.

Historic range of the San Joaquin kit fox included most of the San Joaquin Valley from the vicinity of Tracy, San Joaquin County southward to southern Kern County. By 1930 this range may have already been reduced by 50 percent and kit foxes that formerly

occupied portions of their northern, northeastern and eastern range were restricted to the southern and western parts of the valley. Kit foxes occur in the remaining native vegetation associations of the valley floor and surrounding foothills from southern Kern County north to Los Banos, Merced County. Depending on extent of agricultural development, distribution is spotty within this broad range. In addition, smaller, less dense populations may be found further north and in the narrow corridor between Interstate 5 and the Interior Coast Range from Los Banos to Contra Costa County. Portions of Monterey, Santa Clara, San Benito and Santa Barbara counties are also included in the range of the San Joaquin kit fox.

Studies and information from various sources indicate that a density of one kit fox per square mile in suitable habitat is a reasonable figure to use to estimate populations based on known acreage of habitat, although densities can range from less than one to over six foxes per square mile. A reasonable population estimate is about 7,000 animals in the 14 counties included within the range.

Recent efforts to delineate the range of the San Joaquin kit fox indicate that most of the range defined in 1975 still supports some kit foxes. There has been significant loss of habitat locally, however. The problem is particularly acute in regions of the State where urban expansion extends onto surrounding agricultural lands, areas of intensive agricultural expansion and where extensive petroleum exploration operations continue (see Table III). The lands that are hardhit include the areas surrounding Bakersfield and western Kern County, particularly in portions of the "oil patch." Northern portions of the range, particularly in the areas to the east and south of the San Francisco Bay area are becoming increasingly fragmented due to urbanization and kit fox habitat may be lost to residential developments and public works projects such as reservoirs (see Table III). These threats pose the very real possibility of extinction of the northern population. In addition to habitat loss from agriculture, oil, residential and public works development, kit foxes are subject to disease, predation, roadkill, shooting, trapping and rodenticide mortality (see Table III).

About 82,000 acres of grassland/shrubland habitat has been acquired on the Carrizo Plain Natural Heritage Reserve and additional habitat acquisition is anticipated for that area and portions of the southern San Joaquin Valley, particularly in the Semi-tropic Ridge area of northern Kern County. Kit fox habitat exists on other public lands managed for a variety of purposes where the habitat is subjected to a range of compatible and incompatible uses. Such areas include lands administered by the BLM, Department of the Army, Department of Energy, FWS, DWR and DFG. A revised draft of the recovery plan is being prepared by the FWS but work on the document has been temporarily halted due to lack of staff and funds to devote to the project. Additional regional planning efforts, particularly in the southern portion of the kit fox range, are anticipated to assist in the recovery of the kit fox. Tax check-off funds are used to support DFG's efforts in developing research and management programs benefiting the San Joaquin kit fox.

**The population is considered to be declining.**

*Ron Schlorff*

# Island fox

*(Urocyon littoralis)*

CA - Threatened (1971)
FED - Candidate 2 (1982)

General Habitat:
- Chaparral
- Coastal Scrub
- Cismontane Woodland (Channel Islands)

This species has pepper-and-salt-colored fur, with a rufous or buffy underfur and a dorsal median black stripe ending in the black tip of the tail. Insects, particularly grasshoppers, crickets and beetles, and the fruits of plants are the most important components of the diet. Birds, their eggs, mammals and grasses are also eaten. The fox is found on the six largest of the Channel Islands. These are San Miguel, Santa Rosa, Santa Cruz, Santa Catalina, San Nicolas and San Clemente islands. The island fox appears to use most habitat types found on the six occupied islands, although it may have a preference for the woodland or chaparral types. These habitats are not found on all islands.

The known threats to the species are habitat loss or degradation, direct interaction with feral cats, and vehicles on those islands with extensive road systems. The population may be stable on all islands. Adverse-impact categories (see Table III) include development and introduced predators and competitors.

The fox is designated as a category 2 (also called candidate 2) species in the latest (November 21, 1991) Federal Register notice of review of vertebrate species. This means that the FWS currently has information which indicates that the fox may deserve to be proposed as Endangered or Threatened, but that conclusive data on biological vulnerability and threat are not available. The notice of review lists the status of the fox on five of six islands as "Stable", which indicates stable numbers over the recent past and/or threats remaining relatively constant. For Santa Catalina Island the status is listed as "Unknown", which indicates that additional survey work is required to determine trends.

The first DFG five-year status report of the fox was written in 1987. In the report, the DFG recommended to the FGC that the Threatened classification of the fox be retained. Management activities for the fox include reduction and attempted elimination of feral cats on San Nicolas Island, reduction and attempted elimination of deer, feral pigs and feral goats on San Clemente island; and population studies on San Miguel, San Nicolas and San Clemente islands. A

two-year study of the status of the fox on Santa Catalina and San Clemente islands, using Endangered Species Tax Check-off funds, was completed in 1991. A final report submitted to DFG is under review.

Management needs for the fox are as follows: elimination or significant reduction of exotic mammals (both herbivores and carnivores) on all islands occupied by the fox; preparation of a State management plan which would incorporate the elements of exotic mammal elimination or reduction and of surveys and studies of the fox; and surveys on Santa Rosa and Santa Cruz islands to determine the status of the population, investigate various life history factors and describe threats to its continued existence.

**The population trend is considered to be stable .**

*John Gustafson*

## Wolverine

*(Gulo gulo)*

CA - Threatened (1971)
FED - Candidate 2 (1985)

General Habitat: • Many High Elevation Habitats

The wolverine is the second largest member of the weasel family; only the sea otter (*Enhydra lutris*) is larger. The wolverine resembles a small, short-legged bear with a coarse shaggy coat and a bushy tail. The coat is heavy and dark brown with two broad, light-colored bands extending from the shoulder to meet at the base of the tail. Wolverines typically weigh 35-60 pounds and measure 35-45 inches long, including a six - ten inch tail. They stand about 14-18 inches at the shoulder. Their jaws are very powerful and are adapted to crush and shear frozen meat and bones. Sexes appear similar except that males are 25-35 percent larger than females. The wolverine is a tireless hunter and scavenger, sometimes ranging great distances within a home range that may encompass several hundred square miles. Wolverines subsist on a variety of foods including small and medium sized mammals, birds, insects, berries and fungi. Carrion, especially in the form of large ungulates, is believed to be an important component of the diet, particularly during winter. Wolverines have litters of one to five young, with two to four being most common. Birth of young takes place in dens of various configurations of rocks, hollow logs and vegetation.

Wolverines are often regarded as animals of high elevation habitats; however, sighting data collected by DFG over the past few decades indicate that the species inhabits a variety of habitat types between 1,600 feet and 14,200 feet. The mean elevation of 143 sightings in California is about 8,000 feet. Habitat generally consists of open terrain above timber line. The present and historic ranges of the species are rather similar. The historic range is from Mount Shasta on the north to Monache Meadows in Tulare County on the south. Portions of the north coast and the north Sierra regions of the State are also included in the pristine range. Currently, sighting information indicates that the species extends from Del Norte and Trinity Counties to the north eastward through Siskiyou and Shasta Counties and then south along the Sierra crest to Tulare County. No density data are available on the wolverine population in the State due to difficulties involved in studying such an elusive and far-ranging species in its native habitat. An estimate of 50 to 100 wolverines was made a decade ago and this must serve as today's population information since no more recent estimate is available.

Regardless of the difficulties involved in the study of this species, basic population, ecological and habitat relationships data are needed in order to develop management plans to ensure the continued survival of wolverines in California. No management plans for this species have been prepared, partly because of the difficulty in collecting data and limited financial resources. No State or Federal land use planning documents address the habitat needs of wolverines at the present time. Wolverines are not given adequate consideration for protection of habitat or protection from disturbances in the several forest plans that have been drafted by the USFS to date. Established wilderness areas within the State preserve many acres of habitat, and additional areas have been proposed for wilderness designation, but none have been established in California during the past eight years. Wolverines may be subject to habitat loss due to logging and over-grazing by livestock. They may also be affected by human disturbance including use of ORV's and snowmobiles in remote "wilderness" areas (see Table III). Research into the population status of the wolverine began in FY 90-91 and will continue for several years. Initially the study attempts to document the occurrence of wolverines at selected habitats within the suspected range by the use of remote sensor cameras associated with a carrion bait station. No wolverines were photographed at bait stations during summer, 1991, but it is hoped that success will occur during operations in winter 1991-92.

**The population trend of this animal is unknown .**

*Ron Schlorff*

# Guadalupe fur seal

*(Arctocephalus philippii townsendi)*

CA - Threatened (1971)
FED - Threatened (1985)

General Habitat: • Marine, Coastal rocks

The Guadalupe fur seal is recovering slowly from near extinction brought about by sealers in the last century. This species, which was regarded as extinct until 1949, breeds only on Guadalupe Island, Mexico, located off the Pacific Coast of central Baja California. The total population is increasing slowly and is presently estimated to number about 1,600 - 2,000 animals. Each year between two and six adult males and juveniles are seen on San Nicolas Island and San Miguel Island. Guadalupe Island has been declared a marine mammal sancturay, and the species is fully protected by the Mexican government. In U.S. waters, it is afforded full protection pursuant to the Marine Mammal Protection Act of 1972, and management authority is the responsibility of the Federal government (National Marine Fisheries Service). The State has no formal or active management program for this species.

**The population trend for this species is stable/increasing.**

*Bill Maxwell*

# California bighorn sheep

*(Ovis canadensis californiana)*

CA - Threatened (1971)
FED - (None)

General Habitat: • Steep Open Terrain

The California bighorn sheep is one of three mountain sheep subspecies found in California and eight found in North America. Both sexes have horns, the female with ten to 12 inch goat-like horns and the male with massive horns which may grow to make a full curl as viewed from the side, thus the name bighorn sheep. Mature males may be 40 inches tall at the shoulder and weigh around 200 pounds. The female is about 30 percent lighter. Bighorn habitat requirements include steep open terrain free of competition from other grazing ungulates. The historic distribution in California was the east slope of the Sierra Nevada Mountains from Walker Pass to Sonora Pass, and the lava rim rock areas of northeastern California.

Since this subspecies was listed as rare in 1971, it has increased from 195 animals in two indigent herds to five herds totaling about 300 animals. This increase resulted from five trapping projects removing surplus animals from the Baxter herd and relocating them to suitable habitat. In January 1988 the entire reintroduced herd (65 bighorn) in the Warner Mountains died. The cause was determined to be a bacterial pneumonia believed to have been contracted from a contact with a stray domestic sheep. All Sierra Nevada bighorn herds are being monitored, including the reintroduced Lee Vining herd. Suitable habitat and reintroduction potential is currently being evaluated, taking into account the recent losses and potential conflicts with livestock grazing.

**The population trend for this species is stable/increasing.**

*Steve Torres*

# Peninsular bighorn sheep

*(Ovis canadensis cremnobates)*

CA - Threatened (1971)
FED (None)

General Habitat: • Open Desert Slopes

The peninsular bighorn sheep is one of three mountain sheep subspecies found in California and eight found in North America. As with all wild sheep, the males have large curling horns, and the females have small horns with a slight curve. Mature rams weight as much as 180 pounds and ewes weigh about 140 pounds. Peninsular bighorn uses the open desert slopes, found mostly below 4,000 feet elevation, from the San Gorgonia Pass south and extending into Mexico. Their historic range is much the same as the present range.

Despite this, their numbers have declined. When the subspeices was listed as rare in 1971, their estimated population was 1,100 animals. The current estimate is about 450-600 animals. The problem has been a very low lamb survival over much of their range since 1977. There is an ongoing study by the Bighorn Institute in the Santa Rosa Mountains to determine the cause of high lamb mortality. A Santa Rosa Wildlife Habitat Management Plan has been developed jointly by the BLM and DFG. The population is being monitored by making helicopter herd composition counts. The DFG has acquired over 41 square miles of bighorn habitat that was held in private ownership. A number of water developments have been made to benefit bighorn. Over 100 feral cattle have been removed from within the Anza Borrego Desert State Park in an effort to improve conditions for peninsular bighorn sheep. Livestock are a possible source of disease contributing to the high lamb mortality. In the 1991 DFG was notified that this subspecies is being considered for Federal candidacy.

**The population trend for this species is stable/decreasing.**

*Steve Torres*

# BIRDS

Elf owl - photo courtesy of the California State Department of Parks and Recreation

# California brown pelican

*(Pelecanus occidentalis californicus)*

CA - Endangered (1971)
FED - Endangered (1970)

General Habitat: • Marine Habitats

The brown pelican is a large, grayish-brown bird with a long, pouched bill. The adult has a white head and dark body, but the immature is all dark with a white belly. In California the pelican eats surface schooling fishes such as the Pacific mackerel (*Scomber japonicus*), Pacific sardine (*Sardinops sagax*) and northern anchovy (*Engraulis mordax*). The two latter species have declined due to overfishing by humans, and over 90 percent of the pelican diet, based on the most recent food habits studies, consists of the anchovy during the critical pelican breeding season. The California brown pelican breeds from the Channel Islands of southern California southward (including the Baja California coast and the Gulf of California) to Isla Isabela, Islas Tres Marias off Nayarit, Mexico and Isla Ixtapa off Acapulco, Guerrero, Mexico. In the past the pelican also bred on Point Lobos (Monterey County), but successful breeding has not occurred there since 1959. The pelican constructs a nest of sticks on the ground. Between breeding seasons pelicans wander as far north as British Columbia, Canada and as far south as Central America.

The breeding populations of the California brown pelican can be differentiated into identifiable and geographically separate entities. However, these probably are not isolated breeding groups. The population segment of interest and concern to the DFG is the southern California bight (SCB) population, which has shown the major declines that were the impetus for endangered classification. The SCB population consists of those breeding birds on the Channel Islands; Islas de los Coronados off Tijuana, Baja California, Mexico; Isla Todos Santos; and Isla San Martin (the latter two islands are off Baja California). This population typically breeds on West Anacapa Island, Santa Barbara Island, Isla Coronado Medio, and Isla Coronado Norte.

The SCB population is threatened by the following factors: the phenomenon of alternate years of small and large breeding efforts at the West Anacapa Island and Santa Barbara Island colonies; continued low productivity or colony failure at the Islas de los Coronados; continued presence of relatively high levels of pesticide residues in the tissues of some pelicans; the dependence of the pelican for food on the Northern Anchovy; the continued threat of an oil spill from tanker traffic in the Santa Barbara Channel in several scales of disaster from the February 1990 spill at Huntington Beach up to or exceeding that of the March 1989 Valdez spill in Alaska; human and non-human disturbance of the pelican at important central California coast post-breeding roosts; physical injury and death due to fish hooks and entanglement of birds in abandoned fishing line; and disease outbreaks resulting from overcrowding at fish disposal areas in harbors. Adverse-impact categories (see Table III) include development; pesticides, poisons, and contaminants; human disturbance; and disease.

Population numbers are well-known because the SCB breeding colonies are surveyed almost every year. The breeding population had been generally increasing through the 1986 and 1987 breeding seasons but then suffered a precipitous decline in 1988 to about 2900 breeding pairs from about 7200 in 1987. In 1989 the breeding population increased to about 6000 pairs and then fell to about 2400 pairs in 1990. In 1991 about 5000 pairs built nests on Anacapa Island in a split season, but there was a great amount of abandonment during the March storms (during the first part of the nesting season) and at least half the nests of the second part of the season also were abandoned. Many nests on Santa Barbara Island also were abandoned during March. These dramatic changes from one year to the next illustrate the need to base management decisions for the SCB population on data from more than a five-year period (the period specified in the federal recovery plan; see below). The Los Coronados breeding colonies have gradually declined to the point of virtual extirpation, probably due to human disturbance.

Management actions for SCB birds include protection of nesting colonies from human disturbance in California; periodic assessment of reproductive success in the SCB (including the 1989 study which was conducted by DFG contractors using Endangered Species Tax Check-off funds and by NPS personnel); in 1983 the preparation of a federal recovery plan which gives the following criteria for achieving recovery: the SCB population should be considered for reclassification to Threatened when any five-year *mean* productivity (number of young fledged per nesting attempt) of 0.7 occurs at a time when the breeding population is at least 3000 pairs, and should be considered for delisting when any five-year *mean* productivity of 0.9 occurs in a breeding population of 3000 pairs; investigation of the importance of post-breeding areas along the coast of California, Oregon and Washington; disease investigations; and investigation of the effects of waterfowl shooting on pelicans at the Moss Landing Wildlife Area (Monterey County). The first five-year status report for the pelican was written in 1990. In the report the DFG recommended that the pelican retain its classification of Endangered.

Management needs include revision of the recovery plan to eliminate the concept of *mean* productivity for a five-year evaluation period of CBP status and substitute the concept of *minimum* productivity; revision of the recovery plan to provide for a recovery evaluation period of at least 10 years to replace the current five-year period; revision of the recovery plan to provide for productivity values higher than the current 0.7 and 0.9 as numerical thresholds for reclassification of the CBP to Threatened and for delisting, or to justify the current values; revision of the recovery plan to evaluate current factors which make the CBP vulnerable to extinction in the SCB as a breeding species or at least susceptible to continued endangerment; providing Section 6 funds to the DFG annually for a breeding season survey of SCB nesting populations, in order to obtain data on number of nesting attempts and productivity; providing Section 6 funds to the DFG to undertake recovery plan tasks on pollution monitoring and correlation of annual fishery data to CBP productivity in the SCB, as well as other priority 1 and 2 tasks; development by the FWS of a formal international cooperative program between the United States and Mexico to protect CBP nesting colonies in Mexico (no progress has been made to date); construction by the DFG of a new outer levee and islands in the salt ponds at the Moss Landing Wildlife Area, and management of water levels in the ponds to protect roosting pelicans (not completed to date); employment of a biologist to exclusively conduct CBP breeding season surveys in the Channel Islands; a wider protection zone around the Anacapa Islands (no progress has been made to date); and prohibition of aircraft over Anacapa (no progress has been made to date).

**The trend of this population is considered to be stable/declining.**

*John Gustafson*

# California condor

*(Gymnogyps californianus)*

CA - Endangered (1971)
FED - Endangered (1967)

General Habitat:
- Chaparral
- Foothill and Valley Grasslands

The California condor is North America's largest land bird; its wing span exceeds nine feet. Adults are black with a pink-orange head, and there is a white patch under each wing. It is the only living representative of this genus. Condors formerly were widespread in western North America from British Columbia to Baja California. By the early 1980s, the species had been restricted to mountain and foothill grassland and forest habitats in a U-shaped range from northern Los Angeles County in the south, northward through the Coast Range to San Luis Obispo County and northward through the western Sierra Nevada to Tulare County. They nested mainly on cliffs in the southern part of this range. They foraged in the foothills for dead cattle, deer and other carrion.

The greatest threat to the survival of the condor over the decades has been the unnaturally high rate of mortality caused by human activities, directly or indirectly. Probably no single, dominant factor caused the population decline. Adverse impacts have included development, egg predation by ravens, poisons and contaminants, human disturbance, energy development, collecting and shooting. The relative significance of each factor has changed over time. Lead poisoning from the ingestion by condors of lead bullets in carcasses has contributed significantly to the decline. Shooting has long been considered to be an important source of condor mortality, more so in the past than in recent decades. Incidental death from use of strychnine poisoning of predators in the early 20th and in the 19th century may have been another important factor. DDT contamination may have reduced condor reproductive success in the recent past. Unnaturally high incidence of loss of eggs to ravens may be the result of human activities that have benefited that species. The population declined steadily in recent decades from 120-180 in the 1940s to 25-35 in the late 70s.

In 1980, an intensive last-ditch interagency research and recovery program was implemented, but the decline continued so rapidly that the last remaining birds had to be trapped by 1987 for captive breeding. This captive population consisted of only 27 birds, including captured wild birds and incubator-hatched young from eggs collected from nests of the last wild breeding pairs. The captive breeding program has been successful. Since 1988, when the first fertile egg ever laid in captivity by this species hatched, the captive population has nearly doubled. By 1991, the captive population totalled 52, and criteria established by the recovery team had been met for beginning a release program. Two captive-hatched California condors will be released to the wild in the Sespe area in January 1992, to be followed annually by increasing numbers of releases in efforts to form the first of at least two self-sustaining wild populations.

A successful experimental release program using female Andean condors was recently completed in southern California to refine procedures for the California condor releases. A Geographic Information System relating to condor habitat will be completed in early 1992. All aspects of breeding and release programs are guided by recovery team recommendations and by the 1984 recovery plan. Many agencies and organizations contribute to the program. The Environmental Protection (License Plate) Program Fund has annually provided a major, dependable funding base for the captive breeding program.

**The population trend is stable, that is, the captive population is relatively secure but no wild population exists yet.**

*Ron Jurek*

# Bald eagle

*(Haliaeetus leucocephalus)*

CA - Endangered (1971)
FED - Endangered (1967)

General Habitat: • Many wetland and forest habitats

The bald eagle is a large, dark brown bird of prey which, as an adult, has a white head and tail. It occurs widely in North America. The species winters throughout most of California at lakes, reservoirs, river systems and some rangelands and coastal wetlands. The breeding range is mainly in mountainous habitats near reservoirs, lakes and rivers in the northern one-third of the State; some pairs have bred in recent years in mainland southern California and on Santa Catalina Island. Typical nest sites are in live trees near water bodies. They feed primarily on fish, waterfowl and carrion. The breeding population trend is increasing, both in numbers and range. The number of breeding pairs known to be occupying territories in 1981 totaled 50; by 1990, it had increased to 93; the 1991 total was 90. The breeding range expanded from portions of 8 counties in 1981 to 18 in the early 90s. The Pacific Bald Eagle Recovery Plan (1986) covering a seven state area including California, establishes goals for population recovery: a minimum 800 breeding pairs, average productivity of at least one young per pair, breeding population goals met for at least 80 percent of management zones, and no decline in major winter concentrations. Based on improvement of population status in most of the country, the U.S. Fish and Wildlife Service is considering the possibility of reclassifying much of the national population, including the Pacific States population, to threatened status on the federal list.

Adverse impacts have included development, agriculture, pesticides and contaminants, human disturbance, timber harvest activities, off-road vehicles and shooting. The multi-agency California Bald Eagle Working Team provides guidance to agencies and groups in management and research matters, and the team is preparing a management plan for bald eagles in California to assist in implementing the recovery plan. Many breeding territories are being maintained and protected under local management plans. Key winter habitats are receiving increasing attention in terms of population monitoring, site protection and public viewing and education. Several agencies, including Pacific Gas and Electric Company and U.S. Forest Service, are sponsoring intensive ecological studies. Other research efforts are under way on contaminants, human disturbance, and other matters that affect this species. Several bald eagle studies, including population restoration efforts on the Channel Islands, have been supported with Tax Check-off funding assistance. At Catalina, some of the 35 birds released there since 1980 are now breeding, but until 1991 no eggs had hatched, possibly because of DDE contamination, a problem that is continuing to be assessed. A second reintroduction effort using translocated eaglets has been under way since 1987 in coastal Monterey County. Also, a captive breeding population is being developed at the San Francisco Zoo. Breeding status of nesting territories and winter population size and distribution are monitored annually by cooperating agencies and individuals.

**The breeding population is increasing and the winter population appears to be stable, varying from year to year and exceeding 1,000 birds some winters.**

*Ron Jurek*



# Swainson's hawk

*(Buteo swainsoni)*

CA - Threatened (1983)
FED - Candidate 3C (1989)

General Habitat: • Valley and Foothill Grassland

The Swainson's hawk is a medium-sized buteo with relatively long, pointed wings and a long, square tail. The species occurs in three main color morphs: light, rufous and dark, with intermediates, all of which have been observed in California populations. Adult birds have dark brown heads with a dark breast band which is set off from a lighter-colored belly in lighter morph birds. In dark birds, however, the entire body may be a sooty-brown to black color. The throat is white or partially white in dark birds. The wings are bicolored underneath with the wing linings generally lighter than the dark flight feathers. Adult females weigh 28 to 34 ounces and males 25 to 31 ounces.

Swainson's hawks breeding in California spend the winter in South America as far south as Argentina. The diet of the Swainson's hawk is varied with the California vole (*Microtus californicus*) being the staple in the Central Valley. A variety of birds and insects are also taken. Swainson's hawks often nest peripheral to riparian systems of the valley as well as utilizing lone trees or groves of trees in agricultural fields. Valley oak (*Quercus lobata*), Fremont cottonwood (*Populus fremontii*), walnut (*Juglans hindsii*) and large willow (*Salix* spp.) with an average height of about 58 feet (41-82 feet) are the most commonly used nest trees in the Central Valley. Swainson's hawks in the Great Basin area of the State (northeastern counties) occupy the juniper-sagebrush community typical to the area. Junipers (*Juniperus occidentalis*), with an average

height of 15 feet are most commonly used as nest trees in the Great Basin. The diet of Great Basin populations of Swainson's hawks consists of montane meadow voles (*M. montanus*) and Belding's ground squirrels (*Spermophilus beldingi*).

Swainson's hawks require large, open grasslands with abundant prey in association with suitable nest trees. Suitable foraging areas include native grasslands or lightly-grazed pastures, alfalfa and other hay crops and certain grain and row croplands. Unsuitable foraging habitat includes row crops in which prey are scarce or unavailable due to the density of the vegetative cover. Those include vineyards, orchards, rice, corn and cotton crops. Suitable nest sights may be found in mature riparian forest, lone trees or groves of oaks and other species in agricultural fields and mature roadside trees. Over 85 percent of Swainson's hawk territories in the Central Valley are in riparian systems adjacent to suitable foraging habitats.

Swainson's hawks were once found throughout lowland California and were absent only from the Sierra Nevada, north coast ranges and Klamath Mountains and portions of the desert regions of the State. Today, Swainson's hawks are restricted to portions of the Central Valley and Great Basin regions of the State where suitable nesting and foraging habitat is still available. In the Central Valley, the trend toward planting of more and more crops that are unsuitable for Swainson's hawks (e.g., vineyards, orchards, rice) and urban expansion onto surrounding agricultural and grassland areas further threatens the population. Residential and commercial development of foraging habitat is becoming increasingly prevalent in the center of Swainson's hawk distribution in the Central Valley, particularly in Yolo, Sacramento and San Joaquin counties (see Table III).

During historic times (Ca. 1900) Swainson's hawks may have maintained a population in excess of 17,000 pairs. Today the statewide population is estimated to be only about 550 pairs. If current trends of agricultural and urban expansion continue, the remnant population may decline to the point of endangerment. Breeding populations of Swainson's hawks are monitored each year to determine trend and condition of habitat. Banding and color marking studies are ongoing in the Great Basin region, and recently radio-telemetry was used to monitor Swainson's hawk movements in the Central Valley. Management needs of the Swainson's hawk include ensuring availability of suitable nesting and foraging habitat through preservation of riparian systems and lone and groves of mature trees in agricultural fields, and maintenance of compatible (with the Swainson's hawk) agricultural practices in grasslands, pastures and croplands. Compatible agriculture is essential to the maintenance of current Swainson's hawk populations. The loss of agricultural lands to various developments is a serious threat to Swainson's Hawks throughout California (see Table III). Additional threats are posed by habitat loss due to bank protection projects, expansion of incompatible agriculture, shooting, pesticide poisoning of prey animals, competition from other raptors and human disturbance at nest sites (see Table III).

Developing a cooperative effort between DFG and private landowners is crucial to the effectiveness of habitat management programs since 95 percent of known territories in the Central Valley are on private lands. Swainson's hawks in the Great Basin exist on both private and public (BLM and USFS) lands. The widespread use of pesticides and rodenticides within the range of the Swainson's hawk is cause for concern. Besides the direct and sublethal effects on adult and young birds caused by pesticides, there is a definite impact on potential prey animals upon which Swainson's hawks depend. No statewiode management plan has been prepared for the Swainson's hawk. However, some local conservation planning efforts are underway in San Joaquin and Yolo counties. Study and monitoring programs that are part of mitigation requirements for a levee reconstruction project on the Sacramento River have yielded valuable information on reproductive biology of Swainson's hawks.

**Currently the population is declining statewide.**

*Ron Schlorff*

## American peregrine falcon

*(Falco peregrinus anatum)*

CA - Endangered (1971)
FED - Endangered (1984)

General Habitat: • Many Habitats

Adult peregrines are slate gray above and light below, and the dark cap of the head extends to the cheeks. The wingspan exceeds three feet. The range includes most of California during migrations and in winter, except in deserts. The California breeding range, which has been expanding, now includes the Channel Islands, coast of southern and central California, inland north coastal mountains, Klamath and Cascade ranges and the Sierra Nevada. Nesting sites are typically on ledges of large cliff faces, but some pairs are nesting on city buildings and bridges. Nesting and wintering habitats are varied, including wetlands, woodlands, other forested habitats, cities, agricultural areas and coastal habitats. They feed on birds that are caught in flight.

Pairs formerly nested commonly in most of the State, but only about ten breeding pairs were known by the mid 70s. The decline was attributed to the effects of DDT, which caused failure of eggs to hatch. Restrictions on use of DDT and intensive recovery efforts have helped to restore breeding to some areas of the State. Part of the increase is owing to the program of annual releases to the wild of captive-hatched birds. The known number of breeding pairs in 1991 was 111, compared with 90 in 1989, 70 in 1985 and 39 in 1980.

Under the Pacific Coast Recovery Plan for the peregrine falcon (1982), management has been directed to augmenting natural productivity by releasing large numbers of young, captive-hatched birds through various means. The Santa Cruz Predatory Bird Research Group produces peregrine chicks from the incubator-hatching of eggs laid by captive peregrines or of thin-shelled eggs collected from poorly reproducing pairs in the wild. Some young are released to the wild into active nests of peregrines or of prairie falcons. Others are hand reared in "hack" box nests for release where few peregrines now nest. Since 1977, 657 peregrines have been released to augment natural productivity of the growing number of wild breeding pairs in California. This part of the recovery program is gradually being phased out owing to the success of recovery efforts. Other recovery actions include annual surveillance and protection of nest sites; sampling of eggs for contaminant analyses; environmental review and restrictions on developments and disturbances near nest sites; creation or enhancement of nesting ledges; and acquisition of peregrine nesting habitat.

The Federal Section 6 program, the Environmental License Plate Program and Endangered Species Tax Check-off funds greatly supported much of this program through 1991, when funding was discontinued. Ecological Reserves protect habitats of several breeding pairs. Two western U.S. Peregrine Falcon Recovery Teams were replaced by one team in 1989 as part of federal changes in administration of the nationwide recovery effort, and an interstate working team has been established to aid coordination. The multiagency California Peregrine Falcon Working Team provides recovery program guidance to cooperators. An interagency memorandum of understanding was signed in 1988 to ensure the adequacy of annual surveys for a five-year period to provide information needed for eventually reevaluating its endangered status.

**The breeding population trend is stable/increasing, with population increases in most regions of the State but with little or no improvement in others.**

*Ron Jurek*

## California black rail

*(Laterallus jamaicensis coturniculus)*

CA - Threatened (1971)
FED - None

General Habitat: • Marshes and Swamps

This rail is tiny, about the size of a sparrow, and is blackish in color, with a small black bill, a back speckled with white and a nape of deep chestnut. Little is known about food habits, but apparently the rail eats arthropods. This species historically was known or thought to occur as a breeder from the San Francisco Bay area (including the Sacramento/San Joaquin Delta) south along the coast to northern Baja California, in the San Bernardino/Riverside area, at the Salton Sea and along the lower Colorado River north of Yuma in California and Arizona. The coastal populations included those at Morro Bay and San Diego. Wintering birds were found in the breeding areas and also at Tomales Bay. The rail now is probably absent as a breeder from coastal southern California. Its status as a breeder in the Riverside area is unknown. The species is known to inhabit saltwater, brackish and freshwater marshes. Vegetation in marshes utilized by this species varies from almost pure pickleweed (*Salicornia* sp.) to sedges (*Carex* sp.) and saltgrass (*Distichlis* sp.) to bulrushes (*Scirpus* sp.) and cattails (*Typha* sp.).

The major threat to the existence of the rail in California is the loss and degradation of its habitat. Adverse-impact categories (see Table III) include water projects, development, agriculture, and flood control. The Arizona Game and Fish Department has expressed concern about the rail along the lower Colorado River, which was subjected to extremely high water flows in 1983.

The California black rail is not listed in the most recent Federal Register notice of review of vertebrate species dated November 21, 1991. However, the notice does list the black rail as a species, with all of its subspecies including the California one as category 2. This means that the FWS currently has information which indicates that the black rail may deserve to be proposed as Endangered or Threatened, but that conclusive data on biological vulnerability and threat are not available.

The first DFG five-year status report for the rail was written in 1987. In the report, the DFG recommended to the FGC that the Threatened classification be retained. Using Endangered Species Tax Check-off funds, the DFG contracted for a field study of the rail in 1988 to determine the distribution and relative abundance in the greater San Francisco Bay area. In 1989, also using tax check-off funds, the DFG contracted for a field study to determine distribution and relative abundance along the lower Colorado River and in the Imperial Valley. The 1988 and 1989 studies together should give a relatively complete picture of the status of the rail in California when they have been analyzed by DFG. There is no active management of habitat for the rail.

The management needs of the rail are as follows: cooperation of federal, State and local agencies in the development of programs to study the species and protect habitat; protection of wetlands through acquisition, easement or other means and management of these wetlands for the rail; periodic surveys (at least every three years) to determine distribution, numbers, quality and extent of habitat at all sites and threats to the sites; classification, if warranted after analysis of the 1988 and 1989 studies is completed, as Endangered or Threatened by the federal government; studies of life history requirements, especially those of nesting habitat and food habits; restoration of degraded wetlands, including establishment of a high marsh component in those marshes; and preparation of a State management plan which would incorporate the elements of protection and restoration of habitat, cooperative programs and surveys and studies.

**The population trend for this species in California is considered to be stable/declining (see Table I), due to loss of coastal salt marshes, inland freshwater marshes and Colorado River marsh habitat.**

*-John Gustafson*

# California clapper rail

*(Rallus longirostris obsoletus)*

CA - Endangered (1971)
FED - Endangered (1970)

General Habitat: • Marshes and Swamps

This coot-sized marsh bird is slightly larger and grayer than the southern California subspecies of the clapper rail. The clapper rails generally are gray-brown above and buffy-cinnamon below. The cheeks are brownish-gray, and the flanks are barred with black and white. The orangish bill is long and slightly downcurved. The California clapper rail eats a variety of invertebrates including mollusks and crustaceans. It is presently a resident of San Francisco Bay and was formerly found at Humboldt Bay (Humboldt County), Morro Bay (San Luis Obispo County) and Elkhorn Slough (Monterey County). This species is a year-round inhabitant of cordgrass (*Spartina foliosa*) marshes at Dumbarton Point, Mowry Slough and Arrowhead Marsh in Alameda County, the Palo Alto Baylands in Santa Clara County, the Faber Tract, Greco Island and Bair Island in San Mateo County, the Corte Madera Marsh Ecological Reserve, Muzzi Marsh and Gallinas Creek in Marin County and may be present year-round in Suisun Bay in Solano County. During the spring breeding season smaller numbers utilize brackish marshes in the Napa Marsh and south San Francisco Bay. Current estimates are for a population of as few as 300 individuals, with over 90 percent of the population in the south San Francisco bay.

Dramatic loss and degradation of its tidal marsh habitat has led to the endangerment of the rail. The rail is threatened today by pollution from sewage effluent, industrial discharges and urban run-off, which are contaminating its food resources. Sewage effluent in the south bay has converted much of its salt marsh habitat into brackish marsh with limited value for this species. Introduced non-native cordgrass (*Spartina* sp.) which could negatively affect the rail's habitat has appeared at a number of salt marshes around the bay. About 1984 the non-native red fox appeared in Alameda County. This exotic predator is probably responsible for recent drastic declines in the rail population in the San Francisco Bay National Wildlife Refuge (NWR), formerly the stronghold for this species. Adverse-impact categories (see Table III) include development; introduced predators and competitors; agriculture; pesticides, poisons, and contaminants; exotic plants; and flood control.

Management activities include protection of habitat, occasional surveys of local populations, evaluation of the affects of red fox predation and sewage effluent, and partial implementation of a federal recovery plan. In September 1990 the FWS issued a major new release from its Portland, Oregon regional office. Asking "Is San Francisco Bay about to be 'derailed'?", the news release correlated the recent rapid decline of the rail in the south bay with the rapid increase in the population of red foxes. The FWS revealed that federal biologists had found the remains of three rails near the entrances of two active fox dens in April 1990.

In March 1991 the FWS released its environmental assessment which evaluated the effects associated with the implementation of a predator management program on the NWR. The assessment proposed to implement a program to reduce the number of selected predators and increase the density and production of endangered species and colonial nesting waterbirds on the NWR. A primary focus of the predator-reduction program is the non-native red fox; a primary beneficiary is the California clapper rail. Following public review of the final environmental assessment, the FWS began a program of predator control.

In September 1991, using Section 6 funds, the DFG contracted with the U.S. Department of Agriculture, Animal Damage Control, to conduct a red-fox- control program on non-federal lands in the San Francisco Bay area. The purpose of the program is to benefit the California clapper rail.

Management needs include a rangewide survey, long-term population studies through banding, investigation of life history and habitat requirements, restoration of tidal salt marshes, examination of the effects of exotic vegetation, and revision of the recovery plan to emphasize the impact of foxes on rails.

**The population trend for this species is known to be declining.**

*John Gustafson*

# Light-footed clapper rail

*(Rallus longirostris levipes)*

CA - Endangered (1971)
FED - Endangered (1970)

General Habitat: • Marshes and Swamps

This is a brown, coot-sized marsh bird with long legs and bill; a short, upturned tail; and barred flanks. Disjunct breeding populations occur in coastal marshlands from Ventura County to San Diego County and also in northern Baja California. These populations inhabit cordgrass-pickleweed (*Spartina* sp - *Salicornia* sp) saltmarsh year-round, feeding primarily on crabs, snails, and other intertidal invertebrates.

The species declined in population in recent decades as its habitat was drained, filled, degraded or came under increased predation pressure. Annual totals of breeding pairs from 1980 to 1983 ranged from 173 to 249, but the population drastically declined from 277 pairs in 1984 to about 140 pairs the following two years. Since 1986, the number of breeding pairs counted annually has increased gradually, reaching 235 pairs in 1991. Breeding pairs have been found at 22 marshes in California at one time or another since 1980. Breeding pairs were found in 18-19 marshes in 1982-84, 11-14 from 1985-88, eight in 1989, nine in 1990 and 11 in 1991. Upper Newport Bay Ecological Reserve has supported between half and three-quarters of the statewide breeding population since 1985. Now representing 20% of the statewide population, the Tijuana Marsh subpopulation has made an astounding recovery after having been nearly extirpated in 1985 because of a temporary cessation of tidal action. Anaheim Bay at Seal Beach is another important rail population center. The other California populations contain fewer than ten pairs.

Statewide, adverse impacts have included filling, dredging and development of wetlands; loss of regular tidal connection with the ocean; sedimentation and the disruption of natural drainage through coastal wetlands because of upstream development or flood control; introduced predators and unnaturally heavy predation by some native predators; and human disturbance. In many wetlands, human-caused changes to marshland topography and vegetation has decreased the amount of suitable nesting habitat and also has made the rails more vulnerable to predation, especially at high tides.

Predation has been a serious problem at several areas. Carpinteria Marsh, the last remaining clapper rail habitat in Santa Barbara County, supported about 10% of the California population in 1984, but this entire subpopulation was eliminated over the next four years, apparently because of intensive predation by a large population of domestic cats and other predators associated with increased development of bordering uplands. Red foxes are abundant in urban areas adjacent to Upper Newport Bay and present a major threat to the that rail stronghold. Coyotes currently hunt in this marshland and effectively exclude the foxes now, but continuing development in surrounding areas threaten the continued survival of coyotes. Nest site enhancement and trapping of exotic red foxes at Anaheim Bay has allowed the Seal Beach National Wildlife Refuge rail population to rebound after having been nearly extirpated by predation; the November 1991 high tide count yielded the highest population of rails since counts began.

The Light-footed Clapper Rail Recovery Plan (1985) guides management and protection activities such as the annual breeding surveys; studies of reproductive biology; enhancement of nesting habitat by creation of nesting substrates, such as floating platforms; control of human disturbance and of predation; and habitat management and protection. A Clapper Rail Recovery Team was formed in 1991 to guide recovery efforts for the two subspecies of Clapper Rail on the Pacific Coast.

Continuing studies are being made to determine whether contaminants are affecting rail reproductive success. Increasing attention is being directed to predator control; identification of causes of local area extirpations or declines; determination of genetic relatedness of remaining populations; and implementation, where feasible, of reintroduction efforts, including development of captive breeding and capture-translocation procedures.

**In the past decade the status of the California population has been stable/declining, as the population size has fluctuated and the number of breeding populations has tended to decline.**

*Ron Jurek*

# Yuma clapper rail

*(Rallus longirostris yumanensis)*

CA - Threatened (1971)
FED - Endangered (1967)

General Habitat: • Marshes and Swamps

This rail is the most slender and pale of the three clapper rail subspecies in California. The clapper rails generally are gray-brown above and buffy-cinnamon below. The cheeks are brownish-gray, and the flanks are barred with black and white. The bill is long

and slightly downcurved. The Yuma clapper rail eats mostly crayfish but also small fishes, isopods, insects, clams and seeds. Although some individuals may move southward into Mexico during the winter, the rail generally is a resident of shallow, freshwater marshes containing dense stands of cattails (*Typha latifolia*) and bulrushes (*Scirpus acutus*) along the lower Colorado River from California and Arizona into Mexico. It is also found at the Salton Sea in Imperial County, California.

The rail is threatened by loss of habitat due to human-caused river flooding, so-called reclamation projects and mosquito abatement activities. Great concern has been expressed about the effects of high water in the river in 1983 on rail reproduction and habitat. The status in Mexico is not known. The status of the rail in Imperial County agricultural drains and the deltas of the New and Alamo rivers is uncertain. Adverse-impact categories (see Table III) include water projects, development, agriculture, exotic plants, and flood control.

Management actions include organization in the 1970's by the FWS of agency personnel into a recovery team; completion of a recovery plan in 1983; periodic surveys of Colorado River marshes; habitat protection at State and Federal wildlife refuges; and a three-year study of rail life history funded by the Bureau of Reclamation.

The latter study was completed in December 1987 and a final report was issued by the Bureau in July 1989. The author's recommendations for research and management for rails include preparation and implementation of management plans on federal and state management areas; creation and management of wetlands; new research on captive birds to clarify nesting biology, vocalizations, design of call counts, and reproductive problems associated with selenium; standardization and continuation of call-counts (annually on standardized routes, riverwide every three years); cooperative efforts with Mexico to preserve habitat in the Colorado River Delta; continued listing of Yuma clapper rails as Endangered until habitat is stabilized and reproductive effects of selenium are clarified; retention of an interagency team to oversee all counts; no net loss in habitat area; and more oversight on projects conducted within or adjacent to marsh habitats. The author also stated that future recovery efforts for Yuma clapper rails should emphasize implementation and evaluation of management recommendations rather than large-scale additional basic research.

Management needs include regular assessment of populations in the U.S. and Mexico, greater protection of existing habitat through protection in Mexico and through control of river flows by the Bureau, removal of exotic vegetation from rail habitat, creation and enhancement of rail habitat on state and federal refuges, and implementation of the other recommendations in the Bureau's 1989 report.

**The population trend for this species is considered to be stable/declining (see Table I) due to loss of marshes along the lower Colorado River and to land-management practices in Imperial County.**

*John Gustafson*

# Greater sandhill crane

*(Grus canadensis tabida)*

CA - Threatened (1983)
FED - None

General Habitat: • Inland Wetlands

Greater sandhill cranes are the largest of the six subspecies of sandhill cranes. Average adult male weight is about 168 ounces, while females average about 135 ounces. Except for the above size differences, sexes are similar. General coloration is pale gray with darker primaries. The birds' cheeks, ear coverts and chin are white, and all but juveniles have bare, reddish foreheads. Fledged young are similar in size to adults but may be distinguished by rust-brown feathers on the nape. Greater sandhill cranes eat a variety of foods but are primarily vegetarians. The diet may include roots, tubers, grain, toads, frogs, eggs, young birds, small mammals and various invertebrates.

Historically, greater sandhill cranes nested in eastern Siskiyou County, northeastern Shasta County and southward to Honey Lake, Lassen County. Intensive surveys conducted under DFG contracts and as independent research in 1971, 1981 and 1988 have delineated the range and estimated current population size in California. Presently, greater sandhill cranes nest in Lassen, Modoc, Plumas, Shasta, Sierra and Siskiyou counties. During 1988 greatest numbers occurred in Modoc County (165 pairs), Lassen County (75 pairs), Siskiyou County (27 pairs) and Plumas County (seven pairs). Shasta and Sierra counties each had a single pair. No surveys have been conducted since 1988.

In California sandhill cranes establish territories in wet meadows that are often interspersed with emergent marsh. California birds tend to nest in rather open habitat; however, in certain areas, they nest in association with a dense cover of bulrush (*Scripus* spp.) and burreed (*Sparganium* spp.). Nests are generally built over water with an average depth of about two inches, but conditions can range from dry land to 13 inches of water. Nesting territories contain moist soil to enable young birds to forage for invertebrates during the first few weeks of life. After the young have fledged, cranes will move to grain fields and other suitable habitats near favorable roost sites.

Favorable roost sites and an abundance of cereal grain crops characterize the greater sandhill cranes' Central Valley wintering ground. Rice is used extensively by cranes near the Butte Sink area of Butte County, and corn is the principal food source at most other Central Valley winter

concentration areas, particularly in the Sacramento-San Joaquin Delta near Lodi, San Joaquin County. Irrigated pastures are chosen for loafing sites throughout the wintering ground. A communal roost site consisting of an open expanse of shallow water is a key feature of wintering habitat. Most concentration areas on wintering grounds are within a few miles of secure roost sites that often can accommodate several thousand cranes (both greater sandhill cranes and the more common subspecies, the lesser sandhill crane, share the wintering ground in central California). Since both greater sandhill cranes and lesser sandhill cranes intermix on the wintering ground in California, it is difficult to accurately estimate populations. The estimate for greaters is between 3,400 and 6,000 individuals. There are about 25,000 lesser sandhill cranes wintering in California each year. Annual population monitoring is conducted on both the breeding and wintering ground in California, with a focus on the threatened greater subspecies. Studies conducted on wintering grounds in California and breeding grounds in Oregon, particularly at Malheur National Wildlife Refuge, indicate the population is not producing enough young to maintain stability. Cranes are very long-lived in the wild (20 + years), and it may be years before the low recruitment rates result in population declines. However, the problems of habitat destruction, disturbances, predation and mower-caused mortality persist on the breeding grounds in California, Oregon and other areas (see Table III). Although federal listing is not imminent, all breeding populations are being closely monitored.

The 1988 study of breeding populations was supported by the tax check-off fund. This fund also supports staff assigned to develop research and management programs involving greater sandhill cranes. The 13,000 + acre Ash Creek Wildlife Area was, in part, purchased to protect breeding habitat for greater sandhill cranes. A 150 acre and a 360 acre parcel in the delta at Woodbridge Ecological Reserve have been purchased to provide secure roost sites for wintering cranes. Acquisition of key habitats and protection of nesting and wintering areas from destruction and disturbance are important facets of efforts to recover this threatened subspecies. An additional challenge remains to ensure that all of the acquired breeding and wintering habitats receive proper management consideration by DFG to secure maximum benefits to greater sandhill cranes. This is especially important where protection of greater sandhill cranes was used as part of the justification for the acquisition. The Department is attempting to develop management strategies sensitive to sandhill cranes and their habitats through research and monitoring efforts to be conducted in the Butte Sink area of the northern Central Valley. However, this species continues to be threatened by agricultural conversion of habitat, predation, human disturbance, various forms of development and land management conflicts on State Wildlife Areas, Federal Refuges, and National Forests (see Table III).

**The population trend of this species is stable/declining.**

*Ron Schlorff*



# California least tern

*(Sterna antillarum browni)*

CA - Endangered (1971)
FED - Endangered (1970)

General Habitat: • Coastal Dunes
• Strand

This is our smallest tern; it is about nine inches long with a 20-inch wingspread. It is mostly white and pale gray; wingtips are black. The head of the adult has a black cap and white forehead and the yellow beak is black-tipped. This migratory bird winters somewhere in Latin America, but the winter range and habitats are unknown. The nesting range is along the Pacific coast from southern Baja California to San Francisco Bay; terns usually arrive in California in April and usually depart in August.

They nest in colonies on bare or sparsely vegetated flat substrates near the coast. The historical nesting habitats of this species have been largely eliminated by development and recreation use. Typical nesting sites are now on isolated or specially protected sand beaches or on natural or man-made open areas in remnant coastal wetlands. These sites are typically near estuaries, bays or harbors where small fish are abundant. Pairs lay usually two eggs in a shallow nest depression they make in the ground.

Formerly nesting in colonies of up to thousands of birds each, the total number of breeders found in California in the mid-1970s was only about 600 pairs. Through protection and site management, they increased from about 800 known pairs in 1978 to 1,000-1,300 pairs during 1983-1990, reaching 1,700 pairs in 1991. About 40 colony sites have been active at one time or other in recent years, but the number of them occupied by breeding pairs has stayed at about 28-29 per year, distributed in the San Francisco Bay area and from San Luis Obispo County to the Mexican border.

Adverse impacts include wetland development, introduced predators, unnaturally heavy predation by native species, human disturbance and off-road vehicles. El Niño ocean conditions may diminish coastal fish food supplies of the terns and reduce breeding

success, such as might have occurred in the mid 80s when a population decline was noted. Spring rains and extreme high tides occasionally flood nest sites. Colonies are subjected to many detrimental factors, such as weed overgrowth, human disturbance and predation, especially where only land fills, dikes, paved areas or other artificial substrates in remnant or degraded wildlife habitats remain for terns to use as nesting areas. Many colonies are continually threatened by human disturbance and by development pressures on nesting and feeding areas. A major continuing threat to the nesting colonies is heavy predation on adults, eggs or chicks by birds of prey, domestic cats, mammalian carnivores and many other species. American kestrels and introduced red foxes have been significant predators at many sites.

The 1980 California Least Tern Recovery Plan stresses the importance of annual breeding population surveys and site management and protection activities. Fencing, trapping, other predator control measures and protection from human disturbances have contributed significantly to improving tern nesting success and increasing population size in many of the existing colonies in recent years. However, there has not been a significant expansion of the breeding range nor increase in the number of colonies. Local coordination, intensive nest-site management, continual colony protection efforts and establishment of new nesting sites are critically needed each year to protect colonies and enhance nesting conditions. However, the Least Tern working team was forced to become inactive in 1991 due to a shortage of staffing.

**Despite increases in the population in recent years, there has been no net change in the number of breeding colonies occupied each year, so during the past decade, population status has been stable.**

*Ron Jurek*

# Marbled murrelet

*(Brachyramphus marmoratus)*

CA - Candidate (1990)
FED - Proposed Threatened (1991)

General Habitat: • North coast conifer forests

The marbled murrelet is a small seabird that ranges along the Pacific coastline from the Aleutian Archipelago in Alaska to central California. It is approximately robin-sized and short and chunky in appearance, with a large head, thick neck, and stubby wings. Winter coloration is dark above and white below, and breeding plumage is black-brown barred above and brown mottled below. The legs are set far back on the body, making the birds very maneuverable in the water but clumsy on land. Flight is fast and direct. Food consists mainly of small fish (such as anchovies) obtained by diving from the surface. When at sea, murrelets generally reside in nearshore areas with rocky and sandy substrate.

Marbled murrelets are the only members of the family Alcidae (which includes auks, murres, and puffins) that nest in trees. During the breeding season they range up to 30 miles inland and occupy old-growth coastal coniferous forests. In California, they nest on large, horizontal, moss-covered limbs situated within virgin coastal conifer forest. They lay a single egg per year in a mossy depression on a large horizontal limb. Each adult pair alternates between brooding and resting activities, flying between the nest tree and the coast, and changing duties once a day, usually in the early morning. After hatching, both adults feed the nestling by carrying small fish inland to the nest. At fledging, the young bird must fly from the tree to the coast where it joins the adults floating on the sea surface. These birds are long-lived. They do not breed until several years old and adults do not necessarily breed every year.

Historically, the marbled murrelet occurred in California from Monterey County to the Oregon border, where it lived and foraged along the nearshore coastline and nested in the old-growth coastal coniferous forests that formed a continuous strip along the western slope of the Coast Range. Presently only about 3.5% of this old-growth nesting habitat remains in California, and the marbled murrelet population has been greatly reduced. Their historical breeding population in California is estimated to have been about 60,000 individuals. Their current breeding population in California is estimated to be 1,650 to 2,000 individuals. The major cause of decline has been the removal and severe fragmentation of old-growth coastal coniferous forests, needed by the species for nesting, by commercial timber harvest over the last 150 years. Studies have shown that murrelets do not nest in second-growth coastal coniferous forests.

The present population of marbled murrelets in California is divided between three remaining isolated areas: 1) northern Santa Cruz and southern San Mateo counties; 2) south central Humboldt County; and 3) northern Humboldt and Del Norte counties to the Oregon border. These areas are isolated from each other enough to limit genetic exchange and make recolonization unlikely should one of the populations be extirpated. The northern-most California population is also isolated from the remaining murrelets to the north, since the next large healthy breeding population is found in the Puget Sound area. The birds in California are breeding in remaining patches of old-growth coastal coniferous forest.

Marbled murrelets are threatened with extinction by numerous factors. Their habitat and range have already undergone and are presently threatened with further destruction, modification, and curtailment. Their remaining essential habitat is threatened by over-utilization for commercial (timber) and recreational (parks) purposes. They are faced with increased predation in parks where corvids (jays and ravens) have flourished. Other natural occurrences (food web collapse) and human-related activities (oil spills and gill-

netting) continue to adversely affect their existence. They may be affected by a newly discovered toxic algae typically eaten by anchovies that has recently resulted in numerous deaths of seabirds along the California coast.

The California Fish and Game Commission received a petition to list the marbled murrelet from Mr. Peter W. C. Paton of the Redwood Region Audubon Society and accepted the petition as complete on June 29, 1990, making the marbled murrelet a state candidate species. The Status Report was completed by the Department in June 1991 and recommended listing the marbled murrelet as endangered. At the August 1, 1991 hearing the Commission voted to list the species as state endangered. The hearing for final adoption of the regulation occurred on December 6, 1991, and the "Final Statement of Purpose for Regulatory Action" was submitted to the Office of Administrative Law on December 31, 1991. It is anticipated that State listing will be finalized early in 1992. In addition, the U.S. Fish and Wildlife Service published a proposed rule to list the marbled murrelet as a federal threatened species in the Federal Register on June 20, 1991. Final Federal action is anticipated in June 1992.

**It is most likely that the marbled murrelet population is continuing to decline, despite management efforts aimed at controlling timber harvest in old-growth coastal coniferous forests.**

*Esther Burkett*

# Western yellow-billed cuckoo

*(Coccyzus americanus occidentalis)*

CA - Endangered (1987)
FED - None

General Habitat: • Riparian Forest

This slender bird is brown with white underparts. In flight its wings show rufous or cinnamon color, and its tail shows black with white spots. The nest typically is on the horizontal branch of a tree willow, in a location hidden from view from the ground or from surrounding trees. Food items brought to the nest include katydids, green caterpillars, tree frogs and grasshoppers. The cuckoo historically was known as a breeder in all regions of California except the central and northern Sierra Nevada, the Great Basin and the Colorado Desert. These regions included the north coast, central coast, south coast, Klamath-Modoc, Sacramento Valley, San Joaquin Valley, southern Sierra Nevada (south fork of the of the Kern River), Mojave Desert and lower Colorado River. In 1977 a survey conducted for the DFG found cuckoos in the following six areas: Sacramento Valley, Kern River, Owens Valley, Amargosa River, Santa Ana River and Lower Colorado River. Using Endangered Species Tax Check-off funds, the DFG contracted for field studies in 1986 and 1987 to determine the Statewide distribution and population size for the cuckoo. Breeding pairs were found only along the Sacramento River in Butte, Glenn and Colusa counties; along the Feather River in Sutter County; on the south fork of the Kern River; and along the Santa Ana, Amargosa and lower Colorado rivers. The cuckoo has nested in walnut and almond orchards in California, but its natural nesting habitat is in deciduous riparian forest and woodland of a cottonwood-tree willow composition.

The major threat to the cuckoo is the loss and degradation of its riparian habitat. The Statewide survey in 1986 and 1987 resulted in an estimate of 31-42 pairs which breed in California. This represents a decline of 66-81 percent from the 122-163 pairs estimated in the previous statewide survey (in 1977). Adverse-impact categories (see Table III) include water projects; development; agriculture; pesticides, poisons and contaminants; livestock grazing; and off-road vehicles.

The cuckoo is not listed in the most recent Federal Register notice of review of vertebrate species dated November 21, 1991. The FWS considers the cuckoo to not have the taxonomic status necessary to meet the federal Endangered Species Act's legal definition of species. Although the western cuckoo is recognized by ornithologists as a subspecies separate from the eastern yellow-billed cuckoo, the FWS, unfortunately, is relying on a 1988 scientific paper by one of its own employees who made a determination, based entirely on museum specimens, that there were no subspecies of the yellow-billed cuckoo. Based on this study, which ignored information on ecological and vocalization differences between the western and eastern forms, the FWS has concluded that the western cuckoo does not deserve the protection of the Act. The DFG believes, based on our knowledge of its status in California, Arizona, and the Pacific Northwest, that the western subspecies deserves a federal classification of Endangered.

The first DFG five-year status report for the cuckoo was written in 1987. In the report, DFG recommended to the FGC that the Threatened classification be changed to Endangered. The FGC subsequently made the change in 1987. As follow-up studies to the Statewide survey in 1986 and 1987, the DFG has used Endangered Species Tax Check-off funds to determine the annual status of the cuckoo on the south fork Kern River and the Sacramento River in 1988 and 1989. In a cooperative project with TNC, DFG has been provid-

ing Endangered Species Tax Check-off funds for several years (including the 1989 project) to restore riparian woodland for the cuckoo at TNC's Kern River Preserve. Several State wildlife areas and other State-owned properties protect habitat of the cuckoo, and several recently-acquired properties possess great potential for revegetation of riparian forests. One example of the latter is the Schohr Ranch in Butte County, purchased in 1988-89, which will be established as the Upper Butte Sink Wildlife Area.

The management needs for the cuckoo are as follows: preparation of a management plan for the new Upper Butte Sink Wildlife Area, which designates sites for restoration of riparian forests, before any habitat manipulation occurs; protection of riparian forests and woodland through acquisition, easement and mitigation, and management of these areas for the cuckoo; cooperation of State and federal water management agencies in minimizing impacts to existing habitat and in developing programs to restore habitat; restoration of habitat through planting, control of exotic vegetation and elimination of grazing; elimination of the application of pesticides within or adjacent to riparian areas; classification of the cuckoo as Endangered by the federal government; continued research on breeding biology and other life history requirements; preparation of a State management plan which would incorporate the elements of protection and restoration of habitat, cooperative programs, surveys and studies; and periodic surveys (at least every three years) to determine Statewide distribution and numbers.

**The population trend is considered to be stable/declining, due to loss of riparian habitat in the Central Valley, southern California and along the Colorado River.**

*John Gustafson*

## Elf owl

*(Micranthene whitneyi)*

CA - Endangered (1980)
FED - None

General Habitat: • Riparian Forest

The elf owl is the smallest owl in North America, measuring five to five and a half inches long. Plumage is spotted with buff and white on a gray or brown base. The breast is white with rust or brown streaks. The top of the head has some rust color, the white "eyebrows" are obvious and it has a short tail and yellow eyes. This species is migratory and only spends the breeding season in California. It arrives in March and probably leaves by October. Records of the seasonal occurrence of elf owls in California are from March 18 to early August with almost 70 percent occurring during April and May, the height of the breeding season when males are very territorial. The diet of the elf owl consists almost entirely of large insects, centipedes and scorpions. Small birds and amphibians are taken occasionally. Hunting from a low perch, they use their superb hearing to locate prey and capture most victims in their talons while on-the-wing. In California the elf owl is limited to the cottonwood (*Populus fremontii*) - willow (*Salix* sp.) and mesquite riparian zone along the lower Colorado River. Here, the owl nests in deserted woodpecker holes which, when occurring in larger trees with thick walls next to the cavity, offer insulation from the high daytime temperatures. The nest hole is selected by the male who also assists in the incubation of two to five eggs. Incubation takes 14 days, and young are ready to leave the nest by late June or early July. Elf owls have probably never been common in the State, and siting reports of more than one individual or a pair are uncommon. Current population estimates are extremely low -- only about 25 pairs. A 1987 survey encompassing the majority of the potential habitat in the lower Colorado River Valley documented between 17 and 24 owls at ten sites.

Population declines have resulted from the conversion of riparian woodland to agriculture and from river channelization and flooding. Reintroduction efforts on the river have shown little success because of the lack of available habitat to support this species. Management needs include: protecting remaining riparian habitat; eradication of exotic trees and restoration of native riparian species; annual monitoring of nesting sites; and working with the Bureau of Reclamation and other land managers toward large-scale restoration of native habitat. Current coordinated planning efforts aimed at re-establishing cottonwood-willow forests along portions of the lower Colorado River will hopefully provide future habitat for this endangered bird.

**The current population trend of this species is unknown.**

*Gordon Gould*

## Great gray owl

*(Strix nebulosa)*

CA - Endangered (1980)
FED - None

General Habitat: • Upper Montane Conifer Forest

The great gray owl is the longest and has the largest wingspan (five feet) of any species of owl in North America, although it doesn't weigh quite as much as great horned or snowy owls. In addition to a long tail and wings, great gray owls have a large head with a large, circular facial disc. Plumage is thick, which provides insulation for winter living at high elevations and in northern latitudes. The gray and gray-brown feathers are streaked with light and darker grays. There is some barring on the feathers of the belly. This owl exhibits no regular seasonal migration. However, food scarcity or availability causes post-breeding season movement upslope and downslope movement in the winter.

Owl pairs probably return to the same nesting area each year if nesting is attempted. This is determined by the quantity of prey, usually microtine rodents and pocket gophers, that are available early in the year. Nests are usually placed in the broken tops of large conifer trees where the soft heart of the tree is hollowed out with harder wood forming a rim. Nests are often 35 feet or more from the ground. Up to five eggs may be laid, although two or three are usual. Incubation by the female lasts about 30 days, and nestlings remain in the nest about three weeks. The flightless young remain in the vicinity of the nest for another three to five weeks. Fledglings stay in the nesting territory for several more months until they can fend for themselves.

There is no historic information on the abundance of the great gray owl in California. One can suppose that it was more numerous in the past because of the broader distribution of historic sighting and specimen records. This would indicate a larger historic population than currently exists. It is known that they were found in over 15 counties throughout the Sierra Nevada and north coast. Only ten different pairs of breeding great gray owls have been documented in California in recent years, all in the vicinity of Yosemite National Park and adjacent national forests. The current statewide population estimate is approximately 60 individuals.

The preferred habitat of great gray owls during the breeding season is, on the lower margin, Sierra Nevada mixed conifer. On the upper margin, they are found in the red fir forest. Except for birds dispersing, nearly all great gray owls are found in or near meadows. It is not known what ecological parameters are necessary for owls to choose a particular meadow as a foraging area. However, a number of characteristics appear to be important including the quality of forest around the meadow. Important meadow characteristics also include meadow size, height of grass, the presence or absence of grazing and the portion of the meadow covered by non-grass/forb vegetation. Important characteristics of the forest surrounding the meadow include a high canopy closure and a high density of snags per acre greater than 24 inches diameter at breast height (DBH). Nesting requires large diameter snags in a forest with high canopy closure to provide a cooler sub-canopy microclimate.

The primary cause for the decline of the great gray owl is habitat loss. The mixed conifer and red fir forest zones that the species depends on have also been the most important timber production zones in the Sierra Nevada. Over 100 years of logging activity has substantially reduced the quantity of mature forests available to owls. In addition, montane meadow habitats have a long history of overgrazing which has resulted in lower prey densities in these critical feeding environments. Currently a master's thesis project at the University of California, Davis, is assessing the potential of human disturbance on great gray owls in Yosemite National Park. This assessment involves studying the species' annual movement patterns, its daily activity cycle, the impact of increased human activity on the owl's prey base and its reproductive success, and if human noises are detrimental to the owl's ability to hunt. Results of this study will hopefully be available in 1992. While the study is developing information on NPS lands, the information also could serve as a guide for management procedures on National Forest lands. As a result of the recent studies and recommendations, artificial nest sites have been constructed on the Groveland Ranger District, Stanislaus National Forest. A single artificial nest site, different each year, was used by great gray owls in this area in 1985 and 1987. This area burned heavily in 1987 and it is not known whether owls have nested here since, although they have been heard. This management strategy may be used as the first step in providing augmented habitat for nesting on lands which have a history of logging. In addition to the information being gathered in the NPS study and the eventual implementation of management guidelines derived from that study, the next most important action is to continue to survey potential habitat and to follow up on unconfirmed sightings. These efforts will guide future management and, in the interim, can provide some protection to currently occupied breeding habitat.

**The current population status of this species is unknown.**

*Gordon Gould*

## Gila woodpecker

*(Melanerpes uropygialis)*

CA - Endangered (1987)
FED - None

General Habitat:
- Riparian Forest
- Shade Trees

This large woodpecker has a grayish-brown head, neck and underparts, and has a back which is narrowly barred with black and white. In flight the bird has a conspicuous white patch in the wing at the base of the primaries, and conspicuous black and white barring on the central tail feathers. The male has a red crown patch which is visible only at a short distance. Food items include insects, mistletoe berries, cactus pulp, bird eggs, corn in fields and peaches and pears from fruit trees. This woodpecker is a primary cavity nester. It is a permanent resident of mature cottonwood (*Populus fremontii*) - willow (*Salix gooddingii*)

iparian forest and mesquite (*Prosopis glandulosa*) riparian woodland. The bird was formerly found along the entire California portion of the lower Colorado River and adjacent Arizona in the extensive riparian forests and also was in the cottonwood groves of the Imperial Valley south of the Salton Sea. Now the Gila woodpecker is found only at scattered locations along the California side of the river between Needles and Yuma.

The species is threatened by habitat loss and degradation and by competition with the exotic European starling (*Sturnus vulgaris*) for nest cavities. Along the Colorado River the latest population estimates were about 200 individuals in 1984 with relatively few successful breeding pairs (only 27 individuals were observed). Adverse-impact categories (see Table III) include water projects, development, introduced predators and competitors, agriculture, livestock grazing, exotic plants, flood control, and off-road vehicles.

No current surveys or habitat management efforts are planned due to lack of funds. This woodpecker may eventually benefit from riparian forest revegetation efforts along the Colorado River, but the benefit will be delayed since these birds are dependent on large-diameter, mature softwood trees for their nesting activities. It will take many years for any revegetation efforts to mature sufficiently to provide improved habitat.

The management needs for the woodpecker are as follows: protection of existing riparian woodland along the lower Colorado River through acquisition, cooperative agreement or conservation easement and through control of river flows; protection of former forested areas as sites for reforestation; extensive reforestation on public and other lands; removal of exotic salt cedars (*Tamarix* sp.) from riparian areas; annual surveys to determine distribution, numbers, quality and extent of habitat at each site and threats to the site; and preparation of a State management plan which would include the elements of protection of existing and potential riparian areas, reforestation, removal of exotic vegetation and field surveys.

**The current population trend is considered to be unknown, but the population has declined over time due to continuing loss of cottonwood-willow and mesquite habitats and the extirpation of saguaros from the lower Colorado River valley, coupled with continued competition with starlings for nesting cavities.**

*John Gustafson*

# Gilded northern flicker

*(Colaptes auratus chrysoides)*

CA - Endangered (1987)
FED - None

General Habitat: • Riparian Forest

This woodpecker has a brown-barred back, white rump, yellow wing- and tail-linings, brown crown, gray cheeks and throat and spotted underparts with a black crescent bib. The male has a red whisker stripe. The bird eats ants, other insects, wild fruits and berries. It is a primary cavity nester in mature cottonwood (*Populus fremontii*) - willow (*Salix gooddingii*) riparian forests along the lower Colorado River. Formerly, the flicker inhabited a saguaro (*Cereus giganteus*) belt near Laguna Dam (the old, low dam above Yuma) in Imperial County, extensive cottonwood-willow habitat along the entire length of the river in California and adjacent Arizona, and Joshua tree (*Yucca brevifolia*) woodland at Cima Dome in San Bernardino County. Now the bird is found only at several sites on the California side of the Colorado River north of Blythe in Riverside County.

The flicker is threatened by habitat destruction and degradation. Along the Colorado River the latest population estimates were less than 40 individuals in 1984, but in 1986 no birds were observed. In the Joshua tree woodland of Cima Dome, the last (1978) population estimate was only one to two pairs. Adverse-impact categories include water projects, development, agriculture, livestock grazing, exotic plants, flood control and off-road vehicles.

No current surveys or habitat management efforts are planned due to lack of funds. The flicker may eventually benefit from riparian forest revegetation efforts along the Colorado River, but the benefit will be delayed since these birds are dependent on large-diameter, mature softwood trees or mature saguaros for their nesting activities. It will take many years for any revegetation efforts to mature sufficiently to provide improved habitat.

The management needs for this flicker are as follows: protection of existing riparian woodland along the lower Colorado River through acquisition, cooperative agreement or conservation easement and through control of river flows; protection of former forested areas as sites for reforestation; extensive reforestation on public and other lands; removal of exotic salt cedars (*Tamarix* sp.) from riparian areas; annual surveys to determine distribution, numbers, quality and extent of habitat at each site and threats to the site; and preparation of a State management plan which would include the elements of protection of existing and potential riparian areas, reforestation, removal of exotic vegetation and field surveys.

**The current population trend is considered to be unknown, but the population has declined due to continuing loss of riparian forest habitat and the extirpation of saguaros from the lower Colorado River valley.**

*John Gustafson*

# Willow flycatcher

*(Empidonax traillii)*

CA - Endangered (1990)
FED - Candidate 1 (1991)

General Habitat: • Riparian Scrub

The willow flycatcher was formerly a common summer resident throughout California. Its breeding range extended wherever extensive willow thickets occurred. The species has now been eliminated as a breeding bird from most of its former range in California. Only five populations of significance remain in isolated meadows of the Sierra Nevada and along the Kern, Santa Margarita, San Luis Rey and Santa Ynez rivers in southern California. The smallest of these consists of about six pairs and the largest about 44 pairs. The total population estimate for California is about 200 pairs of willow flycatchers.

The loss of riparian habitat is the principal reason for the decline of California's willow flycatcher population and contraction of the species range (see Table III). Impacts to habitat and breeding birds associated with livestock grazing have also been implicated in the decline of the species (see Table III). Nest parasitism by brown-headed cowbirds (*Molothrus ater*) may have contributed significantly to population reductions (see Table III).

More than a decade ago the California Department of Fish and Game designated the willow flycatcher a "Bird Species of Special Concern" of highest priority. This finding prompted several years of Department studies to further assess the status of willow flycatchers in California. Reports from the Pacific Coast and Southwest resulted in addition of the willow flycatcher to the National Audubon Society's Blue List of declined bird species in 1980 and 1986. In 1984 the willow flycatcher was added to the U.S. Forest Service, Region 5, (mostly comprised of the State of California) Sensitive Species list. The U.S. Fish and Wildlife Service has also designated the willow flycatcher as a sensitive species for Region 1 (Washington, Idaho, Oregon, California and Nevada) based on significant declines in this region. The Southwestern willow flycatcher (*E. t. extimus*), with small populations in southern California, is a U.S. Fish and Wildlife Service candidate species.

A survey of remaining willow riparian and montane meadow habitat should be conducted to determine their extent within the historic range of the willow flycatcher. Periodic breeding population surveys should continue to be conducted in all remaining willow riparian and montane meadow habitats throughout the range of the willow flycatcher to determine the number of nesting territories and locations of isolated population fragments. A survey conducted in late summer 1991 on Department-owned willow riparian habitat at Red Lake, Alpine County indicated a significant breeding population exists there. Further study is planned in 1992. A population viability analysis of the willow flycatcher should be conducted. The Department, in cooperation with other agencies and scientists, should evaluate the feasibility of intensive management including the transfer of eggs and/or young between isolated populations to expand the breeding range and size of populations and to facilitate gene flow.

**The species is declining in California.**

*Ron Schlorff*

# Bank swallow

*(Riparia riparia)*

CA - Threatened (1989)
FED - None

General Habitat: • River Banks

The bank swallow is the smallest North American swallow, with a body length of about four and three quarter inches. Bank swallows are distinguished from other swallows by their distinct brown breast band contrasting with white underparts. The upper parts are brown. The species creates nests by burrowing into vertical banks consisting of fine-texture soils. Bank swallows that breed in California during April to August spend the winter months in South America. Bank swallows are now locally common only in restricted portions of California where sandy, vertical bluffs or riverbanks are available for the birds to dig their burrows and nest in colonies. Most of California's remaining population of bank swallows nests along the upper Sacramento River where the stream still meanders in a mostly natural state. In this alluvial plain, the river system provides suitable soil types and erosion needed for prime nesting habitat. It is estimated that the range of bank swallows in California has been reduced by 50 percent since 1900.

During a survey conducted in 1987, a total of 111 colonies were located statewide. Seventy-five percent of the State's population is concentrated on the banks of Central Valley streams, including about 50 to 60 colonies on the Sacramento River. Bank swallows have been extirpated from southern California where they used to occur, principally on the coast. Remaining scattered populations exist in portions of northern, north coastal, central coastal and Inyo-Mono regions of the State. Bank swallows were eliminated from

southern California because virtually every river and natural waterway was converted to flood control channels. Former coastal colonies have been abandoned due to increased human disturbance.

Sacramento River populations still persist in colonies that may support several hundred pairs of swallows. However, the activities of the U.S. Army Corps of Engineers and the State Reclamation Board are in conflict with bank swallow habitat in the last breeding stronghold in California. There have been documented losses of colony sites on the Sacramento River since 1975 due to riprap installation to provide bank stabilization and flood control. The riprapping of natural stream bank associated with bank protection projects is the single most serious threat to the long-term survival of the bank swallow in California (see Table III). It is projected that as much as 50 percent of the remaining population of bank swallows could be lost if all bank protection projects currently proposed are completed (Phase one is already completed, Phase two started in 1974 and is scheduled for completion in 1996, and Phase three is scheduled for 1996-2006). Existing active colony sites and areas of potential habitat are expected to be lost over the next few years. Riprap installed under the Sacramento River Bank Protection Project has affected almost 133 miles of Sacramento River bank since 1960. Additional riprap proposed under this project will result in loss of eroding bank habitat that ranges from 50-75 percent for a given reach of the river. There have been several recent documented losses of active bank swallow colonies due to riprapping. In 1980 a 2,000 burrow colony was riprapped just below the Red Bluff diversion dam. In 1985 three large colonies near Chico and Butte City were destroyed during the height of the breeding season resulting in total loss of the reproductive effort. Several thousand eggs and young were involved. In 1986-87 an additional five colonies, including some of the largest in the State, were lost to riprap. Most recently, in 1988, an extremely large and vital colony was replaced by more than a mile of riprap near Golden State Island on the upper Sacramento River. Recent survey information indicates a continuing decline in Bank Swallow populations on the Sacramento River. Based on an average occupancy rate of about 45 percent of all burrows dug into river banks, an estimated population of 12,348 pairs of Bank Swallows nested in Sacramento River habitats in 1986. Since then the breeding population has declined to about 7,525 pairs in 1991. Factors responsible for the decline are not completely understood but the drought may have had a major influence along with the loss of several major breeding colonies in the past five years. Continued decline in 1992 may necessitate action to reclassify the species as endangered. In addition to these losses on the Sacramento River, colonies in northern California and the Inyo-Mono region are threatened by actions of governmental agencies, corporations and private landowners. Eroding river bank, the critical breeding habitat for bank swallows, is currently unprotected throughout the species' range.

Some efforts have been undertaken to develop mitigation techniques for bank swallow habitat loss. These include improvement of natural habitat and construction of artificial banks near riprap installations. Although some success has occurred at these sites, no long-term solution may be possible with these techniques due to a variety of inherent problems including lack of private landowner cooperation and long-term maintenance costs. A FWS evaluation study concluded that artificial and enhanced habitat would not be suitable mitigation for Bank Swallows in almost every case. Only a system of habitat preserves that would be secure from riprap installations in the future will guarantee the long-term survival of the bank swallow on the Sacramento River.

Since the great majority of bank swallows exist on the Sacramento River, this population must become the focus for management. Without a means to secure a portion of this population, the chances for the survival of the bank swallow in California are extremely poor.

Endangered Species Tax Check-off funds have been used to support bank swallow research on the Sacramento River and in the remainder of California in 1986-87. These funds also support one position involved in bank swallow research and recovery planning. Cooperation between DFG, FWS and State Board of Reclamation has resulted in surveys, experimental mitigation techniques and long-term planning efforts to preserve some bank swallow habitat in the face of an active riprapping program proposed for many miles of Sacramento River banks. A draft recovery plan has been prepared and is currently undergoing review (due to be completed in 1992). A recovery planning team has also been constituted and has periodic meetings to discuss bank swallow research and management issues.

**The population is declining throughout its range in the State.**

*Ron Schlorff*

# Arizona Bell's vireo

*(Vireo bellii arizonae)*

CA - Endangered (1987)
FED - None

General Habitat: • Riparian Scrub

This small bird is drab gray above and whitish below, with sides and flanks faintly washed with grayish olive-yellow, indistinct white spectacles and faint wing bars with the lower bar being more prominent. The vireo is almost entirely insectivorous. It is a summer resident in the willow (*Salix* sp.) - mesquite (*Prosopis glandulosa*) thickets along the Colorado River. The bird was formerly found along the entire California portion of the lower Colorado River and adjacent Arizona. Now it is found at only a few sites on the California side of the river near Needles (San Bernardino County) and Laguna Dam (Imperial County).

The vireo is threatened by habitat destruction and degradation and by nest parasitism by the brown-headed cowbird (*Molothrus ater*). Along the lower Colorado River the latest population estimates were about 35 singing males in 1981, but in 1986 only four singing males were observed. Adverse-impact categories (see Table III) include water projects, development, introduced predators and competitors, agriculture, livestock grazing, exotic plants, flood control and off-road vehicles.

No current surveys or habitat management efforts are planned due to lack of funds. The vireo may eventually benefit from riparian forest revegetation efforts along the lower Colorado River, particularly those involving establishment of willow and mesquite thickets along the river banks. It will take several years for any revegetation efforts to mature sufficiently to provide improved habitat. In the most recent Federal Register notice of review of vertibrate species, this species was dropped from a 3C rating.

The management needs for the vireo are as follows: protection of existing riparian woodland along the lower Colorado River through acquisition, cooperative agreement or conservation easement and through control of river flows; protection of former forested areas as sites for reforestation; extensive reforestation on public and other lands; removal of exotic salt cedars (*Tamarix* sp.) from riparian areas; annual surveys to determine distribution, numbers, quality and extent of habitat at each site and threats to the site; control of brown-headed cowbirds by removal from vireo habitat; and preparation of a State management plan which would include the elements of protection of existing and potential riparian areas, reforestation, removal of exotic vegetation, cowbird control and field surveys.

**The current population trend is considered to be unknown, but the population has declined due to continuing loss of willow and mesquite riparian habitat along the lower Colorado River, coupled with continued nest parasitism by brown-headed cowbirds.**

*John Gustafson*

# Least Bell's vireo

*(Vireo bellii pusillus)*

CA - Endangered (1980)
FED - Endangered (1986)

General Habitat: ● Riparian Scrub

This small bird is drab-gray above and whitish below, with sides faintly washed with grayish olive-yellow, and has indistinct white spectacles and faint wing bars with the lower bar being more prominent. The vireo is insectivorous. It is a summer resident of the following riparian habitats: willow (*Salix* sp.) - cottonwood (*Populus fremontii*) forest, oak (usually *Quercus agrifolia*) woodland, shrubby thickets (often composed solely of willow species, usually narrowleaf willow -*S. exigua* or black willow - *S. gooddingii*) and dry washes (with willow thickets at the edges to provide vireo foraging habitat and nest sites). The willow-cottonwood habitat is the more commonly used habitat by the vireo. The bird was formerly known as a breeder from interior northern California near Red Bluff (Tehama County) south through the Sacramento and San Joaquin valleys and Sierra Nevada foothills, and in the coast ranges from Santa Clara County south to the approximate vicinity of San Fernando in Baja California. Populations also were found in the Owens Valley, Death Valley and at scattered oases and canyons throughout the Mojave Desert. Now its known breeding range is restricted to two intermittent localities in the Salinas River Valley (Monterey and San Benito counties), one locality along the Amargosa River (Inyo County) and numerous small populations from southern California (primarily Santa Barbara, Riverside, Ventura and San Diego counties) into northwest Baja California.

The vireo is threatened by habitat loss and degradation and by nest parasitism by the brown-headed cowbird (*Molothrus ater*). The population seems to fluctuate around 300 pairs but should not be considered stable. Nest parasitism by brown-headed cowbirds continues to be a problem, but is under control in some vireo nesting areas due to intensive cowbird control programs. Adverse- impact categories (see Table III) include water projects, development, introduced predators and competitors, agriculture, livestock grazing, human disturbance, exotic plants, flood control and off-road vehicles.

Management activities include establishment, in the 1980's, by the FWS of a working group comprised of State, federal, local and private biologists to develop standard census methods, encourage research and make timely recommendations on ways to avoid impacts to vireo habitat in development projects; establishment (in 1985) by the San Diego Association of Governments (SANDAG) of a multi-agency task force to develop a comprehensive species management plan (CSMP) for the vireo; development of a draft recovery plan; and annual cowbird control. As part of the CSMP process, the preparation of four separate HCPs was begun for riparian areas on the Santa Ana, San Luis Rey, San Diego and Sweetwater rivers. The DFG participated in the process by serving on four advisory committees and on the task force itself. Unfortunately, in 1990 a group of landowners along the San Luis Rey River, who were concerned that conservation

planning for the vireo would interfere with the ability to develop their properties, scuttled the San Luis Rey effort by convincing SANDAG to stop the preparation of this particular HCP. Local government did not move to prevent this action. The Santa Ana HCP was not completed, but rather was converted to a set of policy guidelines for future development projects along the river. The reason for noncompletion was that there were no pending projects which would be subject to the HCP. The completed HCPs for the San Diego and Sweetwater rivers will be used by SANDAG as part of a late 1991 application to the FWS for a permit to take vireos incidental to otherwise lawful activities.

Management needs include an expanded, efficient cowbird removal program; protection and restoration of riparian habitat; annual surveys to determine distribution, numbers, quality and extent of habitat at each site and threats to the site; acceptance and implementation of each HCP by the appropriate local governments; designation of Critical Habitat by the FWS; and completion of the recovery plan.

**The population trend is considered to be stable/declining.**

*John Gustafson*

## Inyo brown towhee

*(Pipilo fuscus eremophilus)*

CA - Endangered (1980)
FED - Threatened (1987)

General Habitat: • Willows at Seeps and Springs

The towhee is a dull gray-brown bird with a moderately long, dark tail. It is distinguished from other brown towhees by having a smaller bill, shorter toes and tarsi and paler coloration. It eats insects and seeds. The bird is a completely isolated subspecies of the brown towhee (now called the California Towhee, *P. crissalis*, by the American Ornithologists' Union) in the southern Argus Mountains of Inyo County. There is no information on whether the geographic range was greater in the Argus Mountains or the Mojave Desert than at present. The northern Argus Mountains may once have had a brown towhee population, but mining activities and burros may have caused the elimination of the bird. The towhee is restricted to the proximity of dense riparian vegetation. It forages and nests in this vegetation but also forages on the desert hillsides adjacent to the riparian areas.

The only known threat to the towhee is the destruction or degradation of its habitat. It is estimated that the population contains fewer than 150 birds. Adverse-impact categories (see Table III) include water projects, development, introduced predators and competitors, flood control and off-road vehicles. There is no management activity specifically for the towhee, although the bird probably has benefited from the removal of burros from China Lake Naval Weapons Center.

The towhee was listed as a federal Threatened species in 1987 and Critical Habitat was designated by the FWS at that time. The first DFG five-year status report for the towhee was written in 1987. In the report the DFG recommended to the FGC that the Endangered classification for the towhee be retained.

The management needs for the towhee are as follows: protection of riparian vegetation, related springs and adjacent hillsides by federal agencies; elimination of burros from the southern Argus Mountains; preparation of a recovery plan which would incorporate the elements of restoration and protection of habitat, surveys and studies, and elimination of burros from riparian areas; continued research on breeding biology, habitat requirements, other life history requirements and distribution; annual surveys to determine towhee numbers and distribution; and designation of additional Critical Habitat.

**The population trend is considered to be unknown, but the population has declined over time.**

*John Gustafson*

## Belding's savannah sparrow

*(Passerculus sandwichensis beldingi)*

CA - Endangered (1974)
FED - Candidate 2 (1985)

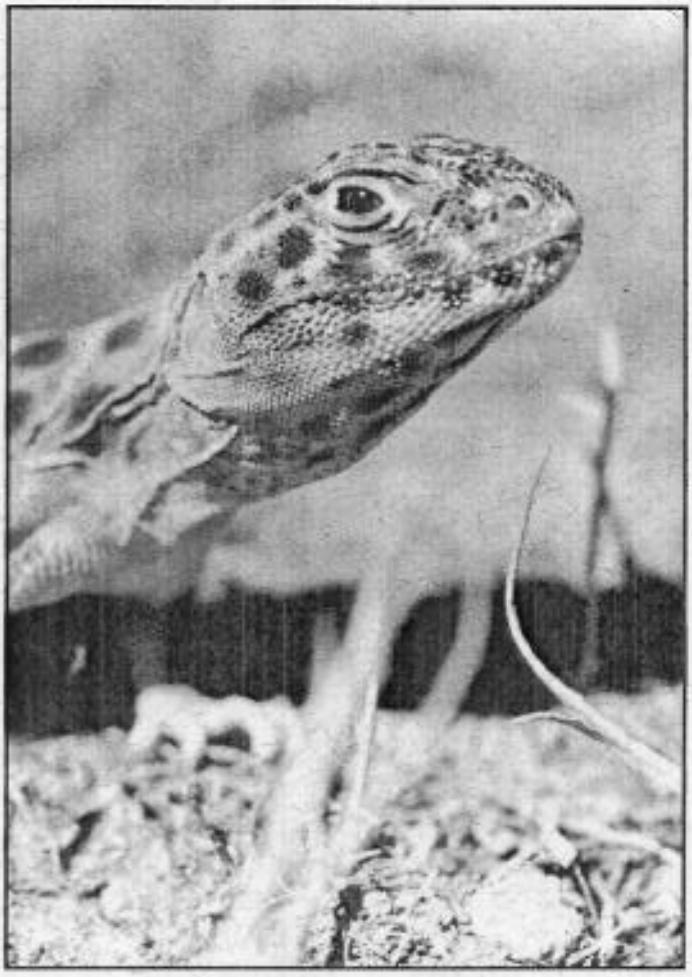
General Habitat: • Marshes and Swamps

This bird is five and a half inches long and is similar to other subspecies of savannah sparrows but is darker and is heavily streaked on the back, breast and sides. It resides year-round in coastal salt marshes from Goleta Slough, Santa Barbara County, south to northern Baja California. Nesting occurs primarily in pickleweed (*Salicornia*) habitat at the higher levels of the salt marshes, above the reach of the highest spring tide.

Since 1973, four statewide surveys have been made in California and breeding pairs have been recorded in 30 nesting areas. The 1973 count was not as thorough as later surveys. The 1977 population in California was estimated at 1,610 pairs at 28 sites, compared with an estimated 2,274 pairs at 27 sites in 1986. A minimum of 1,844 pairs were counted at 27 marshes in 1991, but this total might have exceeded 2,000 had a large concentration of birds in a portion of Mugu Lagoon not gone unsurveyed. The largest populations (in declining order) occurred at Mugu Lagoon, Tijuana Marsh, Upper Newport Bay, Sweetwater Marsh, Anaheim Bay, Santa Margarita River Estuary, Bolsa Chica Wetlands and Penasquitos Lagoon.

# REPTILES





Blunt-nosed leopard lizard - photo by Dave Dick

# Desert Tortoise

*(Gopherus agassizii)*

CA - Threatened (1989)
FED - Threatened (1990)

General Habitat: • Many Desert Habitats

The desert tortoise is a medium-sized tortoise with an adult carapace length of about 8 to 14 inches. Males average larger than females and are distinguished by having a concave plastron, longer gular horns, larger chin glands on each side of the lower jaw and a longer tail. Carapace color varies from light-yellow brown (horn color) to dark grey-brown. A composite of characteristics often is necessary to distinguish the desert tortoise from the other species of gopher tortoises, but its most unique feature is its very large hind feet. It ranges from southern Nevada and extreme southwestern Utah south through southeastern California and southwestern Arizona into northern Mexico. In California, desert tortoises occur in northeastern Los Angeles, eastern Kern and southeastern Inyo counties, and over most of San Bernardino, Riverside and Imperial counties. The desert tortoise inhabits washes, rocky hillsides and flat desert having sandy or gravelly soil. Creosote bush, burrobush, saltbush, Joshua tree, Mojave yucca and cacti are often present in the habitat along with other shrubs, grasses and wildflowers.

The desert tortoise's habitat in California has been reduced 50 to 60 percent since the 1920's and is now highly fragmented and has been degraded by a combination of human- related activities including livestock grazing, energy and mineral development, off-highway vehicle (OHV) use, vandalism (illegal shooting), road and trail construction, and collecting. More recently, the desert tortoise has suffered severe population losses due to disease and predation by ravens. The disease, called Upper Respiratory Tract Disease (URTD) has infected 50 percent of the tortoises in the vicinity of the Desert Tortoise Natural Area (DTNA -- designated a research area by BLM and fenced to exclude grazing and ORVs) in the western Mojave Desert. Populations in study plots there have declined up to 70 percent. The DFG, USFWS, and BLM are coordinating efforts to find a cure and treatment for URTD. Veterinarians from the DFG, U.C. Davis, the University of Florida, and private practice are involved in the effort. Other tortoise diseases are showing up in other parts of the desert in southern California. The disease outbreaks are believed to be due, at least in part, to stresses related to the lengthy drought we are experiencing. Predation by ravens has caused serious reductions in the recruitment of young tortoises into the adult population. In the Mojave Desert, raven populations are increasing at a rate of nearly 15 percent per year.

DFG, working with the Desert Tortoise Preserve Committee and TNC, has recently acquired several blocks of tortoise habitat within the DTNA and have established the West Mojave Ecological Reserve and Fremont Valley Ecological Reserve in tortoise habitat outside the DTNA. A portion of these lands was acquired with Tax Check-off funds. Tax Check-Off funds have also been used to investigate the disease and raven problems. Also, the DPR has provided OHV Green Sticker funds to the DFG to help with the raven problem and a public education program.

**The desert tortoise population is declining.**

*John Brode*

# Barefoot banded gecko

*(Coleonyx switaki)*

CA - Threatened (1980)
FED - Candidate 2 (1985)

General Habitat: • Rocky Desert Foothills

The barefoot banded gecko is a medium-sized (53 to 84 mm) lizard with soft skin and fine, granular scales. Its large eyes with vertical pupils and grey-brown body with various black and white spots and bands give it a striking appearance. This species is known only from five localities in eastern San Diego County and western Imperial County. These limited distribution records indicate that the gecko inhabits rocky, boulder-strewn desert foothills, where it spends most of its life deep in rock crevices and subterranean chambers.

The rarity of this species makes it vulnerable to illegal collection by reptile hobbyists and commercial collectors. Anza-Borrego Desert State Park affords protection for some gecko habitat, and the DFG is involved with a Habitat Management Plan for BLM land on which the gecko occurs. DFG biologists hope to fund a study to develop a suitable monitoring technique when funds become available.

**The population status of this gecko is unknown, as no monitoring technique has been developed yet .**

*Betsy Bolster*

# Coachella Valley fringe-toed lizard

*(Uma inornata)*

CA - Endangered (1980)
FED - Threatened (1980)

General Habitat: • Desert Dunes

The Coachella Valley fringe-toed lizard is medium-sized (70 to 120 mm), and has a flattened body with very fine scales. Its dorsal ground color and spotting patterns provide excellent camouflage. Its countersunk lower jaw, well-developed ear flaps, and toes fringed with long, pointed scales are all adaptations to the sandy habitat in which this lizard occurs. This species is restricted to areas of fine, windblown sand deposits in the sandy plains, sand hummocks and mesquite dunes of the Coachella Valley, Riverside County.

Approximately 75 percent of this species' habitat has been lost to human activities such as agriculture and construction of golf courses, subdivisions, condominiums and shopping centers. A recovery plan was approved in 1983. Three reserves have been established in the Coachella Valley to set aside approximately 783 acres of remaining lizard habitat (five percent of the lizard's historical habitat) and blowsand sources. Five years of studies, sponsored in part by Tax Check-Off funds, obtained biological information critical to the management and preservation of the lizard. The impact of continuing drought conditions on survivorship, reproduction, and recruitment, however, is unknown. Recent research found wind-induced changes in the sandy habitat at two of the reserves that may be detrimental to the long-term survival of this species. The researcher plans to continue monitoring habitat condition and population biology on his own time.

**The population trend of this lizard is stable to declining.**

*Betsy Bolster*

## Blunt-nosed leopard lizard

*(Gambelia silus)*

CA - Endangered (1971)
FED - Endangered (1967)

General Habitat: • Chenopod Scrub
• Valley and Foothill Grassland

The blunt-nosed leopard lizard is a large lizard with a long, round tail. Color above is grey or brown, with whitish crossbars on the back and tail. Dark blotches on the back and tail and a short, blunt snout give this species its common name. Breeding females have orange or reddish spots on sides. Lengths from snout to vent in adults is three to five inches. The species was originally found throughout the San Joaquin Valley and adjacent foothills from about San Joaquin County southward and into eastern San Luis Obispo County. It inhabits sparsely vegetated plains, alkali flats, low foothills, grasslands, canyon floors, large washes and arroyos.

Urbanization and agricultural development have eliminated nearly all leopard lizard habitat in the San Joaquin Valley. Of the wildlife habitat remaining in the San Joaquin Valley in 1976, 228,000 acres were identified as leopard lizard habitat. By April 1980, this habitat had been reduced to 158,000 acres. The blunt-nosed leopard lizard now occurs in scattered locations in the valley and in the eastern portions of the coast ranges, including the Antelope and Carrizo plains and Cuyama Valley.

A recovery team was appointed by the USFWS in 1975, and a recovery plan was published in 1981. The recovery plan is presently being revised by the USFWS. The DFG has acquired several ecological reserves which have populations of the blunt-nosed leopard lizard including Alkali Sink, Allensworth and Antelope plains. A coordinated effort by the DFG, TNC, California Energy Commission, the USFWS and the BLM is underway to identify and protect important remaining habitats in the San Joaquin Valley and Carrizo Plain. BLM, TNC, and DFG are combining efforts to establish the Carrizo Plain Natural Area (CPNA). The CPNA will include 180,000 acres when acquisition is complete. An interim management plan has been drafted and is undergoing revision by the CPNA technical committee. The plan was still under review and the status of the natural area remained unchanged in 1991. Several habitat conservation plans, which should benefit the blunt-nosed leopard lizard, are being developed in Kern and Fresno counties. Tax Check-off funds are being utilized to determine the effects of grazing on this lizard and other endangered species associated with its habitat.

**Although there has been some progress towards recovery, primarily in the form of habitat protection, the population trend of the blunt-nosed leopard lizard is stable to declining.**

*John Brode*

## Southern rubber boa

*(Charina bottae umbratica)*

CA - Threatened (1971)
FED - Candidate 2 (1982)

General Habitat: • Montane Forest

The southern rubber boa is stout-bodied with a short, blunt tail that resembles the head. The skin is smooth and shiny. The scales on top of the head are large and sometimes asymmetrical. Color is olive or

pale yellowish-brown dorsally and light yellow below. There is no color pattern, but there may be a few dusky flecks on the lower sides. Adults grow to about two feet. This snake is known only from several localities in the San Bernardino Mountains, San Bernardino County; near Idyllwild, Riverside County; and Mt. Pinos, Kern County. It occurs in the pine forests near streams and meadows.

Habitat loss is the principle cause of this species' decline. The principle causes of habitat damage include resort development, OHV activities, logging and wood gathering. The USFS has investigated the distribution of the southern rubber boa in the Angeles, Los Padres and San Bernardino national forests. A Southern Rubber Boa Advisory Committee was formed in the early 1980's to coordinate studies and management of this snake. Recommendations have been made to the USFS designed to lessen impacts on the snake from logging.

**This secretive snake is considered stable/declining because of habitat loss.**

*John Brode*

## Alameda whipsnake

*(Masticophis lateralis euryxanthus)*

CA - Threatened (1971)
FED - Candidate 1 (1991)

General Habitat:
- Chaparral
- other inner Coast Range plant communities

The Alameda whipsnake is a slender, fast-moving diurnal snake that has a narrow neck and relatively broad head with large eyes. Adults may reach a length of five feet. Color is black or dark brown above with a distinct orange stripe on each side. It is associated with chaparral in Alameda and Contra Costa counties, but may occur in any inner Coast Range plant community, including grasslands, open woods, on rocky slopes and along open streams and arroyos.

In 1989 a working group of agency and university specialists was established that will be preparing a management plan. Protection efforts are underway on public lands, including Diablo State Park, various units of the East Bay Regional Park District and land owned by the East Bay Municipal Utilities District. A life history study funded by Tax Check-Off money is underway at California State University, Hayward. This study is due to be completed in 1992. The information gathered during this study will contribute to the development of the management plan. Also, this information will help in refining survey methodologies and developing standard procedures for assessing potential adverse impacts to the whipsnake from development projects. The Alameda whipsnake working group has begun efforts to identify the remaining known and potential whipsnake habitat and refine the whipsnakes distributional limits.

**Populations are thought to be declining as habitat is urbanized.**

*John Brode*

## San Francisco garter snake

*(Thamnophis sirtalis tetrataenia)*

CA - Endangered (1971)
FED - Endangered (1967)

General Habitat:
- Marshes and Swamps
- North Coast Ponds
- Reservoirs

The San Francisco garter snake has a mid-dorsal stripe of greenish-yellow edged with a black and a red stripe on each side which may be broken or divided. The belly is greenish-blue, and the top of the head is red. Adults grow to a length of two to three feet. This snake, until recently, was known only to be from San Mateo County. It has now been found in extreme northern Santa Cruz County, but the extent of its occurrence there is unknown. Small populations occur near freshwater marshes, ponds and slow-moving streams along the coast from Sharp Park to Ano Nuevo and east into the Santa Cruz Mountains where suitable habitat occurs. Studies conducted in 1987 through 1989 have determined that upland areas near the pond/marsh habitats are important to the snake during the fall and winter. Information from these studies indicate it is possible the upland areas are where the females give birth.

Urbanization has destroyed the majority of the prime habitat for this animal. Studies have been conducted on the distribution and ecology of the snake, and this information will be used to develop management plans for specific areas such as Pescadero Marsh and Ano Nuevo State reserves. The DFG is working with USFWS and the San Francisco International Airport to provide protection for the snake on the airport's "West of Bayshore" property, which has been identified as a possible location for airport parking and a BART station. A very large population of the snake occurs on this property, although a 1990-91 study funded by PG&E indicated that this population has recently declined. This apparent decline may be a result of the prolonged drought, which has reduced the amount of seasonal water and food for the snake. In 1985 the USFWS published a recovery plan for the snake.

**The San Francisco garter snake is considered stable/declining.**

*John Brode*

# Giant garter snake

*(Thamnophis gigas)*

CA - Threatened (1971)
FED - Candidate 1 (1991)

General Habitat:
- Marshes and Swamps
- Sacramento-San Joaquin Streams

This is one of the largest garter snakes, with adult females commonly reaching four feet in length. The basic color is dull brown with a checkered pattern of well-separated black spots on the dorsal side. There is a dull yellow mid-dorsal stripe, but lateral stripes are often not developed. The head is elongated with a pointed muzzle. The original reported range of this snake was the San Joaquin Valley from the vicinity of Sacramento and Antioch southward to Buena Vista Lake, Kern County. It appears that this snake has been extirpated from Buena Vista Lake and the Tulare Lake basin. The present known distribution extends from near Chico, Butte County, to the vicinity of Burrel, Fresno County. It is one of the most aquatic garter snakes and is usually found in areas of freshwater marsh and low-gradient streams, although it has adapted to human-made habitats such as drainage canals and irrigation ditches, especially those associated with rice farming.

As a result of human activities, the giant garter snake and its supporting habitat are depleted throughout its range. In addition, much of the remaining habitat is degraded or threatened in those areas that still support this species. Urbanization, including housing, business, industrial and recreational developments, often leads to the destruction of wetlands and channelization of streams. Other impacts of urbanization include pollution, destruction of food sources, predation by native and introduced species and removal by collectors.

DFG has utilized Tax Check-Off funds to investigate the status of this snake and its habitat requirements. This information has been used to develop a draft management plan for the snake in the American Basin (Sacramento and Sutter counties), including mitigation recommendations for anticipated habitat loss associated with proposed development within the basin.

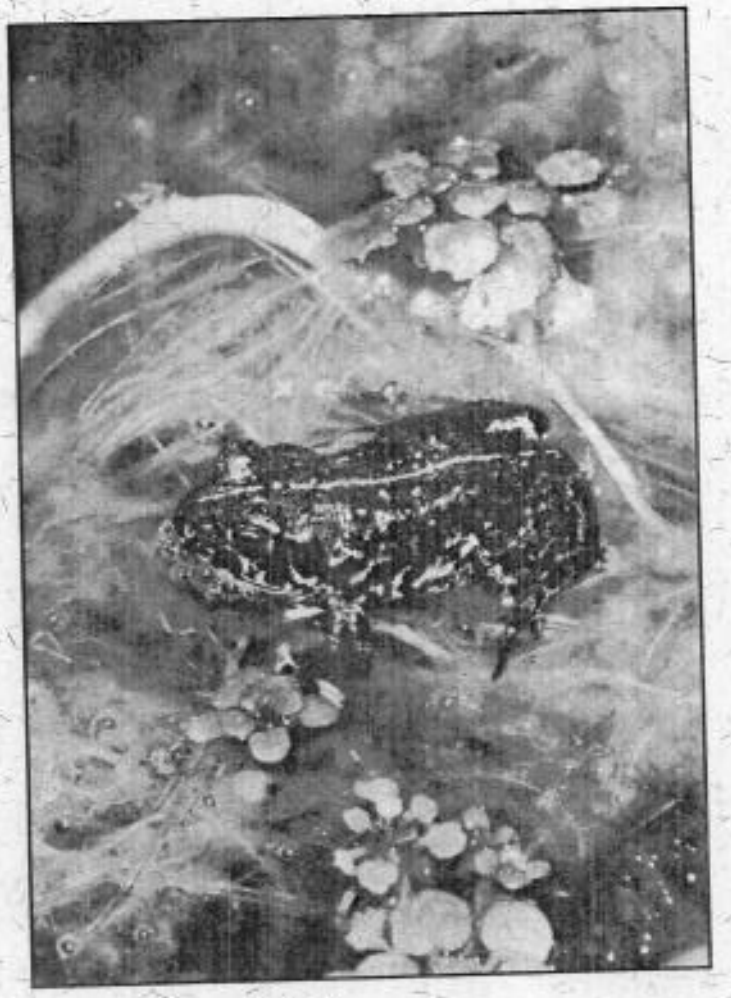
The American Basin provides the most important habitat remaining in California for the giant garter snake. Nearly 30,000 acres of farmland (including about 140 miles of giant garter snake canal habitat) and open space within the basin may be converted to urban use over the next 50 years. The north Natomas Development Plan and the accompanying EIR in which the giant garter snake is discussed are currently under the review by the City of Sacramento. The DFG has also submitted the final report to CalTrans regarding the widening of State Route 99/70 in Sacramento and its potential adverse impacts on the giant garter snake. Development on such a scale would probably extirpate the giant garter snake within the basin. The giant garter snake is now recognized as a full species (*Thamnophis gigas*). DFG is also addressing the needs of this snake in revised management plans for several DFG wildlife areas.

**The population trend of the giant garter snake is considered to be declining.**

*John Brode*

# AMPHIBIANS





Black toad - photo by William E. Grenfell, Jr.

# Santa Cruz long-toed salamander

*(Ambystoma macrodactylum croceum)*

CA - Endangered (1971)
FED - Endangered (1967)

General Habitat: • Meadows and Seeps

The Santa Cruz long-toed salamander is a relatively small (15 to 30 mm), black salamander with yellow-orange blotches. It frequents coastal woodland and chaparral near the ponds and freshwater marshes in which it breeds. This species is known from four localities in Santa Cruz County and three localities in Monterey County.

Two localities are partially protected by a DFG Ecological Reserve and a USFWS Wildlife Refuge. Habitat at another locality, although protected by a conservation easement granted to TNC in 1982, was seriously degraded by previous saltwater intrusion. The remaining localities are all on privately-owned lands, some of which have recently been threatened by illegal wetland conversion, proposed housing developments and the appearance of a Parasitic flatworm whose long-term effect on salamander survival is not yet known. An advisory committee convened in 1988 to address these problems. The status of salamander populations at all but one locality is unknown. The extended drought has drastically reduced recruitment to most, if not all, the known breeding populations. The 1991 winter population assessment found the reproduction was unsuccessful. Drought relief funds will be used to augment breeding habitat at Ellicott Pond Ecological Reserve. The plan is to supplement rain water by pumping well water into the breeding pond during rain storms. Management activities planned for the next two years include fence repair, installing new signs, exotic vegetation removal, and possibly developing a new breeding pond on USFWS property adjacent to Ellicott Pond.

**Due to the extended drought, the population trend of the Santa Cruz long-toed salamander is unknown.**

*John Brode*

# Siskiyou mountain salamander

*(Plethodon stormi)*

CA - Threatened (1971)
FED - Candidate 2 (1982)

General Habitat: • North Coast Conifer Forest

This is a slim-bodied salamander with short legs. It has five toes on the hind feet and four on the front feet. Color is dull brown to chocolate brown on the dorsal surface and sides, often profusely speckled with white or yellowish flecks. The ventral surface is purplish gray. Adults grow to four to six inches. This salamander occurs in scattered locations in Siskiyou county near the Hutton Guard Station, the Cook and Green Guard stations, along Joe and Dutch creeks in the upper Applegate River drainage and along Seiad and Horse creeks in the Klamath River drainage. It is covered with moss or leaf litter, associated with loose rock rubble and talus often, but not exclusively on north-facing slopes and in heavily wooded areas.

The most serious threat to this salamander appears to be the gradual destruction of overstory vegetation within its range by clear-cutting in areas of rock outcrops and talus slopes. This practice eliminates the moist microhabitat necessary for species survival. Currently, management is limited to review of projects that may affect the animal or its habitat and to an "Interim Management Direction" developed for activities within the Klamath National Forest. This direction provides some protection by the use of streamcourse preservation measures designed to maintain water quality and fisheries habitat. However, this species is not dependant on aquatic habitat per se, only moist, rocky habitat and it is unknown whether this is adequate to maintain populations of the Siskiyou Mountain salamander.

**The status of this species is currently unknown due to lack of any recent information.**

*Carla Markmann*

# Tehachapi slender salamander

*(Batrachoseps stebbinsi)*

CA - Threatened (1971)
FED - Candidate 2 (1982)

General Habitat: • Cismontane Woodland
• Lower Montane Conifer Forest
• Riparian

This is a relatively large and robust slender salamander. Adults grow to about 5 inches. It is distinguished by its relatively large feet and long legs. Dorsal color is dark brown with lighter patches sometimes forming an indistinct band. The ventral surface is dark grey-black. It occurs in small areas in the Piute and Tehachapi mountains southeast of Bakersfield, Kern County, where it lives in rock talus in foothill woodland, usually on north-facing slopes.

No intensive surveys have been done recently. If a flood control dam is built in Caliente Creek, Canyon, it could adversely impact habitat of this salamander. The limited number of sites occupied by this species makes it extremely vulnerable to any changes in its habitat.

**The population trend of this salamander is unknown.**

*John Brode*

## Kern Canyon slender salamander

*(Batrachoseps simatus)*

CA - Threatened (1971)
FED - Candidate 2 (1982)

General Habitat:
- Cismontane Woodland
- Lower Montane Conifer
- Chaparral

This species has relatively long limbs and tail and a narrow head. The color is black on the sides and ventral surface, while the dorsal surface has dashes and patches of bronze and light reddish-brown pigment which may form an imperfect dorsal band. Adults grow to 4 to 5 inches. This salamander is found in the lower Kern River Canyon from about Democrat Hot Springs downstream to Live Oak Picnic Area in Kern County. Individuals occur beneath rocks, fallen and other surface material, as well as large rock slides and talus on rather steep north-facing slopes.

Highway construction, small hydro development and firewood collecting are potential threats to this salamander. In 1988, consultation with CalTrans resulted in postponing the widening of portions of a local highway. At that time no salamanders were located, although the habitat appeared suitable.

**The population trend of this salamander is unknown.**

*John Brode*

## Desert slender salamander

*(Batrachoseps aridus)*

CA - Endangered (1971)
FED - Endangered (1973)
General Habitat:
- Riparian Woodland
- Sonoran Desert Scrub

This is a moderately small slender salamander with a short tail. Color is blackish above, overlaid with an indistinct lighter band. Ventrally, the trunk is a darker blackish-maroon, and the underside of the tail is flesh-colored. Adults grow to about four inches. This salamander is known only from Hidden Palm Canyon, a tributary of Deep Canyon, about ten miles south of Palm Desert, Riverside County. It is found in crevices between limestone sheets and under limestone slabs and other rocks along the base of cliffs where continuous water seepage occurs. During the late winter and early spring these salamanders may occasionally be found beneath rocks and other objects on the floor of the canyon.

The primary threat to this species is the fact that it has an extremely restricted distribution. Prolonged drought, water pumping, or storm erosion are potential threats to its limited habitat.

The entire habitat for this salamander is located within the 160-acre Hidden Palm Ecological Reserve. A DFG management plan for the reserve, developed in 1975, is currently being revised. A management committee coordinates management of the reserve. A recovery plan for the salamander has been prepared by the USFWS.

In September 1976, a severe tropical storm destroyed about 50 percent of the salamander habitat in Hidden Palms Ecological Reserve. A study was initiated to determine the amount of remaining habitat and the status of the salamander population. During the study it became apparent that the remaining habitat needed protection from further erosion. A gabion structure of heavy-mesh wire filled with rocks was installed at the edge of the remaining habitat area to prevent further erosion of the soil. Since the 1976 flood, no more than three salamanders have been observed on any one visit by DFG personnel. The habitat is improving, however, and the DFG has initiated a habitat monitoring program.

**The present status of this salamander is unknown.**

*Betsy Bolster*

## Shasta salamander

*(Hydromantes shastae)*

CA - Threatened (1971)
FED - Candidate 2 (1982)

General Habitat:
- Ravines
- Cismontane Woodland
- Lower Montane Conifer Forest
- Chaparral

This salamander has webbed toes and a flattened body. The dorsal side is gray-green, beige, tan or reddish, and usually with yellow on the tail. The ventral surface is dark with white flecks or blotches. The young are gray-green, olive, tan or reddish on the body and yellowish on the tail. Adults grow to three to four inches. The Shasta salamander inhabits limestone formations in several areas near Shasta Lake, Shasta County. They are found in moist limestone fissures

and caves and under rocks on the surface during wet weather in mixed pine-hardwood stands.

Nine of the 12 known populations occur on USFS land, one is on BLM land, and two are on private property. The Shasta-Trinity National Forest has developed a management plan for this species. Highway and road construction, quarrying for limestone, and raising the elevation of Shasta Lake are potential threats to this species.

**The Shasta salamander population is thought to be stable due to isolated habitat.**

*Carla Markmann*

## Limestone salamander

*(Hydromantes brunus)*

CA - Threatened (1971)
FED - Candidate 2 (1982)

General Habitat:
- Rock Outcrops
- Cismontane Woodland

This salamander has webbed toes and a flattened body. Its color is uniformly brown above and pale brown to gray below. The underside of the tail is yellowish. The young are pale yellowish-green above, changing with age through pale yellow to beige or brown. Adults grow to 3 to 4 inches. The limestone salamander occurs in the Merced River Canyon in the vicinity of Briceburg and along Bear Creek, a tributary to the Merced River, Mariposa County. It has also been found in Hell Hollow, about four miles above Lake McClure and at the confluence of Hell Hollow Creek with Lake McClure. As its name indicates, the species is associated with limestone outcroppings. It is found in the digger pine-chaparral belt, where it lives in rock crevices and in talus, especially where overgrown with moss.

The Limestone Salamander Ecological Reserve (LSER) protects 120 acres of limestone salamander habitat and BLM has designated an additional 1,600 acres as the Limestone Salamander Area of Critical Environmental Concern (LSACEC). The LSACEC encompasses both confirmed and potential limestone salamander habitat. DFG published a management plan for the LSER in 1976 and a BLM Management Plan for the LSACEC is under review. A proposed gold mine operation in Hell Hollow poses the most serious threat to this salamander. Other potential threats include highway construction and quarrying for limestone.

**The population trend of the limestone salamander is unknown.**

*John Brode*

## Black toad

*(Bufo exsul)*

CA - Threatened (1971)
FED - Candidate 2 (1982)

General Habitat:
- Meadows and Seeps
- Springs

The dorsal surface of this toad often appears shiny and lacquer-black. There is a narrow white or cream dorsal stripe, and the underside is white or cream with dense mottling and marbling of black. Dark markings often spot the throat. This small toad rarely exceeds 3 inches in body length. The range of this species is extremely restricted. It is found only in and around Deep Springs (Buckhorn Spring, Corral Spring, Bog Mound Spring) and Antelope Spring in Deep Springs Valley, Inyo County. It inhabits watercourses and marshes adjacent to the springs. Adults are more aquatic and diurnal than other toad species in California.

This species occurs in a very limited area, therefore, it is extremely vulnerable to any habitat change. It is also threatened by unlawful collecting.

Populations appear stable around Deep Springs but have apparently declined at Antelope Spring. DFG has purchased 719 acres to protect habitat of the black toad at Deep Springs. Deep Springs College, which owns property at Deep Springs and Antelope Spring, has been apprised of the legal status of this toad. The college has fenced an area to exclude livestock from toad habitat at Corral Spring and has changed its irrigation practices to minimize impacts on breeding toads and developing eggs and larvae at Deep Springs.

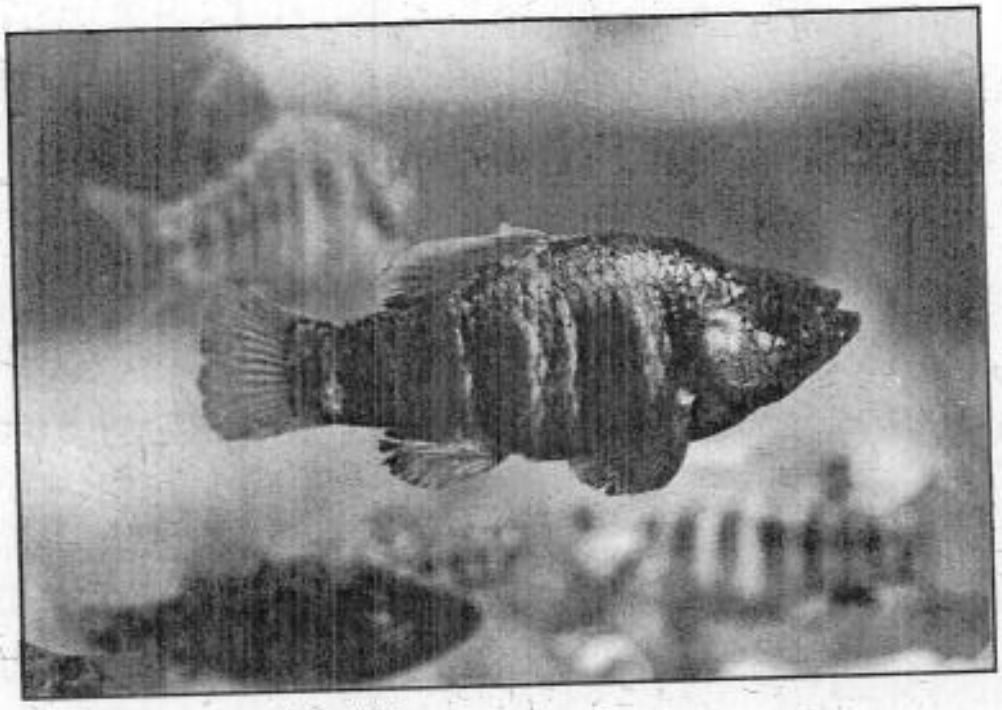
DFG personnel conducted two site visits in 1991. At Corral Spring, tadpoles, juveniles, and adult toads were observed in April and young-of-the-year, juveniles, and adult toads were observed in November. Young-of-the-year and adult toads were observed at Bog Mound Spring in November (not visited in April). Buckhorn Spring was not visited. No toads were observed during two visits (April and November) to Antelope Spring. There appeared to be little or no breeding habitat available to the toads at Antelope Spring.

DFG personnel met with officials of Deep Springs College in 1991 to discuss a joint management plan for the toad which will include habitat restoration and enhancement at Antelope Spring. The habitat work will include two livestock exclosures so toad breeding habitat can be restored and protected. The livestock exclosure at Corral Spring has become overgrown with vegetation and appears to have lost its suitability as toad habitat. Habitat maintenance of this area will be discussed with Deep Springs College officials.

**Although much of the habitat appears stable, the population trend of the black toad is unknown.**

*John Brode*

# FISHES



Owens pupfish - photo by B. "Moose" Peterson, WRP

# Winter-run chinook salmon

*(Onchorhynchus tshawytscha)*

CA - Endangered (1989)
FED - Threatened (1990)

General Habitat:
- Sacramento/San Joaquin drainage
- Sacramento River

The Sacramento River winter-run is a distinct race of chinook salmon. Other races which utilize the Sacramento River are the fall-run, the late fall-run, and the spring-run. These races can be distinguished by the timing of adult upstream migration, spawning, egg incubation, juvenile downstream migration, younger age at spawning, lower fecundity, rapid upstream movement of adults and extended holding-staging periods of adults. Sacramento winter-run chinook salmon only occur in California and virtually all spawning is limited to the mainstem Sacramento River. Adult winter-run leave the ocean and migrate upstream through the Delta into the Sacramento River from November through June. Upstream movement past the Red Bluff Diversion Dam (RBDD) begins in July with outmigration continuing possibly into March. Peak movement may occur between mid-October and mid-December. Fry may appear in the Delta as early as September, especially when fall storms cause high Sacramento River discharge. Peak outmigration through the Delta appears to occur during the months of February and March. In some years, seaward migration can last into the month of May.

The winter-run chinook salmon population in California has declined greatly in recent years. Compared with the 60,000 to 120,000 spawners typical of the 1960's, the annual run sized dropped to a five-year average in the mid-1980's of 2,000 fish. By 1989, the spawning escapement had dropped to 547 fish. In 1990, this number further declined to 441 fish. 1991 saw a record low spawning of 191 fish.

The threats to this population are blockage of fish passage by dams, numerous unscreened diversions in the Sacramento River, excessive water temperatures, poor water quality and delta water diversions.

A State-Federal Recovery Team is being assembled to develop and implement a recovery plan for the winter-run salmon. The Recovery Team will convene in early 1992. Ongoing management actions which will likely form the basis of the recovery plan include (1) structural and operational changes at Shasta Dam to provide suitable water temperatures for spawning and egg incubation below the dam, (2) control and treatment of water pollution from Iron Mountain Mine, (3) correct fish passage and juvenile stranding problems at Anderson-Cottenwood Dam, (4) correct fish passage problems at RBDD, (5) initiate measures to control squawfish predation at Red Bluff Lake, (6) restore spawning habitat in the Redding area, (7) modify the fish trap at Keswick Dam to prevent mortality, (8) develop a winter-run propagation program at Coleman National Fish Hatchery, (9) fishery harvest restrictions to protect adult spawners, and (10) continue measures and expand studies, such as taking corrective action on the numerous unscreened agricultural diversions along the Sacramento River, that will contribute to the recovery of this unique race of chinook salmon.

**The population trend for the winter-run chinook salmon is one of decline.**

*Debbie McKee*

# Bull Trout

*(Salvelinus confluentus)*

CA - Endangered (1980)
FED - Candidate 2 (1985)

General Habitat:
- Sacramento/San Joaquin drainage
- McCloud River

The bull trout is a large (ten-40 inches) non-anadromous species of char. It has a long, broad head which is flat above and sharply tapered through the snout with the eye positioned near the dorsal margin. The coloration is olive green with small yellow or light spots on the back and inconspicuous small red spots on the sides. Bull trout are bottom-dwelling fish that prefer deep pools of cold rivers and their larger tributaries. Spawning requires a large volume of cold water. Bull trout formerly occurred in the McCloud River drainage below Lower Falls. It was extirpated from this area. Management plans have been completed. This species was reintroduced into the McCloud River tributaries above the McCloud Reservoir in 1990 and these efforts are continuing. The bull trout has been severely depleted throughout most of its range and several states are proposing threatened listing. Continuing problems for this species are watershed deterioration resulting from logging, competition from exotic species and water diversion.

**The population trend for this species is declining.**

*Eric Gerstung*

# Mohave tui chub

*(Gila bicolor mohavensis)*

CA - Endangered (1971)
FED - Endangered (1970)

General Habitat:
- Mojave Drainage
- Ponds

The Mohave tui chub is a dark olive color above, with bluish or creamy-white on the belly. Bluish or gold reflections on its sides give this minnow a metallic appearance. Formerly found throughout the Mojave River drainage, this fish is no longer found here due to hybridization with the illegally introduced arroyo chub, habitat alteration, water diversions and pollution. Occurrence of this fish in now restricted to four highly-modified habitats in San Bernardino County. Two of the populations are on BLM land, a third is at DFG's Camp Cady Wildlife Area and the fourth is at China Lake Naval Weapons Center. Maintenance of these artificial habitats, especially vegetation control, is an ongoing problem. DFG found some potential introduction sites for the chub during 1988 but has curtailed further efforts on BLM land, as the BLM has been unwilling to contact holders of grazing leases or mining claims to negotiate fish introductions with them. Repair work and installation of a pond liner began at DFG's Camp Cady Wildlife Area. The pond leakage in 1989 resulted in significant chub mortality in November, 1991.

**This subspecies is considered to be stable to declining.**

*Betsy Bolster*

# Owens tui chub

*(Gila bicolor snyderi)*

CA - Endangered (1974)
FED - Endangered (1985)

General Habitat:
- Owens Drainage
- several Owens Basin Habitats

The Owens tui chub is very similar in appearance to the closely-related Mohave tui chub; olivaceous on the dorsal surface and bluish or creamy-white below. Scales, gill rakers and fins must be examined carefully to tell these two subspecies apart. The Owens tui chub was formerly found throughout the Owens River basin in Mono and Inyo counties. Habitat was greatly reduced by development, storage and export of Owens River basin water for agricultural, domestic and industrial use. In addition, the unauthorized introduction of Lahontan tui chub into the Owens basin by anglers displaced or genetically contaminated most Owens tui chub populations. Illegal introductions of non-native predaceous species (especially largemouth bass) into chub refugia have also hindered recovery efforts for this fish.

Small populations are currently found in remnants of natural habitat at three locations: the Owens River Gorge, springs at the DFG's Hot Creek Hatchery and a pond near Owens Dry Lake owned by Anheuser Busch. Chubs introduced into a waterfowl pond in the Inyo National Forest in 1988 are thriving, and DFG is using funds received from the USFWS to work cooperatively with Forest personnel to create additional chub habitat there. A Tax Check-off funded study to determine the genetic and taxonomic relationships among Owens tui chubs and other tui chubs which may hybridize with them was inconclusive.

**This subspecies is considered to be stable to increasing.**

*Betsy Bolster*

# Bonytail

*(Gila elegans)*

CA - Endangered (1974)
FED - Endangered (1980)

General Habitat:
- Colorado Drainage
- Colorado River

The bonytail is a large chub (commonly 30 to 35 cm) with a gray or olivaceous back and white, silvery sides and belly. It has an extremely narrow caudal peduncle with a deeply-forked tail, fine, embedded scales and a short, flattened head with a broad snout and small elliptical eyes. There is usually a conspicuous hump behind the head. Historically the bonytail occurred in the mainstream of the Colorado River and the lower-gradient portions of its major tributaries. Habitat alteration caused by major water projects ultimately resulted in the bonytail's present rarity. This fish is virtually extirpated from its former California habitat. In the lower basin a few large, old adults are still found in Lake Mojave but no successful reproduction has been documented there. Researchers believe bonytail are still Lake Havasu. A recovery plan, prepared by the Colorado River Fishes Recovery Team in 1984, was recently updated. In the past, bonytail fry from Dexter National Fish Hatchery in New Mexico were stocked in grow-out ponds at the DFG's Niland Native Fish Ponds (part of the Imperial Warmwater Hatchery) and in ponds at the Imperial National Wildlife Refuge and later released into the Colorado River. The DFG stocking program has been discontinued due to lack of demonstrable results. The apparent failure of the program is most likely due to lack of habitat in the lower Colorado River. California's participation in recovery efforts for this species will be limited until the success of efforts by other state and federal agencies in the Upper Colorado River is evaluated.

**The population trend for this species is declining and on the verge of extirpation in California.**

*Susan Ellis*

# Colorado squawfish

*(Ptychocheilus lucius)*

CA - Endangered (1971)
FED - Endangered (1967)

General Habitat:
- Colorado Drainage
- Colorado River

The Colorado squawfish is one of the largest minnows in the world. It has been reported to reach lengths of more than 150 cm and weights of 36 kg. The head, which may make up one quarter of the total body length, is long, slender and depressed, with a large, toothless mouth and small eyes. Coloration is dusky greenish above, silvery on the sides and yellowish to white on the belly. Although once abundant throughout the Colorado River and major tributaries in slow, deep water, it has not been seen below Glen Canyon Dam (Arizona) since 1968.

The Colorado squawfish is being recovered in concert with the bonytail chub, humpback chub and razorback sucker. The 1989 "Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin" identifies specific recovery tasks and strategies to be employed in recovering these fish. The goal of the implementation program is to recover the Colorado River fishes in 15 years at an estimated cost of $53 million. Development of a similar program for the lower Colorado River basin is being planned.

Lower basin rivers provide an opportunity to conduct valuable research and experimentation that may not be feasible or desirable in the upper basin. Ongoing stocking and monitoring efforts by lower basin researchers could lead to a better understanding of the habitat requirements, homing behavior and factors limiting Colorado squawfish survival. These activities will add to our understanding of squawfish biology and support recovery efforts throughout the Colorado River basin/. The DFG participates on the Colorado River Fishes Recovery Team, but is not currently involved in any direct recovery activities.

**The population trend for this species is extirpated from the wilds of California.**

*Susan Ellis*

# Modoc sucker

*(Catostomus microps)*
CA - Endangered (1980)
FED - Endangered (1985)

General Habitat:
- Pit River Drainage
- Pit River Tributary Streams in the Modoc Plateau

This is a small (rarely exceeding 200 mm), fine-scaled sucker. Body coloration varies from dark above and white below with no markings, to black above with highly mottled sides and white below. The species is only found in a small portion of the upper Pit River drainage in Modoc and Lassen counties. Major threats include continued drought conditions, introduction of exotic predators, grazing and possible hybridization.

The most serious current threat is the continuing drought. Fish had to be salvaged for the second year in a row in the summer of 1991. DFG and USFS personnel moved suckers from drying pools into stable pools within the same creek. It is believed that low water has reduced reproductive success and increased susceptibility of Modoc suckers to predation by exotic fish species. Genetic studies using Tax Check-off money to evaluate hybridization could not be completed due to the low population densities which precluded sacrifice of fish for electrophoretic analysis.

In 1991 the WCB made a key purchase of 160 acres on Dutch Flat Creek. This adds a significant reach of stream habitat which can be restored and managed for Modoc sucker protection. The USFS continues habitat restoration work including barrier construction, modification of grazing practices, fencing to protect stream habitat, bank protection and erosion control measures. Electrofishing to remove exotics occurs regularly.

DFG will be using Tax Check-off funds to begin a first-time ever comprehensive population and habitat status study throughout the entire species' range. This information will be used to evaluate the effectiveness of ongoing habitat restoration work and develop new management/recovery strategies if needed. State Emergency Drought monies may be used to improve existing habitat to allow fish to survive summer dry periods more successfully. The Modoc Sucker Action Plan is being revised.

**Populations are thought to be declining due to reduced habitat availability and quality associated with drought conditions.**

*Carla Markmann*

# Lost River sucker

*(Deltistes luxatus)*

CA - Endangered (1974)
FED - Endangered (1988)

General Habitat:
- Klamath Drainage
- Lakes
- Streams

This is a large sucker that may grow to 97 cm. It is characterized by a long, slender head with a subterminal mouth and long, rounded snout. The coloring is dark on the back and sides, fading to white or yellow on the belly. Lakes and deep pools are the preferred habitat of the Lost River sucker. It migrates to springs or up rivers in the spring to spawn.

A three year study, funded with Tax Check-off funds completed in 1991, found this species and shortnose suckers to be present in Clear Lake and its tributaries (Modoc County), the Lost River and Boles and Willow creeks, in Modoc County. This represents one of the largest and healthiest populations of Lost River suckers found outside of Oregon. Populations in Oregon are seriously threatened by water quality and quantity problems. Clear Lake is a comparatively pristine environment and probably has the greatest potential for maintaining viable populations of this species and the shortnose suckers. Water quality conditions in Clear Lake are good and the surrounding watershed is relatively undeveloped compared to conditions elsewhere. Populations of Lost River suckers in Copco Lake, Iron Gate Reservoir and other areas of the Klamath River Basin Project in California are small and reproductive success is limited. Federal support is being sought to continue studies of life history and habitat requirements so that management recommendations can be developed.

Lack of spawning habitat, water diversions, predation, and potential hybridization with other sucker species are the predominant threats to the species. The University of California, Davis electrophoretic analysis of Klamath River Basin suckers was completed in 1991. Preliminary results suggest that phenotypic variation rather than hybridization may explain the differences in appearance between populations from different locations. Morphological analysis performed as part of the Tax Check-Off study confirmed that Lost River suckers from California are similar to those from upper Klamath Lake, Oregon.

In California, water project operations, water diversions, and the drought are the greatest threats to the species in the Clear Lake basin. At Clear Lake normal water deliveries continued this year, lake levels fell to near historical minimums, and fish were salvaged on an emergency basis to retain broodstock in case of fish kills this winter. Salvaged suckers are being held at the Dexter National Fish Hatchery in New Mexico and DFG's Sucker Springs Hatchery.

The Klamath Basin Working Group continues to meet and is developing a recovery plan. A Federal Biological Opinion is being prepared by the USFWS for the entire Klamath River Basin Project which will address the needs of Klamath River Basin suckers.

**While populations of the Lost River sucker may be in good condition in Clear Lake, elsewhere the species is probably declining due to poor reproductive success.**

*Carla Markmann*

# Razorback sucker

*(Xyrauchen texanus)*

CA - Endangered (1974)
FED - Endangered (1991)

General Habitat:
- Colorado Drainage
- Colorado River

The razorback sucker is easily distinguished by a sharp-edged hump or keel on the back which elevates the dorsal region of the body above the head. Coloration of adults is dusky brown to olivaceous on the back and yellowish on the belly. Historic collections of the razorback were made throughout the mainstream Colorado River and major tributaries from Wyoming to Sonora and Baja California del Norte, Mexico. Due to habitat alteration as a result of major water projects, recent records of razorback occurrence in the lower basin are sporadic and isolated. In 1985 DFG developed a "Management Plan for the Razorback Sucker in California" which calls for stocking in the lower Colorado River. In 1990 DFG discontinued this effort until the success of a similar effort in the upper Colorado River has been evaluated.

**In the lower Colorado River, this species is considered to be declining and on the verge of extirpation.**

*Susan Ellis*

# Shortnose sucker

*(Chasmistes brevirostris)*

CA - Endangered (1974)
FED - Endangered (1988)

General Habitat:
- Klamath Drainage
- Lakes
- Rivers

This is a heavy-bodied, nearly cylindrical lake sucker that grows to 51 cm. It has a large head with a blunt snout. The mouth is terminal, and the lips are thin with few papillae. Coloration is dark above and white to cream-colored below. During most of the year this species inhabits the open water of large, shallow lakes and river channels. Spawning occurs in tributary streams during April and May.

The decline of this species is believed to be due to habitat alterations associated with water diversions and possible hybridization with other species of sympatric suckers. A Tax Check-off fund study, completed in 1991, indicates a large, viable population of shortnose suckers were in Clear Lake. Clear Lake shortnose suckers are reproductively isolated and appear to be morphologically different from shortnose suckers elsewhere in the Klamath Basin. Results of the University of California, Davis preliminary electrophoretic study,

completed in 1991, suggest that shortnose suckers have probably not hybridized with other sucker species. The taxonomic status of the Clear Lake population remains unclear.

The Klamath Basin Sucker Working Group is continuing to develop a species recovery plan. Drought conditions and continuing agricultural diversions pose serious threats to the species. Clear Lake shortnose suckers were salvaged with Lost River suckers in an emergency drought-related operation this fall. The federal Biological Opinion for the Klamath Basin Project will address the needs of the shortnose sucker. The DFG has requested funding from the USFWS to continue studies on the species biology and environmental requirements. In 1992 studies will determine population densities and streamflow needs for various life stages. Attempts to spawn and rear this species at Iron Gate Hatchery were unsuccessful.

**Trend data are unavailable at this time; some populations appear to be declining while others are relatively stable.**

*Carla Markmann*

## Desert pupfish
*(Cyprinodon macularius)*

CA - Endangered (1980)
FED - Endangered (1986)

General Habitat:
- Salton Sea Drainage
- Streams
- Ponds
- Marshes
- Springs

The desert pupfish is a small (less than 8 cm), chunky pupfish with tan to olive coloration and a series of lateral vertical bars. Males become bright blue with lemon yellow tails during the breeding season. In California, this species occurred historically in several springs, seeps and slow-moving streams in the Salton Sink basin, as well as in backwaters and sloughs along the lower Colorado River. As of 1990 ten refugia have been established for this species. Dams, channelization and water diversions, combined with the introduction of exotic fish species, reduced the natural occurrence of this pupfish to two localities in Imperial County. Pupfish in one of these areas, San Felipe Creek, are periodically threatened by invasions of the non-native tilapia (an African fish used for aquaculture). Construction of a barrier to block continued migration of tilapia into pupfish habitat has been postponed due to engineering problems. It is now projected for completion during the 1992/93 fiscal year by the BLM. In 1991, Department surveys found a surprising number of pupfish both in Salton Sea shoreline pools and in irrigation drains tributary to the Sea. Pupfish were formerly thought to exist in very low numbers or to be entirely absent from these areas. A recovery plan, prepared by the USFWS, is currently out for review.

**This species is considered to be stable to increasing.**

*Betsy Bolster*

## Owens pupfish
*(Cyprinodon radiosus)*

CA - Endangered (1971)
FED - Endangered (1967)

General Habitat:
- Owens Drainage
- Streams
- Refugia
- Ponds
- Marshes

The Owens pupfish is a small (less than 6 cm), stout-bodied pupfish. Females are brownish above and whitish below, with dark blotches on the sides. Breeding males are bright blue, with lateral vertical bars and a dark band on the tail. This fish historically occurred in the Owens River system from Lone Pine (Inyo County) to Fish Slough (Mono County). Due to habitat alteration associated with the development and storage of Owens River basin water for agricultural, domestic and industrial use, and the introduction of non-native species, this fish is now confined to small, protected remnants of its former habitat in Fish Slough and has been established in artificial refugia. Transplants into these new refugia and established populations are being monitored by DFG.

**This species is considered to be stable.**

*Betsy Bolster*

## Cottonball Marsh pupfish
*(Cyprinodon milleri)*

CA - Threatened (1971)
FED - None

General Habitat:
- Amargosa Drainage
- Marsh

The Cottonball Marsh pupfish is a small (less than 3 cm), slender pupfish. Individuals of both sexes have seven or eight vertical bars on the sides, and

breeding males become deep blue on the sides and iridescent purple on the back. This species occurs only in Cottonball Marsh in Death Valley National Monument and presently occupies its entire known range. The NPS conducts periodic flights over the marsh to monitor existing conditions and occasionally inspects the marsh on foot to determine the status of the pupfish population.

**The population is thought to be stable due to the isolated, protected nature of the habitat.**

*Betsy Bolster*

## Unarmored threespine stickleback

*(Gasterosteus aculeatus williamsoni)*

CA - Endangered (1971)
FED - Endangered (1970)

General Habitat
- South Coastal Drainage
- Edges of Small Streams

The unarmored threespine stickleback (UTS) is a small (not exceeding six cm standard length) scaleless fish. This fish is currently restricted to the upper Santa Clara River drainage in Los Angeles County and an isolated, introduced population outside of the historic range in San Felipe Creek in San Diego County. A remnant population of unidentified stickleback exists in Shay Creek, San Bernardino County. Major threats to the UTS include stream channelization, urbanization, agricultural development water diversions, groundwater pumping, introduction of predators and competitors, OHV use and chemical spills.

The fish appear to be relatively abundant where found, but are continuously threatened by continuing stream degradation. The UTS is currently being managed by a recovery team which meets regularly. The recovery plan for the species was revised in 1985. The agencies cooperating in the recovery effort have undertaken several actions to conserve the UTS. These activities include: (1) surveys to discover additional populations, (2) transplants to establish UTS in other waters, (3) surveys to discover exotic organisms, (4) eradication programs to remove or control exotic species, (5) a contingency plan to establish response procedures in case of oil or toxic chemical spills, and (6) genetic studies to ascertain taxonomic relationships.

These conservation efforts resulted in the discovery of a remnant population of stickleback in Shay Creek, San Bernardino County, establishment of additional stickleback populations and a potential change in the taxonomic status of one or more of the recognized extant populations. USFWS policy with respect to proposed taxonomic revisions is to await acceptance and publication in a reputable scientific journal before initiating changes in the management of listed species.

Ongoing management activities include identifying appropriate reintroduction sites for sticklebacks from both the Soledad Canyon and Shay Creek populations and facilitating transplants to those sites.

**The population trend of this species is unknown.**

*Susan Ellis*

## Rough sculpin

*(Cottus asperrimus)*

CA - Threatened (1974)
FED - Candidate 2 (1982)

General Habitat:
- Sacramento/San Joaquin Drainage
- Large Streams

The rough sculpin is the smallest member of the family Cottidae in California. It is identified by its relatively narrow body shape and extremely rough skin. Rough sculpins are threatened by nature of their restricted range. They occur only in Shasta County in the Pit River immediately above and below the falls at Burney, as well as in Hat Creek and the Fall River and its tributaries. Populations in lower Hat Creek and the Fall River are probably benefitted by management of those streams as wild trout streams and the efforts to protect the Shasra crayfish. Siltation from dredging and bank erosion caused by grazing pose some threats to this species. No management or recovery actions are being considered at this time.

**Population status is unknown.**

*Carla Markmann*

Although the population is generally maintaining itself, there are some indications of possible long-term decline. The 1991 population was lower than the previous count in 1986. However, total population size may be quite variable from year to year. The number of sites with pairs is declining slightly; small populations may have been lost in at least two sites. Long-term population changes at many sites have varied greatly, undergoing decided declines in some, strong increases in others and more diverse fluctuations in others. Most of the 13 largest populations (those with at least 50 pairs recorded on any survey) have tended to increase in population size since the 1970s, but most of the smaller populations are remaining relatively stable or are clearly declining. From 1986 to 1991, populations declined at 13 marshlands.

Adverse impacts have included filling, dredging and development of wetlands; loss of regular tidal connection with the ocean and inconsistent tidal influence in the upper marsh; flooding or other disruptions in the natural drainage of coastal wetlands because of upstream development or flood control; and human disturbance, including trampling of marsh vegetation. Also, there are concerns about the impact of exotic predators in marshes, especially domestic cats and red foxes.

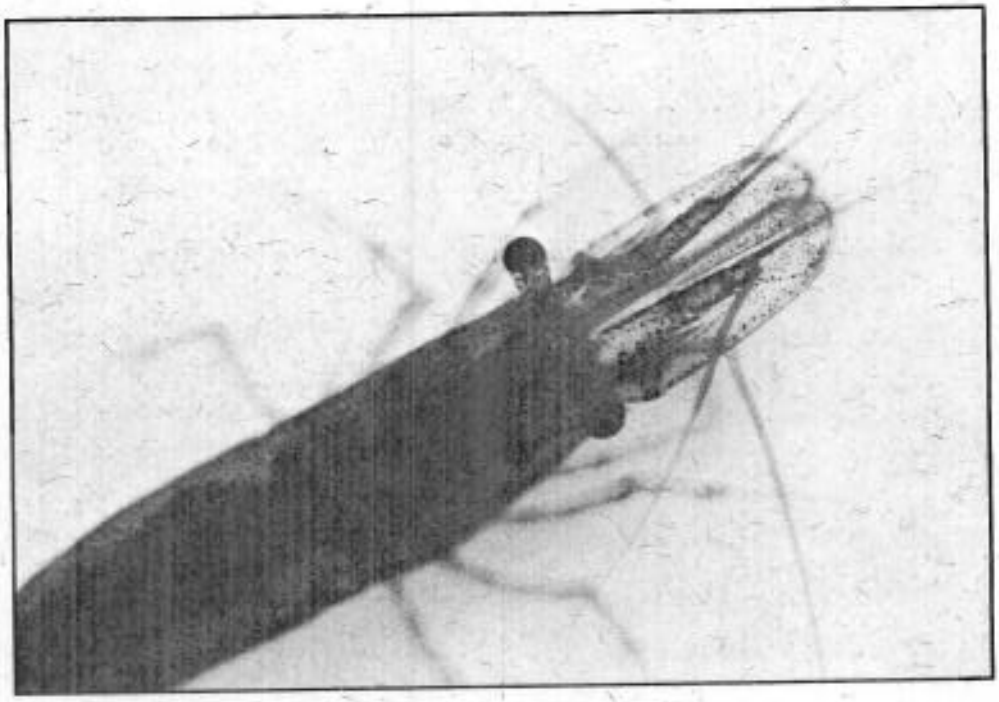
The management needs of this sparrow include protection and enhancement of tidal marshes, particulary the upper salt marsh habitat on military bases, federal refuges and State-owned wetlands; protection of upper marsh habitats in other salt marshes through acquisition for public ownership or through cooperative management programs; restoration of pickleweed vegetation and marsh systems degraded by human activities; maintenance or restoration of regular tidal action to promote renovation of upper marsh vegetation; and statewide breeding population surveys approximately every five years to determine trends in distribution, population size and habitat condition. Major funding for the 1991 survey was provided by the State Endangered Species Tax Check-off funds. Resource agencies have been conducting special population surveys at several of the major sites. Genetic relatedness of isolated populations of this subspecies is being investigated by U.C. Santa Barbara.

This subspecies is a Federal *Category 2* animal that is being considered for listing as endangered or threatened under the Federal Endangered Species Act.

**The population status has been generally stable since the late 1970s.**

*Ron Jurek*

# INVERTEBRATES



California freshwater shrimp - photo by Darlene McGriff

## Trinity bristle snail
*(Monadenia setosa)*

CA - Threatened (1980)
FED - Candidate 2 (1984)

General Habitat: • Riparian

This is a medium-sized (25 mm), dull surfaced, brown to chestnut-colored snail with a lighter peripheral band. The shell has short, translucent bristles from which the snail derives its name. It occurs exclusively in Trinity County in riparian habitat along Swede, Big, French and Little Swede creeks. Habitat disturbance, including mining and watershed erosion due to logging, threatens this species. There is no active management for the species.

**The population trend of this species is unknown.**

*Carla Markmann*

## California freshwater shrimp
*(Syncaris pacifica)*

CA - Endangered (1980)
FED - Endangered (1988)

General Habitat: • North/Central Coastal
• Low Gradient Streams

This is a small shrimp which seldom exceeds 50 mm total length. Males and juveniles are translucent to nearly transparent. Females may be translucent, but often are dark reddish-brown to nearly black. It is distributed in small stretches of 14 low gradient streams in Marin, Sonoma and Napa counties. One new population and one population thought to be extripated in the 1950's were discovered in 1991. The species continues to be endangered by water diversion, watershed erosion, stream sedimentation, riparian removal, agricultural development, grazing and urbanization. The shrimp was listed as federally endangered in 1988. A study to determine current distribution, relative shrimp abundance, shrimp movement within streams, phenology and pool quality is being conducted with funding from the Tax Check-off Program. The 1990 proposal for USFWS funds to conduct a taxonomic analysis has been withdrawn based on other priorities.

**Population trends are not known.**

*Susan Ellis*

## Shasta crayfish
*(Pacifastacus fortis)*

CA - Endangered (1980)
FED - Endangered (1988)

General Habitat: • Pit River Drainage
• Streams

The Shasta crayfish is a small to medium size crayfish. It is a relatively long-lived species, slow to mature (five years) and with low fecundity. The usual color is dark brownish-green to dark brown dorsally and bright orange ventrally. Populations are small and restricted to Shasta County in the Pit River Drainage, including tributaries of the Hat Creek and Fall River subdrainages. It is endangered by competition for food and space with exotic crayfish species, habitat loss from water diversion and impoundments, and predation.

The recent status survey, partially funded by Tax Check-Off monies, indicates that at least one exotic competing species, the signal crayfish (*Pacifastacus leniusculus*), has greatly expanded its range since the last comprehensive crayfish survey of about 12 years ago. The signal crayfish replaced the Shasta crayfish at four locations and overlaps with it in four new locations. One of the largest known populations of Shasta crayfish, estimated to number 2,000-3,000 individuals in 1978 now numbers about 100. The total population is believed to number less than 2,000.

Little is known of the biology or ecological requirements of the Shasta crayfish. The recent study indicated that Shasta crayfish exhibit some distinctive water quality preferences. The Shasta Crayfish Working Group has put a high priority on completing studies over the next 2 to 3 years that will identify species specific needs and provide for the development of a species management/recovery plan. Reserach in 1992 will focus on interspecific affects and habitat preferences.

**While stable at certain isolated springs primarily on private lands, overall Shasta crayfish population is declining.**

*Carla Markmann*

# PLANTS

Tree-anemone - photo by Susan Cochrane

# ANNUAL SUMMARY OF PLANTS CONSERVATION ACTIVITIES

The Department's Endangered Plant Program (EPP) has responsibility for the protection, management and recovery of California's 210 designated endangered, threatened and rare native plants and their habitats. Activities are undertaken in three broad categories: (1) species assessment, listing and delisting; (2) protection and management; and (3) education.

## Assessment/Listing/Delisting

Sonoma Sunshine (*Blennosperma bakeri*), a candidate plant species, was designated an endangered species by the Fish and Game Commission in August of 1991. Sonoma Sunshine is restricted to vernal pools and swales in Sonoma County.

The California Native Plant Society (CNPS) petitioned for State-listing of three plants, San Mateo woolly sunflower (*Eriophyllum latilobum*), white-rayed pentachaeta (*Pentachaeta bellidiflora*), and Marin dwarf flax (*Hesperolinon congestum*) in March 1991. All three were adopted as candidate species by the Commission following a Departmental recommendation. The three species occur in San Mateo County; Marin dwarf flax also occurs in Marin County.

CNPS petitioned for State-listing of three additional plants in August 1991. Two of these, Chorro Creek bog thistle (*Cirsium fontinale* var. *obispoense*) and Morro manzanita (*Arctostaphylos morroensis*), are endemic to western San Luis Obispo County; the third, Vail Lake ceanothus (*Ceanothus ophiochilus*), is known from only one site in southwestern Riverside County. The Commission adopted Chorro Creek bog thistle and Morro manzanita as candidate species in December 1991. Vail Lake ceanothus was denied candidacy in early January of 1992.

Five year reviews were written for the following species: Bakersfield saltbush (*Atriplex tularensis*), Kaweah brodiaca (*Brodiaea insignis*), white sedge (*Carex albida*), Springville clarkia (*Clarkia springvillensis*), Ferris' bird's-beak (*Cordylanthus palmatus*), Ione buckwheat (*Eriogonum apricum* var. *apricum*), Irish Hill buckwheat (*Eriogonum apricum* var. *prostratum*), and Pitkin Marsh lily (*Lilium pitkinense*).

## Protection/Management Coordination

DFG staff administered nine ongoing contracts and received funding for seven new contracts with public agencies and other organizations to conduct protection and recovery activities for State-listed plant species. These projects were funded through public donations made to the California Endangered Species Tax Check-off Fund, from monies provided by the U.S. Fish and Wildlife Service (USFWS) under provisions of Section 6 of the Federal Endangered Species Act, and through Tobacco Tax money.

These projects include surveys for and monitoring of rare plant species, protection and recovery efforts, preparation of management plans, biological research, and public education. Among this year's projects, carried out primarily using California Endangered Species Tax Check-off funds, were:

- Continuation of an analysis of the success of mitigation projects involving transplantation or translocation of State-listed species (Contract with San Francisco State University);
- Research on the population status and management of three State-listed plants in the San Joaquin Valley, Springville clarkia (*Clarkia springvillensis*)(E), striped adobe lily (*Fritillaria striata*)(T) and Tulare pseudobahia (*Pseudobahia peirsonii*)(E) (Contract with Fresno State University);
- Continued ecological research and monitoring of two State-listed Endangered plant species, Cuyamaca Lake downingia (*Downingia concolor* var. *brevior*) and Parish's meadowfoam (*Limnanthes gracilis* var. *parishii*) (Contract with San Diego State University);
- Baseline monitoring, demographic and reproductive studies of the Fish Slough milkvetch (*Astragalus lentiginosus* var. *piscinensis*) (Contract with University of California, Santa Barbara, using Tobacco Tax funds);
- Continuation of on-site protection, monitoring, and public education for a grove of Catalina ironwood (*Lyonothamnus floribundus* ssp. *floribundus*), a narrowly restricted endemic species that occurs naturally only on Santa Catalina Island. (Contract with Catalina Island Marine Institute).

The Department worked with The Nature Conservancy (TNC) using Tax Check-off money to implement the following projects:

- Research on the ecology/biology of three species of *Brodiaea* found on the Santa Rosa Plateau (Riverside County);
- Habitat protection and restoration and educational activities at the Mad River Slough Cooperative Management Area (Humboldt County);
- Habitat protection (fencing, signing, and erosion control) at TNC's McGinty Mountain Preserve (San Diego County);
- Habitat protection and development of an interpretive trail and guide at TNC's Jepson Prairie Preserve (Solano County);
- Protection of rare dune habitat through installation of a gate and fences and preparation of interpretive signs at Nipomo Dunes Preserve (San Luis Obispo County);
- Fencing, trail construction, and restoration of natural hydrology for the vernal pools at Santa Rosa Plateau Preserve (Riverside County);

Ongoing and new projects funded by the Section 6 grant-in-aid program administered by the USFWS include:

- Research on the ecology/biology of San Mateo thornmint (*Acanthomintha obovata* ssp. *duttonii*) and Ferris' bird's- beak (*Cordylanthus palmatus*);
- Habitat studies and monitoring of Ferris' bird's-beak (*Cordylanthus palmatus*) at Springtown wetlands near Livermore (Alameda County);
- Vernal pool habitat restoration at Miramar Mounds National Natural Landmark (San Diego County);
- Implementation of the second phase of the reintroduction effort for the State and Federally endangered large-flowered fiddleneck (*Amsinckia grandiflora*);
- Census surveys of Kern mallow (*Eremalche kernensis*) and San Joaquin wooly-threads (*Lembertia congdonii*);
- Research on the ecology and management needs of California jewelflower (*Caulanthus californicus*).

A rare plant habitat restoration project was initiated at Samoa Peninsula, Humboldt County. This project, which is a continuation of restoration efforts begun by The Nature Conservancy, will restore dune habitat that supports two State-listed endangered plant species, Menzies' wallflower (*Erysimum menziesii*) and beach layia (*Layia carnosa*). Off-highway vehicle (OHV) use in the past resulted in loss of dune habitat and the spread of nonnative plants at this site. The project is being funded by the Department of Parks and Recreation under an agreement with DFG, using funds that have been allocated for OHV projects.

The Shell Oil Spill Litigation Settlement Trustee Committee awarded the DFG $54,000 to accomplish Phase I of a proposed study of the restoration and recovery of Mason's lilaeopsis (*Lilaeopsis masonii*), a State-listed rare plant. The award is in response to a 1988 oil spill that resulted in the contamination of at least two populations of Mason's lilaeopsis, a small perennial herb in the carrot family (Apiaceae) that is endemic to the Sacramento-San Joaquin River Delta. Phase I of the study will consist of a thorough literature review and a field study to determine the distribution, abundance, and health of oiled populations. During Phase II of the study, restoration and enhancement needs and methods will be determined, and a restoration and conservation plan will be developed.

Memoranda of Understanding (MOU) governing research projects involving State-listed plant species were finalized between the Department and the following organizations for the species named:

(1) Sonoma State University for Sonoma sunshine (*Blennosperma bakeri*);

(2) UC Mosquito Control Research Lab for tree-anemone (*Carpenteria californica*);

(3) University of California, Berkeley for California jewelflower (*Caulanthus californicus*);

(4) San Diego State University for short-leaved dudleya (*Dudleya brevifolia*);

(5) The Nature Conservancy for Menzies' wallflower (*Erysimum menziesii*);

(6) San Jose State University Moss Landing Marine Laboratories for sand gilia (*Gilia tenuiflora* ssp. *arenaria*);

(7) San Francisco State University for Mason's lilaeopsis (*Lilaeopsis masonii*);

(8) CalTrans, District 1, for Baker's meadowfoam (*Limnanthes bakeri*);

(9) The Nature Conservancy to examine methods of controlling a nonnative perennial, *Lippia nodiflora*, in vernal pool habitat at Jepson Prairie Preserve; and

(10) CalTrans, USFS, USFWS, BLM, and PG&E to address the protection and management needs of all sensitive plant species within the Merced River Canyon area, which includes the Merced clarkia (*Clarkia lingulata*), a State-designated endangered species.

Mitigation Agreements (MA) governing mitigation efforts for projects adversely affecting State-listed plant species are being negotiated between the Department and the following organizations for the species named: (1) All American Pipeline Company for Gaviota tarplant (*Hemizonia increscens* ssp. *villosa*); (2) Olympia Quarry for Santa Cruz wallflower (*Erysimum teretifolium*); (3) Pebble Beach Company for Tidestrom's lupine (*Lupinus tidestromii* var. *tidestromii*), Menzies' wallflower (*Erysimum menziesii*) and beach layia (*Layia carnosa*).

The Department continued to work with local, State and Federal agencies, conservation organizations and other interested parties to develop coordinated habitat conservation programs for endangered plant and wildlife resources throughout California. Highlights of these include:

- Coordination with the California Native Plant Society and the El Dorado County Planning Department to develop strategies for protecting endangered plant habitat near Cameron Park. It was agreed that the ongoing update of the County General Plan should address rare plant habitat conservation and that interim efforts are needed to mitigate impacts from current development proposals.

- Continued participation in the City of Livermore's Interagency Working Group (composed of agency representatives, conservation representatives and agents for landowners), to protect the Springtown wetlands population of Ferris' bird's-beak (*Cordylanthus palmatus*). Progress was made on several fronts. A wetland mitigation bank, the first developed in California, has been incorporated and will soon begin selling mitigation credits to local developers.

- Continued involvement in meetings of the Vandenberg AFB Technical Advisory Committee that is guiding mitigation efforts for impacts to wetlands, dune habitat and rare plants resulting from construction of test facilities for the Peacekeeper Missile. The Department reviewed the final Mitigation Plan for wetlands and adjacent coastal dune habitat at San Antonio Terrace on Vandenberg Air Force Base in Santa Barbara County. Implementation and monitoring of mitigation activities is ongoing. Two wetlands totaling slightly less than 10 acres have been created, and upland mitigation, consisting of exotic species eradication and reintroduction of native coastal scrub species, is progressing.

- Discussion with the City of Napa and local CNPS members to initiate restoration of rare plant habitat adjacent to Lake Hennessey in Napa County. This site, the largest of only three occurrences of the State-listed threatened Clara Hunt's milkvetch (*Astragalus clarianus*), was inadvertently covered with soil during the City of Napa's efforts to deepen Lake Hennessey.

- Continued involvement in the Sonoma County Vernal Pools Task Force which is discussing regional conservation of vernal pools and associated endangered plants in Sonoma County. The Task Force has developed a Memorandum of Understanding (MOU) which specifies how the interested parties will cooperate to protect the region's vernal pools.

- Participation in the San Joaquin Valley Endangered Species Planning Group. The group includes agency, university and conservation group representatives. The main focus is the development of a regional planning effort to conserve the species and habitats of the Valley. One outcome will be the preparation of a conservation "roadmap" that identifies top-ranking sites for preservation. This "roadmap" would be used by agencies to assure that mitigation plans now being negotiated will include the habitats that are most in need of protection.

- Coordination with the USFWS to discuss cooperative protection efforts for a portion of Otay Mesa, which supports some of the best remaining vernal pools in San Diego County, as well as coastal sage scrub, native grasslands and maritime succulent scrub, all considered to be rare natural communities.

- Continued participation in the BLM's Nationwide Rare Plant Management Team to finalize the format and content of a report on the BLM Special Status Plants and Natural Communities Program.

- Continued efforts to secure protection for Scott's Valley spineflower (*Chorizanthe robusta* ssp. *hartwegii*) habitat through early consultation with project sponsors in the Scotts Valley area of Santa Cruz County.

# Education

In response to the need for a readable and informative reference on endangered species for the general public, the Department, the California Academy of Sciences, and the California Native Plant Society are co-publishing a book about California's endangered plants which will cover over 200 rare, threatened, or endangered plants and feature excellent color photographs. The book will focus on conservation of California endangered plants and their habitats and what the public can do to help. The Department has finalized overall project and concept planning for the book. Pre-production work, including a photosearch, is well underway, and final copy is expected to be completed by Summer 1992. The Department plans to distribute copies of the book to every public school district in California.

The Department continued outreach activities to increase public awareness of endangered plant conservation efforts and to improve public support and participation. Presentations were given to the following groups: California Native Plant Society, Cuesta College Biology Department as part of an environmental seminar series, US Forest Service's Pacific Southwest Region Biologists Training Symposium, Anza Borrego State Park Natural History Association, science staff of the California Department of Health Services, the Annual Meeting of the American Association for the Advancement of Science, Pacific Division, and the Riverside County Board of Supervisors.

DFG staff participated in panel discussions at the Natural Resources Management section of CSU Chico's Biological Sciences Career Day.

DFG staff contributed articles on vernal pools, the western lily (Lilium occidentale), and the Endangered Species Education Project to *Wildlifelines*, a newsletter promoting the California Endangered Species Tax Check-off Fund.

The Department continued to work with the Department of Education to launch the Endangered Species Education Project. This educational project is a statewide competition in which elementary and junior high schools are encouraged to adopt a nearby endangered species, design projects to educate the community about the threats to the endangered species, and develop an action plan for the local community to preserve the species' habitat. The Department's 1991 contributions to this project included:

- Publication of "California's Vanishing Flora, a Curriculum Guide to Endangered Plants of California" and its distribution to County Offices of Education, California School District offices and Instructional Material Display Centers.

- A presentation given by DFG Staff to the California Wildlands Program Supervisors about the adopt-a-species program and their future role in facilitating this project.

- Coordination of a California Conservation Corps public service effort to collate 8300 packets of educational materials which will be distributed to the public schools this Fall. This educational packet includes DFG's new book, *California's Wild Heritage*, and the *Endangered Species Education Resource Guide* developed to aid educators in their participation in the project.

DFG's new traveling display, featuring informational materials and colorful photographs of some of California's threatened and endangered flora, was exhibited at the CNPS Mount Lassen Chapter's Wildflower Show in Chico and at the Annual Meeting of the American Association for the Advancement of Science, in Logan, Utah.

# ENDANGERED PLANTS 1991 SUMMARY

## MITIGATION/MANAGEMENT/RECOVERY ACTIONS

| TYPE OF ACTION | NUMBER OF SPECIES RECEIVING ACTION |
|---|---|
| Habitat Acquisition | 2 |
| Management Plans | 7 |
| On-the-ground Protection/Maintenance | 34 |
| Monitoring | 47 |
| Experimental Reintroductions | 1 |
| Mitigation-related Transplants | 0 |
| Research | 16 |

# PLANT SPECIES ACCOUNTS

Laguna Beach dudleya - photo by Reid Moran

## San Diego thorn mint
*(Acanthomintha ilicifolia)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat:
- Chaparral
- Coastal Scrub
- Valley and Foothill Grassland

San Diego thorn mint is a small, aromatic annual in the mint family (Lamiaceae) with delicate white and rose colored flowers. The lower halves of its leaves are wedge-shaped and its flower clusters are covered by prominently spined bracts. The thorn mint genus occurs almost exclusively in California and every taxon within the genus is rare. This species is found on heavy clay soils near vernal pools, in grasslands, and in the chaparral and coastal sage scrub of San Diego County and northern Baja California. In addition to private ownership, populations occur on the Cleveland National Forest, TNC, BLM, Navy, and City of San Diego parks lands. In the last few years twelve new populations have been discovered in San Diego County, mostly during botanical surveys for housing developments.

Thirty natural San Diego thorn mint populations remain and fifteen have been extirpated in San Diego County. Most of the historical, extirpated populations were in the now highly developed areas adjoining the City of San Diego. Development on the mesa bluffs within the last 100 years has reduced suitable habitat in the San Diego area by 90 percent. This plant is also extirpated from its historical sites in Ventura County. Threats are largely urbanization and off-road vehicles. Due to urbanization, several sites were lost in 1988 and 1989, and one of the best remaining sites was severely damaged by illegal road building in Penasquitos Canyon. DFG now has a mitigation agreement for restoration of that area. A small site was purchased by The Nature Conservancy at McGinty Mountain in 1989. Habitat acquisition and active management are essential for the preservation of this species. Several attempts at experimental transplantation have been made with generally disappointing results. One of these transplanted populations now resides in the Native Plant Garden at the San Diego Wild Animal Park. Seeds of this species are banked at Rancho Santa Ana Botanic Garden. In 1991 a Species Management Guide was prepared for plants on the Cleveland National Forest. Also in 1991, the San Diego Biodiversity Project prepared a report on the status of San Marcos area vernal pools, many areas around which contain this species.

**The overall trend and the recent trend for San Diego thorn mint is one of rapid decline.**

## San Mateo thorn mint
*(Acanthomintha obovata* **ssp.** *duttonii)*

CA - Endangered (1979)
FED - Endangered (1985)

General Habitat:
- Chaparral
- Valley and Foothill Grassland

San Mateo thorn mint is a small, aromatic annual herb in the mint family (Lamiaceae) covered with minute grayish hairs. Its white and purple-tinged flowers occur in clusters covered by spiny bracts. This genus is almost entirely restricted to California and all of its taxa are rare. San Mateo thorn mint is known only from serpentine grassland, a specific habitat of soils derived from serpentine rock.

Historically, San Mateo thorn mint was known from five occurrences in the Crystal Springs region of San Mateo County. Only two of the original populations remain; the rest were extirpated by urbanization. One small population, in a serpentine grassland within Edgewood County Park, is directly downhill from a housing development. This population is threatened by altered drainage patterns and changes in water chemistry caused by the change in land use. San Mateo County has installed protective barriers to reduce off-road vehicle damage to the Edgewood Park population. In 1987, a second population of fewer than 50 plants was discovered in the Edgewood Park area. Population sizes vary from year to year due to local rainfall and competition from nonnative plants. Under a contract with DFG, Federal Section 6 funds are currently supporting studies of this species' seed production, germination and growth requirements. Information from these studies will be used to develop San Mateo thorn mint recovery projects. To protect this taxon from extinction, both populations must be preserved and reintroduction into suitable habitat should be pursued.

**The overall trend for San Mateo thorn mint is one of continued decline.**

## Marin bent grass
*(Agrostis blasdalei* **var.** *marinensis)*

CA - Rare (1978)
FED - Candidate 2

General Habitat:
- Coastal Prairie

Marin bent grass, a member of the grass family (Poaceae), has erect stems and slender leaves. Its green flowers occur in narrow, spikelike clusters. This variety grows on a decomposed granite outcrop at a single location in Marin County. It is very closely related to Blasedale's bent grass (*Agrostis blasdalei* var. *blasdalei*), which is found in northern coastal dunes.

The continued existence of Marin bent grass is precarious. The single known population consists of just over a dozen individuals growing in a popular parking area for picnickers. It is likely that this population was once larger, and that it has declined due to vehicle use in the area. Because Marin bent grass occurs on private land near the junction of two roads, it is vulnerable to road maintenance and improvement activities. In addition, this single surviving population could be eliminated by a chance event such as a fire. There are no management efforts in effect to protect this plant. Marin bent grass is critically endangered at its only known occurrence and should be considered for reclassification as threatened or endangered.

**The trend for Marin bent grass is one of stability to decline.**

## Munz's onion

*(Allium fimbriatum* **var.** *munzii)*

CA - Threatened (1990)
FED - Candidate 1

General Habitat:
- Coastal Scrub
- Pinyon-Juniper Woodland
- Valley
- Foothill Grassland

Munz's onion is a small, bulb-bearing perennial herb in the amaryllis family (Amaryllidaceae) with white, aromatic flowers. Plants are restricted to clay soils in the rapidly disappearing grasslands of western Riverside County. It shares its range and habitat with a similar appearing onion, the red-skinned onion (*Allium haematochiton*). The two species occur within several feet of each other at some sites, but do not interbreed. Most Munz's onion populations occur on private land.

The rapidly accelerating urbanization of western Riverside County poses a severe threat to Munz's onion. Approximately 80 to 90 percent of its historical habitat has been destroyed by human impacts. Remaining populations are fragmented and isolated, and are threatened by active clay mining, urbanization, agriculture, road construction, sheep grazing, off-highway vehicle activity, discing for fire control, competition from weedy exotic grasses, and a proposed reservoir expansion. In 1991 three new populations were discovered on Elsinore Peak in the Cleveland National Forest, and two more were reported on private lands outside the Forest. This survey, partially supported by California Endangered Species Tax Check-off funds, also identified suitable areas for future recovery efforts.

**The overall trend for Munz's onion is one of decline.**

## Yosemite onion

*(Allium yosemitense)*

CA - Rare (1982)
FED - None

General Habitat:
- Broadleaved Upland Forest
- Chaparral
- Cismontane Woodland
- Lower Montane Conifer Forest

Yosemite onion, a member of the amaryllis family (Amaryllidaceae), is a perennial herb that grows from a bulb. It produces two linear basal leaves, and its rose or white flowers occur in an umbel at the end of a leafless stem. The species occurs on open, steep, rocky slopes of metamorphic or granitic rock in the central Sierra Nevada. Populations occur in Mariposa and Tuolumne counties.

Yosemite onion is known from less than 20 occurrences on Federal lands within Yosemite National Park and in the Sierra and Stanislaus National Forests. Although plants could be eaten or trampled by hikers and climbers, especially around Bridalveil Falls in Yosemite National Park, the sites are generally inaccessible. Populations occurring in the vicinity of recent forest fires should be monitored to determine impacts of fire on the habitat. There are no management plans in effect for this species.

**The trend for Yosemite onion is one of stability or increase.**

## Large-flowered fiddleneck

*(Amsinckia grandiflora)*

CA - Endangered (1982)
FED - Endangered (1985)

General Habitat:
- Cismontane Woodland
- Valley and Foothill Grassland

Large-flowered fiddleneck, the rarest of the ten California species of *Amsinckia*, is an erect, coarsely hairy annual herb in the borage family (Boraginaceae). The large orange-red flowers are borne on a stalk curved like the neck of a fiddle. The historic distribution of this species included the dry inland hills of Alameda, Contra Costa and San Joaquin coun-

ties. At present, it is known from just two areas. The first population is southeast of Livermore at Lawrence Livermore National Laboratory's (LLNL) "site 300". This locale consists of two subpopulations: the Droptower, (92 plants censused in 1991) and Draney Canyon (29 plants recorded in 1991). The Droptower subpopulation has declined since 1988 from a high of about 350 plants. In the 1960s the Droptower site supported several thousand plants. In April of 1991 a previously unknown population of about 3000 large-flowered fiddleneck plants was discovered on private land in western San Joaquin County.

USFWS's draft Recovery Plan for large-flowered fiddleneck recommends that the LLNL population be enhanced to support at least 2500 individuals and that a minimum of four additional populations, each of 2500 plants, be established from seed within the historic range of the species. DFG has worked with Dr. Bruce Pavlik of Mills College since 1987 to implement this recovery program, funded with federal Section 6 grant-in-aid and California Endangered Species Tax Check-off funds. Initial studies included (1) development of seed propagation techniques, (2) growth, harvest and storage of a garden-grown seed supply, (3) characterization of the natural habitat, and (4) selection of optimal reintroduction sites. In 1989-90 the first attempt was made to reestablish the plant at Black Diamond Mines Regional Preserve in Contra Costa County. This experiment used a precision planting technique to seed 20 plots of four treatment types (burn, clipped, herbicide, control), and used intensive demographic monitoring to trace the results. In 1990, of 3200 seeds planted, 1100 plants survived to maturity and produced 35,000 seeds. In 1991 this population increased slightly and produced large amounts of seed. In 1990-91 three additional experimental reintroductions were attempted on public and private lands. Initial results indicate that two of these may survive over the long-term. Two more reintroductions are underway in 1991-92. All natural and reintroduced populations are monitored annually. Five to ten years of monitoring data will be required before the long-term viability of these efforts can be determined.

Overall population size of large-flowered fiddleneck at LLNL has declined precipitously since the 1960s. There is no trend data for the newly reported population and the long-term success of recent recovery efforts is unknown.

**Although the total population size of this plant has recently increased, the trend for large-flowered fiddleneck continues to be one of stability to decline.**

# McDonald's rock cress

*(Arabis macdonaldiana)*

CA - Endangered (1979)
FED - Endangered (1978)

General Habitat: • Lower Montane Conifer Forest

McDonald's rock cress, a member of the mustard family (Brassicaceae), is a small rosette-forming perennial herb with light purple flowers and erect flattened seed pods. It is restricted to serpentine soils in open, rocky areas of montane coniferous forests, often growing in rock crevices or on sites with naturally high soil disturbance (such as steep unstable slopes). Intolerance to interspecific competition seems to be the primary factor limiting the natural distribution of this species. McDonald's rock cress is known in California from Red Mountain in Mendocino County and from Del Norte County; it also occurs in Curry County, Oregon. Other rare taxa known to occur on the serpentine soils of Red Mountain include the State-listed endangered Kellogg's buckwheat (*Eriogonum kelloggii*) and Red Mountain catchfly (*Silene campanulata* ssp. *campanulata*) as well as the unlisted but rare Red Mountain stonecrop (*Sedum laxum* ssp. *eastwoodiae*). McDonald's rock cress on Red Mountain in Mendocino County is known from only two occurrences. The species is slightly less restricted in Del Norte County, with nearly twenty occurrences there.

The main threat to this species is mining of the significant nickel and chromium deposits under or adjacent to populations. Mining companies have unpatented mining claims in this species' range in both counties. In addition to direct impacts, the indirect effects of strip mining and nickel extraction operations (erosion and acid rain) would endanger all of the populations located on the North Fork of the Smith River in Del Norte County. A second threat is a 1991 proposal to open some BLM McDonald's rock cress habitat to ORV use. The USFWS recognizes only the populations on Red Mountain as McDonald's rock cress; they consider the Del Norte occurrences hybrids or another taxon. More taxonomic work on the northern populations is needed. In 1991, Six Rivers National Forest personnel assisted researchers in collection of fruits for further taxonomic work. McDonald's rock cress occurs on private and BLM lands in Mendocino County and on USFS land in Del Norte County. Due to the unique assemblage of rare plants, BLM has designated Red Mountain as an Area of Critical Environmental Concern. A report was prepared by BLM in 1984 on the population dynamics and reproductive biology of McDonald's rock cress in the Red Mountain ACEC. USFWS finalized a recovery plan for the species at Red Mountain in 1991.

**The general trend for McDonald's rock cress is one of stability, but because mining claims exist over much of its restricted habitat, this species continues to warrant listing as endangered.**

## Baker's manzanita

*(Arctostaphylos bakeri)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Broadleaved Upland Forest
• Chaparral

Baker's manzanita is an upright evergreen shrub in the heath family (Ericaceae) with pinkish flowers, dark purple bark, pungent leaves and bright red fruit. Its branchlets and leaves have sticky glandular hairs, and its flower stems are hairless. This species is largely restricted to serpentine soils in the localized chaparral communities of Sonoma County. Nine of the eleven known occurrences are on private land, with the remaining two owned by DFG and CNPS.

Most populations are clustered in the area near Occidental, Sonoma County. In addition, Baker's manzanita was recently reported at CNPS's one acre Vine Hill Preserve, the only site for the State-listed endangered *Arctostaphylos densiflora* (Vine Hill manzanita). The chief threat to Baker's manzanita is residential development, followed by grazing, agricultural conversion, off-road vehicles, dumping, nonnative plant encroachment, and hybridization with common manzanitas. Two populations occur on land planned for development. Succession toward oaks and laurels, which shade out Baker's manzanita, is also occurring as a result of fire suppression at most locations. A management plan was completed for DFG's Harrison Grade Ecological Reserve in 1987 using California Endangered Species Tax Check-off funds. The Nature Conservancy negotiated a voluntary protection agreement with a private landowner for a nearby site on Harrison Grade Road.

**The overall trend for Baker's manzanita is one of steady decline, though recent protection efforts may slow population losses.**

## Vine Hill manzanita

*(Arctostaphylos densiflora)*

CA - Endangered (1981)
FED - Candidate 1

General Habitat: • Chaparral

Vine Hill manzanita is a prostrate evergreen shrub in the heath family (Ericaceae) with shiny green leaves, black branches, and small white to pinkish flowers in a many-flowered, branched flower stalk. It roots from nodes along its spreading branches and a single plant can reach several meters across. Vine Hill manzanita is restricted to the "Sonoma Barren," an area of acid marine sand deposits in western Sonoma County.

Over the last twenty years, Vine Hill manzanita has come perilously close to extinction. All but one population in the Vine Hill area have been destroyed by agriculture, residential development, or roadside weed abatement. The last known population, consisting of several mature individuals and a number of younger plants grown from cuttings, occurs on the California Native Plant Society's one acre Vine Hill Preserve. Plants at the preserve suffer from a persistent fungal disease and were damaged by the severe frosts of the 1990-1991 winter. A management plan exists for the preserve which recommends actions to recover Vine Hill manzanita. Suitable historic habitat should be acquired and a larger population established. It is unclear if recent efforts to recover this species will succeed.

**The overall trend for Vine Hill manzanita is one of decline to the brink of extinction.**

## Hanging Gardens manzanita

*(Arctostaphylos edmundsii* **var.** *parvifolia)*

CA - Rare (1981)
FED - Candidate 2

General Habitat: • Coastal Bluff Scrub, Chaparral

Hanging Gardens manzanita is a prostrate evergreen shrub without a basal burl, with glossy green leaves and bright red berries. This member of the heath family (Ericaceae) can be seen growing near the ocean on small eroded ridges and sandstone banks subject to strong onshore winds. The plant is so prostrate that it grows down perpendicular banks in closely adherent drapes. Further taxonomic work is needed to determine if Hanging Gardens manzanita is a good variety or just a local variant of *A. edmundsii*, which is also State-listed rare.

Hanging Gardens manzanita is known from only one privately owned site along the Big Sur coast in Monterey County. Possible threats are erosion, development pressure, and widening of Highway 101.

**The trend for Hanging Gardens manzanita is one of stability as it has always been known from only one occurrence in the world.**

## Hearst's manzanita

*(Arctostaphylos hookeri* ssp. *hearstiorum)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat:
- Maritime Chaparral
- Coastal Scrub
- Valley
- Foothill Grassland

Hearst's manzanita is an evergreen shrub in the heath family (Ericaceae) with shiny green leaves, tiny white flowers, and bright red fruits. This subspecies lacks a basal burl, and is found on grassy hills and mesas in open areas of coastal prairie and chaparral plant communities. It grows on sandy loam substrates which comprise old, stabilized sand dunes near the coast.

All of the five known occurrences of Hearst's manzanita are located in San Luis Obispo County on the Hearst Ranch. These five occurrences contain about 400 individuals. Land at the Hearst Ranch that supports this species is subject to grazing and clearing. Some sites have been burned and disced in an attempt to convert brushland to pasture. This species does not stump sprout after fire and needs time between fires for seedling establishment. There are no management plans for Hearst's manzanita and little is known of its biology. Protection planning will require full cooperation with the management of the Hearst property. Hearst's manzanita is in the nursery trade as an ornamental shrub.

**Due to land use practices at the Ranch, the trend for Hearst's manzanita is one of stability to decline.**

## Presidio manzanita

*(Arctostaphylos hookeri* ssp. *ravenii)*

CA - Endangered (1978)
FED - Endangered (1979)

General Habitat:
- Chaparral
- Coastal Prairie

Presidio manzanita is a prostrate evergreen shrub covered with fine gray hairs that produces round leaves and compact flower stalks of urn shaped white to pink flowers. This member of the heath family (Ericaceae) grows on shallow, rocky serpentine-derived soils in open areas with some exposure to fog within the Presidio of San Francisco. Historically, Presidio manzanita was known from three other sites in San Francisco County which were destroyed by urbanization in the late 1930's.

Currently, this taxon has been reduced to a single plant in the wild and approximately 50 transplanted cuttings at the Presidio. Road widening activities destroyed habitat in 1985, and competing vegetation was removed in 1986. Presidio manzanita is currently threatened by competition from nonnative species as well as vandalism and trampling by pedestrian traffic. Because only one wild individual remains, this manzanita is extremely vulnerable to chance catastrophes. The current conversion of the Presidio from Department of Defense to National Park Service jurisdiction leaves the direction of future Presidio land use uncertain. DFG, USFWS, NPS, and the Department of the Army entered into an MOU in 1987 to protect rare plants occurring on Presidio lands. DFG funded a recovery study using USFWS Section 6 grant-in-aid funding: "A Study of the Ecological Aspects Related to the Reintroduction of *Arctostaphylos hookeri* ssp. *ravenii*." Propagation and reintroduction efforts will be restricted to the Presidio as it is the only remaining historical habitat. Some of the cuttings which were transplanted in 1988 are growing vigorously and flowered for the first time in 1991.

**The overall trend for Presidio manzanita has been one of steady decline although recent recovery actions may help to stabilize the trend.**

## San Bruno Mountain manzanita

*(Arctostaphylos imbricata)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat:
- Coastal Scrub

San Bruno Mountain manzanita is a low evergreen shrub in the heath family (Ericaceae) with white flowers. This species lacks a basal burl, has branchlets with short spreading hairs, bright green, closely overlapping leaves, and fruit with glandular hairs. It forms dense, mat-like colonies on shallow soils derived from Franciscan sandstone, greywacke or shale. A member of the northern coastal scrub community, San Bruno Mountain manzanita is known only from the summit of San Bruno Mountain in San Mateo county. Another endangered species, Pacific manzanita (*Arctostaphylos pacifica*) also occurs near the summit of San Bruno Mountain. At present there are six small populations of San Bruno Mountain manzanita. Five of these occur within San Mateo County Park while one is lo-

cated on privately owned property. One new site for San Bruno Mountain manzanita was discovered in 1991.

Currently all land use on San Bruno Mountain is regulated by a Habitat Conservation Plan (HCP) that was adopted in 1983 and will remain indefinitely. Although all of the extant occurrences of San Bruno Mountain manzanita are protected under the HCP, San Bruno Mountain continues to face persistent urban development pressure. In addition, introduced nonnative species compete with native species for necessary resources and if left unchecked may encroach upon suitable San Bruno Mountain manzanita habitat. Because the seeds of this species require fire in order to germinate, the present wildfire suppression policy on the mountain may threaten the species' long term viability.

**The overall trend for San Bruno Mountain manzanita seems to be one of stability to slow decline.**

## Morro manzanita

*(Arctostaphylos morroensis)*

CA - Candidate Threatened (1991)
FED - Proposed Endangered (1991)

General Habitat: • Chaparral
• Coastal Dunes

Morro manzanita is an evergreen shrub in the heath family (Ericaceae), with clusters of white to pinkish flowers, shredding bark, and truncate leaves. This species lacks a basal burl. Morro manzanita is endemic to less than nine square miles at the southeast end of Morro Bay in western San Luis Obispo County. It ranges from the "elfin forest" area just southeast of Los Osos Creek to its southern limit in the Hazard Canyon area of Montana de Oro State Park.

Although the overall historical distribution of Morro manzanita has not changed significantly, it is estimated that the plant has been removed from approximately 50% of its original habitat. Today only about 2,000 individuals remain, largely on private land in areas of ongoing residential development. In the Los Osos area, where Morro manzanita once grew in a nearly solid stand, residential development since 1960 has resulted in significant habitat loss. Today only isolated individuals remain in much of this fragmented habitat area. Clearing for eucalyptus plantations around the turn of the century resulted in heavy losses of Morro manzanita in the Hazard Canyon area. Although Department of Parks and Recreation (DPR) staff have proposed eucalyptus removal in this area, spread of the trees remains a threat today. Small Wilderness Area Preservation (SWAP), a nonprofit organization, has preserved a small area of manzanita in the elfin forest in the northern portion of the species' range. This species was proposed for federal listing as endangered by USFWS in December, 1991.

**The overall trend for Morro manzanita is one of decline.**

## Pacific manzanita

*(Arctostaphylos pacifica)*

CA - Endangered (1979)
FED - None

General Habitat: • Coastal Scrub

Pacific manzanita is a low prostrate evergreen shrub in the heath family (Ericaceae) with white flowers. This plant has a basal burl, branchlets with fine hairs, pale green leaves with finely serrate margins, and fruits covered with short stiff hairs. The bark of Pacific manzanita cracks and flakes off (exfoliation) leaving the trunk a polished light tan. It is part of the north coast scrub community in two distinct, historically limited populations on San Bruno Mountain, San Mateo County.

One Pacific manzanita population is on private land where it is unprotected and is threatened by nearby residential development. The second population is within San Bruno Mountain County Park. Those rare species found within the County Park are protected by a Habitat Conservation Plan (HCP) which was adopted in 1983 and will be in place indefinitely. In addition to the threat of urbanization, long-term fire suppression has allowed other shrubs to encroach on Pacific manzanita habitat.

**The overall trend for Pacific manzanita appears to be one of stability to slow decline.**

## Alameda manzanita

*(Arctostaphylos pallida)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Chaparral

Alameda manzanita, a member of the heath family (Ericaceae) is a tall, erect evergreen shrub without a basal burl. It has branchlets with short bristly hairs, thin smooth, pale green leaves that clasp the stems, white flowers, and bright red fruits. This species occurs on east or south facing slopes in pure stands on somewhat sterile mineral soils. A member of the manzanita chaparral community, Alameda manzanita is found on the Sobrante and Huckleberry ridges of Alameda and Contra Costa counties.

There are seven isolated stands of Alameda manzanita in reasonably good condition and approximately six more in poor condition. These stands are largely owned by the East

Bay Regional Parks District with a few sites on private land. Residential development in the habitat, competition and shading from exotic plants, lack of fire for regeneration, and fungal disease outbreaks are serious threats to the survival of Alameda manzanita. Genetic introgression due to planting of exotic manzanitas nearby also threatens this species. A management plan, funded by the California Endangered Species Tax Check-off fund, was completed in 1987 by staff of the East Bay Regional Park District. The District is now seeking funding for implementation of the management plan.

**The overall trend for Alameda manzanita is one of decline although recent protection efforts initiated by the Regional Park may help to stabilize the trend.**

## Marsh sandwort

*(Arenaria paludicola)*

CA - Endangered (1990)
FED - Proposed Endangered (1991)

General Habitat: • Marshes and Swamps

Marsh sandwort is a perennial herb in the pink family (Caryophyllaceae). It has rooting, trailing stems and small white flowers which bloom from May through August. Historically, this species occurred in swamps, freshwater marshes, and other wet areas in widely disjunct localities in California and Washington. It occurred in four counties in the coastal region of Washington, as well as in San Francisco, Santa Cruz, San Luis Obispo, and San Bernardino counties in California.

Despite thorough searches, no populations of marsh sandwort have been verified in Washington in recent years. Eight of the nine known California occurrences have been eliminated by urbanization, off-road vehicle activity, and competition with nonnative plants. Today, the worldwide distribution of this species is one site in San Luis Obispo County, in Black Lake Canyon on the Nipomo Mesa. The entire extent of the species consists of fewer than ten plants in less than five square meters of habitat. Encroachment of nonnative eucalyptus trees and the proposed drilling of water wells upstream from the population are serious threats to the continued existence of this species. In addition, plants are extremely susceptible to chance events such as a fire, flood, disease outbreak, or landslide. The San Luis Obispo County Land Conservancy recently acquired twelve acres of habitat in Black Lake Canyon which may include marsh sandwort. San Luis Obispo County also designated a portion of Black Lake Canyon as a Sensitive Resource Area, though the boundaries of such an area can be altered by amendment to the County General Plan. In 1990, a preliminary management strategy for marsh sandwort was developed by DFG. A draft management plan for all of Black Lake Canyon is being prepared by the San Luis Obispo Land Conservancy.

**The trend for marsh sandwort is one of severe decline due to the destruction and degradation of its wetland habitat.**

## Humboldt milk vetch

*(Astragalus agnicidus)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Broadleaved Upland Forest

Humboldt milk vetch, a member of the pea family (Fabaceae), is a perennial herb up to a meter tall, with hollow stems, divided leaves, and many small white flowers on a branched flower stalk. The entire global distribution of this species is restricted to one occurrence of several small colonies on a private ranch south of Miranda in Humboldt County. The milk vetch was the target of an apparently successful weed eradication effort during the 1920s when this reportedly toxic plant was implicated in the death of lambs on the ranch. Subsequently, the plant was not seen after 1954 and was presumed extinct for many years. Several attempts to relocate the plant during the 1970s were unsuccessful.

In 1987, a few Humboldt milk vetch plants were located on the original ranch by botanists from the Department of Fish and Game, California Native Plant Society (CNPS) and the local community. Apparently, dormant seeds had persisted in the soil and were stimulated when a dead tree was felled and removed by the ranch owner a few years earlier. The resulting soil disturbance and opening of the tree canopy triggered seed germination and regeneration of the population. The landowner has since agreed to voluntarily protect the plants and has registered the site in The Nature Conservancy's (TNC) California Register of Natural Areas. Three portions of the population have since been fenced by TNC and CNPS volunteers and have been monitored annually. 1990 monitoring results showed a decrease in population size and an increase in plant size, indicating that the population has thinned and may be stabilizing. More years of monitoring are needed to substantiate this hypothesis. Research conducted separately on this population indicates that shade has a deleterious effect on growth. Under a

1990 Memorandum of Understanding (MOU) with DFG, The Nature Conservancy conducted research on the germination and growth requirements of the milk vetch. Upon completion of these laboratory studies, the study plants were grown to maturity, harvested and sent to the National Cancer Institute for preliminary screening to determine if the toxic properties of the plant have potential pharmacological value. Results from the tests showed no cancer or HIV activity, but some toxicity at higher doses. A 1991 report by TNC outlined current population status and management recommendations. Further studies are needed on genetic variation within the species to guide future management.

**In recent years, the trend for Humboldt milk vetch has been one of increase.**

## Clara Hunt's milk vetch

*(Astragalus clarianus)*

CA - Threatened (1990)
FED - Candidate 1

General Habitat: • Cismontasne Woodland
• Valley and Foothill Grassland

Clara Hunt's milk vetch is a small annual herb in the pea family (Fabaceae). It has up to nine leaflets per leaf and white, purple-tipped flowers which bloom in March and April. This species occurs in Napa and Sonoma counties on rocky clay soils in sparsely vegetated openings within blue oak woodland and grassland communities.

Only four small populations of Clara Hunt's milk vetch are known. Combined, these populations consist of several hundred individuals within about two acres of habitat. Habitat modification and destruction threaten the remaining occurrences. One historic population, near St. Helena in Napa County, was eliminated by urbanization and viticulture. The largest occurrence, near Lake Hennessey, was severely damaged in late 1990 by dredge material that was inadvertently dumped onto milk vetch habitat during a project by the City of Napa to enlarge the lake. Although site restoration has begun, the prospects for recovery and long-term survival of this population are unknown. Less than ten individuals were seen adjacent to the damaged area in 1991. Development of Lake Hennessey and the subsequent traffic from recreational users of the lake park has threatened this population in the past. Because Clara Hunt's milk vetch is an annual plant with extremely small populations, sites could be eliminated through random fluctuation in population size from year to year or other chance events such as drought, disease or fire. A management plan directing protection and recovery actions for this species is needed.

**The trend for Clara Hunt's milk vetch is one of decline as a result of habitat destruction and modification.**

## Long Valley milk vetch

*(Astragalus johannis-howellii)*

CA - Rare (1982)
FED - None

General Habitat: • Great Basin Scrub

Long Valley milk vetch is a slender-stemmed perennial herb in the pea family (Fabaceae) with divided yellow-green leaves and whitish, purple-veined flowers. It grows on gravelly or sandy soils derived from volcanic or travertine rock in the sagebrush scrub or alkali meadows of Long Valley in central Mono County.

Most of the dozen or so Long Valley milk vetch occurrences in California are subject to the effects of seasonal cattle grazing, although light to moderate grazing may not threaten this plant. Long Valley milk vetch is found on BLM and Inyo National Forest lands. Some sites have been monitored in a short-term grazing study. More extensive studies are needed to assess the long-term effects of grazing on population size and vigor. DFG staff visited three occurrences in 1989 and noted that the plants were being browsed at all sites.

**The trend for Long Valley milk vetch is probably one of stability to decline.**

## Sodaville milk vetch

*(Astragalus lentiginosus* **var.** *sesquimetralis)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Meadows and Seeps

Sodaville milk vetch, a member of the pea family (Fabaceae), is a prostrate perennial herb with divided leaves, an open inflorescence of purple flowers, and inflated, elongated seed pods. This species is restricted to moist alkaline clay flats around desert seeps and springs. There is only one known occurrence in California, at Big Sand Spring in Inyo County. Sodaville milk vetch also occurs at two sites in Nevada.

The California occurrence is owned and managed by the BLM. Trampling by burros that frequent the water holes at this site has been a major threat to Sodaville milk vetch. Other threats include trampling by pedestrians, and off-road vehicle disturbance. Also, any alteration to the hydrological regime at the springs where Sodaville milk vetch occurs could threaten the plants. A fence to exclude the burros was installed in 1985 around Big Sand Spring and included approximately 90 percent of the Sodaville milk vetch occurrence. The burros still occasionally gained access to the

fenced area by climbing a mound of dirt adjacent to the fence and jumping inside the exclosure; once inside the burros could not easily get back out. In 1990 the fence was repaired and moved away from the mound of dirt.

**Monitoring results over the past several years suggest that the trend for Sodaville milk vetch in California is one of stability to increase, but access to the population by feral animals should still be restricted.**

## Peirson's milk vetch

*(Astragalus magdalenae* **var.** *peirsonii)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Desert Dunes

Peirson's milk vetch is a stout herbaceous perennial that sprouts from a woody base, with leaves divided into numerous oval leaflets. This purple-flowered member of the pea family (Fabaceae) is covered with fine silky hairs and produces inflated pods. In California, this plant occurs on sand dunes in the Algodones Dunes system of Imperial County. Historically, it was known from Borrego Valley in San Diego County but it has not been seen there in years. Peirson's milk vetch also occurs in Baja California and Arizona.

Recreational off-road vehicle activity has destroyed a large portion of the vegetation in areas of the Algodones Dunes open to public use. The Bureau of Land Management has closed a portion of the Algodones Dunes to ORV use to protect rare plant species there. A recent dunes management plan estimates a doubling in ORV use in the next twenty years; this will heavily impact populations of Peirson's milk vetch and other endemic plants outside the closed area. A study of four sensitive dune species, completed in 1990 for the BLM, suggests that Peirson's milk vetch is the most susceptible to ORV use. Populations growing in areas open to ORVs showed significantly lower fruit production and overall vigor than those in restricted access areas. It is likely that this species has already been extirpated from San Diego County, so protection of remaining populations is crucial. Elimination of recreational vehicle impacts and monitoring of existing populations would improve survival chances for this species.

**The overall trend for Peirson's milk vetch is one of decline due to habitat destruction.**

## Mono milk vetch

*(Astragalus monoensis)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Great Basin Scrub
• Upper Montane Coniferous Forest

Mono milk vetch is a small, prostrate, grayish perennial herb in the pea family (Fabaceae), with white to pale pink flowers in small clusters and curved, papery pods. Plants are covered by soft hairs, and have leaves divided into several folded leaflets. This species is endemic to sagebrush scrub and Jeffrey pine-lodgepole pine forests of northern Mono County where it occurs on pumice flats in loose sandy or gravelly soil. Most sites are located within the Inyo National Forest or on BLM land. One new population was discovered in Inyo National Forest in 1991.

Although there are nearly twenty known Mono milk vetch occurrences, many of these sites are threatened by overgrazing and trampling by livestock. Researchers have stated that destruction of ground-dwelling bee pollinators by grazing animals could result in reduced reproduction levels for this species. Further information is needed on the long-term effects of grazing. Relocating water troughs, which concentrate livestock activity, out of habitat occupied by this species could result in improvement of general habitat conditions. ORV use has resulted in habitat degradation of some sites. Widening of State Highway 395 by CalTrans in 1989 destroyed portions of several sites. No mitigation was proposed or implemented for this project.

**The overall trend for Mono milk vetch is one of stability to decline.**

## Coastal dunes milk vetch

*(Astragalus tener* **var.** *titi)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Coastal Dunes

Coastal dunes milk vetch is a low, dwarf annual plant in the pea family (Fabaceae). It has slender stems, leaves divided into wedge-like or oval leaflets, terminal clusters of purple flowers, and straight or curved pods. This plant grows on moist depressions on clay soils in coastal terrace grasslands and in coastal strand vegetation on sand dunes.

Historically, coastal dunes milk vetch was known from seven sites in Monterey, Los Angeles, and San Diego counties. Only one population, on the Monterey Peninsula, has been located in recent years. All other sites have apparently been destroyed by urbanization, recreational activity and exotic plant encroachment. Half of the remaining population is near parking and the other half is across 17 Mile drive along an equestrian trail. Coastal dunes milk vetch is impacted by hiking, horseback riding and traffic from auto turnout areas. Competition from aggressive, introduced beach plants like iceplant also threatens the species. Half of the population is protected from vehicle access by slightly elevated telephone pole logs.

**The overall trend for coastal dunes milk vetch is one of steady decline to the brink of extinction.**

## Trask's milk vetch

*(Astragalus traskiae)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Coastal Bluff Scrub

Trask's milk vetch is a spreading perennial herb in the pea family (Fabaceae) with evergreen leaves divided into many oval leaflets, yellowish-white flowers in small clusters, and gently curved pods. The plants are covered with short hairs that give them a gray-green color. This species is restricted to seven populations in five areas on Santa Barbara Island and is widespread on San Nicolas Island. It occurs on shallow, often rocky soils in a community that has been described variously as a form of island grassland, southern coastal bluff scrub, cactus scrub and others.

On Santa Barbara Island, which is a part of Channel Islands National Park, the habitat of Trask's milk vetch is managed by the National Park Service (NPS). Introduced rabbits were a threat to all of the rare plants on Santa Barbara Island, but the NPS has completed an eradication program and vegetation recovery is underway. However, monitoring from 1985-89 detected an overall loss of nearly two-thirds of the total Trask's milk vetch population, which now numbers approximately 1200 individuals. This abrupt decline was caused by a severe winter storm in 1988 that completely destroyed two populations and greatly reduced a third. Recovery from the effects of this storm has been minimal. The NPS is planning to continue monitoring of Trask's milk vetch populations on Santa Barbara Island and will be conducting some nonnative plant removal in 1992. The U.S. Navy controls San Nicolas Island, and has contracted out for a new species check-list and surveys for the island in the spring of 1992. Nonnative plant removal will also be conducted there in 1992.

**The overall trend for Trask's milk vetch is one of decline, though current developments point toward future recovery.**

## Bakersfield saltbush

*(Atriplex tularensis)*

CA - Endangered (1987)
FED - Candidate 2

General Habitat: • Chenopod Scrub

Bakersfield saltbush, a member of the goosefoot family (Chenopodiaceae), is an erect, few-branched annual with a scaly surface on the stems, smooth oval leaves, and small dense clusters of greenish flowers. This salt-tolerant species has been reported only from Kern County and is a component of the lowland valley saltbush scrub, a plant community nearly extirpated by agricultural conversion.

Five of the six historic occurrences of Bakersfield saltbush have been extirpated. This species had not been seen since the 1930's until its rediscovery in 1983 on the southern edge of the Kern Dry Lake. The remaining occurrence is in an alkali sink surrounded by farmland. It is managed by TNC as part of their Kern Lake Preserve; the population is fenced and monitored annually. Studies indicate that this species hybridizes with bracted saltbush (*Atriplex serenana*), a closely related, widespread species that is able to tolerate drier conditions. Since the shallow water table has been reduced as a result of agricultural practices and the recent drought, Bakersfield saltbush has been unable to reproduce and thrive. Monitoring data from 1989 and 1990, during which water conditions were below normal, indicated that few if any plants with true Bakersfield saltbush characteristics were present. Ron Tiller, Kern Lake Preserve manager, reported one plant in 1990 and four plants in 1989. In 1991, TNC operated sprinklers at two historic Bakersfield saltbush locations to encourage germination and installed several groundwater test wells to determine how the water level can best be stabilized.

**Monitoring data over the past several years suggest that the trend for Bakersfield saltbush is one of decline and that the species is in serious danger of extinction at its only remaining location.**

## Encinitas baccharis

*(Baccharis vanessae)*

CA - Rare (1982); Endangered (1987)
FED - Candidate 1

General Habitat: • Chaparral

Encinitas baccharis is a slender stemmed, dioecious shrub in the sunflower family (Asteraceae) that grows to a little over one meter tall. It has alternate leaves, reflexed floral bracts, and heads of whitish flowers. This plant only occurs on steep slopes in the chaparral communities of central San Diego County.

Encinitas baccharis has undergone rapid habitat loss due to residential development and agricultural conversion. Only three locations are known to support viable populations, and two of these may be threatened by development. Two additional occurrences in the City of Encinitas contain fewer than five plants each. In 1987 its status was changed from rare to endangered. In the summer of 1990, several Encinitas baccharis stands were burned in the Paint Mountain Fire and plants have since resprouted. There are no management or protection plans for Encinitas baccharis.

**The overall trend for Encinitas baccharis is one of decline, and without immediate intervention and protection efforts this trend will continue.**

## Bensoniella

*(Bensoniella oregona)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Lower Montane Conifer Forest
• Meadows and Seeps

Bensoniella is a perennial herb with basal heart-shaped leaves, unbranched flowering stems, and small saucer-shaped flowers with vivid orange anthers. This member of the saxifrage family (Saxifragaceae) is found only in Humboldt County, California and in Curry and Josephine counties, part of Oregon's Siskiyou Mountains. Bensoniella grows in the margins of moist, grassy meadows and in small openings in evergreen forests. Of the four recently observed California occurrences, three are found on private land and one occurs in Six Rivers National Forest. This species was thought to be extinct until 1977, when it was relocated in Humboldt County. Since that time, botanists have located several new occurrences during surveys.

The bensoniella occurrence on Forest Service land is protected by a fence. Some sites have been damaged by cattle trampling and grazing which are currently the greatest threats at all locations. In 1988, logging activities on private land adjacent to Six Rivers National Forest negatively impacted the only publicly owned bensoniella occurrence. Sedimentation, windthrow of unlogged trees, and the subsequent harvest of those trees for firewood has further degraded bensoniella habitat. Signs will be placed in the area restricting human access. Six Rivers National Forest is working with the California Native Plant Society to repair the gully that formed in the bensoniella population after the timber harvest. Bensoniella, however, is actively colonizing the sides of the new gully. Timber harvest activities should be restricted near bensoniella habitat until more information is available on the plant's biology. A graduate student at Humboldt State University is preparing his masters thesis on bensoniella's biology and ecology and is also drafting a Species Management Guide for bensoniella on National Forest lands. The Nature Conservancy is working with landowners to protect occurrences on private property.

**The overall trend for bensoniella is one of decline.**

## Sonoma sunshine

*(Blennosperma bakeri)*

CA - Endangered (1991)
FED - Endangered (1991)

General Habitat: • Vernal Pools

Sonoma sunshine is a small annual herb in the sunflower family (Asteraceae) with yellow, daisy-like flowers that bloom from February through April. The yellow disk flowers bear white pollen and stigmas, and sterile ray flowers produce red stigmas, a character that separates Sonoma sunshine from other members of this genus. Sonoma sunshine is a narrowly occurring California endemic, restricted to vernal pools, shallow depressions, and intermittent swales in the Santa Rosa Plains and the adjacent Sonoma Valley of Sonoma County. At the DFG's Laguna de Santa Rosa Ecological Reserve, Sonoma sunshine occurs with two other State- and Federally-listed endangered plant species, Burke's goldfields (*Lasthenia burkei*) and Sebastopol meadowfoam (*Limnanthes vinculans*).

Approximately 30 percent of the historic occurrences of Sonoma sunshine have been eliminated or seriously damaged, and most of the remaining sites are threatened with urbanization, wastewater effluent irrigation, and conversion of habitat to agricultural lands. Westward expansion of the City of Santa Rosa threatens 50 to 70 percent of the remaining Sonoma sunshine habitat. DFG has been coordinating with the County of Sonoma and the City of Santa Rosa, as well as with other agencies, private landowners and concerned citizens, to protect vernal pools and associated endangered plants in the area since 1989. As a part of this effort, DFG funded a study which was completed

in 1990 that outlines a protection program and recommends six sites in the vicinity of Santa Rosa for immediate preservation. Protective actions requested by DFG to date have not been implemented and no regional conservation program exists.

**The overall trend for Sonoma sunshine is one of decline.**

## Point Reyes blennosperma

*(Blennosperma nanum* **var.** *robustum)*

CA - Rare (1978)
FED - Candidate 2

General Habitat:
- Coastal Prairie
- Coastal Scrub

Point Reyes blennosperma, a member of the sunflower family (Asteraceae), is a yellow-flowered annual herb with thick, hollow, sprawling stems. Plants occur mostly on sandy soils in the coastal prairie habitat of the Point Reyes Peninsula in Marin County. One population occurs in Mendocino County in north coast bluff scrub overlying sand dunes.

There are less than a dozen known occurrences of Point Reyes blennosperma. The Marin County populations of this species are on Point Reyes National Seashore property, some of which is leased to ranchers. These populations occur in areas grazed by cattle and tule elk, but the animals do not appear to feed on it. Trampling and development are potential threats. The NPS has a regular monitoring program for Point Reyes blennosperma and other rare species at the seashore; the NPS is also studying the effects of prescribed burns in selected areas. A burn of the Tomales Point population area in 1990 produced a four hundred percent increase in 1991 blennosperma numbers there. The Mendocino population is entirely on private land and has no protection.

**The overall trend for Point Reyes blennosperma is one of stability.**

## Dwarf golden star

*(Bloomeria humilis)*

CA - Rare (1978)
FED - Candidate 2

General Habitat:
- Coastal Bluff Scrub
- Chaparral
- Valley and Foothill Grassland

Dwarf golden star is a perennial herb in the amaryllis family (Amaryllidaceae) with an umbrella shaped cluster of bright golden flowers on thin thread-like stalks. It grows from an underground bulb, and produces one or two linear leaves. It occurs in coastal prairie and chaparral communities on open mesas and ocean bluffs in the Arroyo de la Cruz area of San Luis Obispo County, which contains a large ensemble of rare plants. Associated State-listed species include the rare Hearst's ceanothus (*Ceanothus hearstiorum*) and maritime ceanothus (*Ceanothus maritimus*), as well as the endangered Hearst's manzanita (*Arctostaphylos hookeri* ssp. *hearstiorum*).

Only three occurrences of dwarf golden star are known to exist, one small population, and two scattered subpopulations. Combining all populations, about 2,000 plants occur in a ten square mile area. All of the populations exist on the Hearst Ranch on land used primarily for cattle grazing. Although there are no direct threats to this species, range management and fire suppression activities on the Ranch could impact the occurrences. A land use change by the property owners could be detrimental to the existence of dwarf golden star and the other rare species that occur there. Though historical records for this species are lacking, the extremely limited distribution of dwarf golden star makes its existence precarious.

**The trend for dwarf golden star appears to be one of stability.**

## Indian Valley brodiaea

*(Brodiaea coronaria* **ssp.** *rosea)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat:
- Closed-cone Conifer Forest

Indian Valley brodiaea produces long, linear leaves from a perennial corm. This member of the amaryllis family (Amaryllidaceae) also produces rosy pink flowers on a leafless flowering stem. Populations are restricted to serpentine clay and gravel in open areas along creeks. This subspecies often occurs with other rare serpentine plants.

Historically, Indian Valley brodiaea was known from Lake, Colusa and Glenn counties. Collections from Tehama County are believed to be erroneous. The filling of Indian Valley Reservoir in 1975 eliminated much of the historic habitat for this species. A five foot increase in the lake operating level would inundate and destroy most of the plants remaining there. The population area in Glenn County is used as a local dump. BLM has established the Indian Valley Area of Critical Environmental Concern and Research Natural Area Management Plan to protect and enhance 40 acres of existing Indian Valley brodiaea habitat on their land. A new population was located in 1989 in the vicinity of Cook Springs, Colusa County. Another new site was reported in 1991 in Mendocino National Forest and on adjacent private land.

**The overall trend for Indian Valley brodiaea is one of slow decline, though habitat loss has slowed in recent years.**

## Thread-leaved brodiaea

*(Brodiaea filifolia)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat:
- Valley and Foothill Grassland
- Chaparral

Thread-leaved brodiaea, a member of the amaryllis family (Amaryllidaceae), produces several linear and rounded leaves from an underground corm, and a leafless flowering stalk bearing blue to red-purple flowers. This species occurs in open grasslands at the edges of vernal pools or floodplains. Associated State-listed species include California Orcutt grass (*Orcuttia californica*), San Diego thorn mint (*Acanthomintha ilicifolia*), and San Diego coyote thistle (*Eryngium aristulatum* var. *parishii*). Thread-leaved brodiaea occurs in Los Angeles, Riverside, San Diego, and Orange counties. It is now extirpated from San Bernardino County.

Thread-leaved brodiaea is known historically from approximately 25 occurrences. Only 21 of these are considered extant and some are damaged and declining. Most occurrences are on the Santa Rosa Plateau in Riverside County and in the San Marcos and Vista areas of San Diego County. Thread-leaved brodiaea was thought to be extirpated from Los Angeles County as the population in the Glendora area had not been seen since 1921, but it was rediscovered in 1988; this population had several hundred plants in 1989 and was saved from development by concerned citizens. Several more populations were reported in the Glendora area in 1991. In 1989 a small population of about two dozen individuals was discovered in a southeastern Orange County Wilderness Park. Much of thread-leaved brodiaea's habitat is threatened by housing development and off-road vehicle use. One population in Riverside County is also threatened by a proposed Flood Control Project in Railroad Canyon. Transplanting was attempted to save a population near Vista that was impacted by a housing development, but those plants did not survive. In 1988, DFG entered into a Mitigation Agreement with a San Diego developer to mitigate loss of a large thread-leaved brodiaea population in the San Marcos area. The mitigation agreement requires that the developer monitor the transplanted population for at least five years and establish a preserve with permanent protection for the population. In 1991, the San Diego Biodiversity Project prepared a report on all San Marcos area vernal pools, many of which contain thread-leaved brodiaea.

Four Riverside County thread-leaved brodiaea occurrences are on TNC's Santa Rosa Plateau Preserve and the recently discovered population in Orange County is on county park property. The other occurrences are on private property and are afforded no protection. California Endangered Species Tax Check-off funds are being used to finance rare plant habitat protection efforts at TNC's Santa Rosa Plateau Preserve. This project includes protection and restoration of native habitats on the Preserve, installation of interpretive signs, and a study of the species biology to determine appropriate management practices.

**Despite recent discoveries, the overall trend for thread-leaved brodiaea is one of steady decline.**

## Kaweah brodiaea

*(Brodiaea insignis)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat:
- Cismontane Woodland
- Valley and Foothill Grassland

Kaweah brodiaea is a showy, herbaceous perennial in the amaryllis family (Amaryllidaceae). It produces, from a fibrous corm, several linear leaves which are crescent-shaped in cross-section, and a leafless stalk topped by a cluster of rose-purple to pink tubular flowers. This species is endemic to the drainage of the Kaweah and Tule Rivers in Tulare County. It forms pink carpets of color in May and June within blue oak savannah and valley grassland plant communities. Populations occur on U.S. Forest Service land, Caltrans right of ways, DFG ecological reserves, and private property.

Recent surveys located four new Kaweah brodiaea sites in the Kaweah River drainage. Two of these border a golf course near Three Rivers. Currently the Natural Diversity Data Base records about eleven occurrences in stable or better condition. An additional six occurrences are either extirpated or heavily damaged. Some extirpated sites were in the Tule River Canyon of the Sequoia National Forest, and in 1984 a few plants were reintroduced there by the Forest Service. Kaweah brodiaea is often found in roadside localities where herbicide spraying by county maintenance personnel is a threat. Some populations near the town of Three Rivers are threatened by residential development. Other threats include heavy livestock grazing and road widening. In 1984-85, DFG

acquired the 98 acre Kaweah Brodiaea Ecological Reserve. The ecological reserve population has been monitored since 1987 to establish baseline population data. In 1990 and 1991 this population appeared stable despite severe drought. DFG also owns a population at the Blue Ridge Condor Reserve, but it is not managed to benefit Kaweah brodiaea. Recently, both a species and an ecological reserve management plan were prepared for DFG using California Endangered Species Tax Check-off funds. One of the largest populations, at Terminus Dam near Lake Kaweah, has been registered as a voluntarily protected site by The Nature Conservancy. Plans to raise the level of Lake Kaweah have not been implemented, but an EIR prepared for the project stated that a six-foot vertical rise in reservoir level would seriously impact the Kaweah brodiaea population. Damage to plants might also occur from increased recreational use at a larger lake. Under a Memorandum of Understanding with CSU Fresno, genetic research on this species will be conducted.

**The overall trend for Kaweah brodiaea has been one of decline, although in recent years this has stabilized due to a combination of new populations located and sites protected.**

## Chinese Camp brodiaea

*(Brodiaea pallida)*

CA - Endangered (1978)
FED - Candidate 1

General Habitat: • Valley and Foothill Grassland

Chinese Camp brodiaea is an herbaceous perennial in the amaryllis family (Amaryllidaceae). It forms an underground corm, linear basal leaves, and terminal clusters of rose pink flowers. The entire global distribution of this species is one occurrence southwest of Chinese Camp in Tuolumne County. It grows along a shallow, intermittent stream in clay derived from serpentine.

Most Chinese Camp brodiaea habitat is under private ownership and is unprotected. Threats include extensive cattle grazing and alteration of the existing hydrological conditions. A portion of the habitat is zoned for residential use. An acquisition proposal was written by DFG in 1985 but the landowners were not willing to sell to the State. In 1989, further subdivision of the parcel was proposed by the owners. TNC arranged a voluntary protection agreement with another landowner during 1991, and CNPS began leasing an additional parcel of land to protect plants. However, the majority of the population remains unprotected. Habitat must be protected for future survival of this species, and a preserve that carefully manages grazing should be established as a condition of the county subdivision permit.

**The trend for Chinese Camp brodiaea continues to be one of decline and critical endangerment.**

## Leafy reed grass

*(Calamagrostis foliosa)*

CA - Rare (1979)
FED - None

General Habitat: • Coastal Bluff Scrub

Leafy reed grass is a low-growing, tufted perennial member of the grass family (Poaceae) with compact, densely flowered inflorescences. It is found on rocky coastal bluffs, in riparian habitats and cliff slopes, and on steep roadcuts in Mendocino, Humboldt and Del Norte counties. There are more than 30 occurrences of leafy reed grass, two-thirds of which are in BLM's King Range National Conservation Area. Other occurrences are within State Parks and on private lands.

Most extant leafy reed grass occurrences are protected by their inaccessibility to livestock and humans, though a few may be subject to development. Three new occurrences were discovered in 1987, and additional potential habitat needs to be searched. This species appears more widespread than previously known and is not currently threatened.

**The trend for leafy reed grass is one of stability.**

## Dunn's mariposa lily

*(Calochortus dunnii)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Closed-cone Conifer Forest
• Chaparral

Dunn's mariposa lily is an herbaceous perennial in the lily family (Liliaceae) that sprouts from a bulb. It has slender basal leaves, short stem leaves, and showy, bell-shaped white to pink flowers with a red spot at each petal's base. This plant is known only from the mountains of San Diego County and adjacent Baja California. It grows on dry stony ridges and in fire breaks in chaparral and yellow pine forests, and appears to be restricted to gabbroic and metavolcanic soils. Ownership is spread among Cleveland National Forest, BLM, Cuyamaca Rancho State Park and private owners.

About 20 occurrences of Dunn's mariposa lily are known, some of which are small populations of only a few plants. Major threats to this showy plant are flower picking and bulb digging by collectors. Several populations are adjacent to major tourist areas and need to be fenced for added protection. Controlled burning and/or brush clearing may be useful in habitat improvement, but more information is needed on the ecology of this species before a management plan can be written.

**The trend for Dunn's mariposa lily is difficult to determine since current information is not available; it is probably best described as stable to declining.**

## Siskiyou mariposa lily

*(Calochortus persistens)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Lower Montane Conifer Forest

Siskiyou mariposa lily is an herbaceous perennial that arises from a bulb, with slender basal leaves, reduced stem leaves, and one or two striking lavender and yellow flowers. This showy member of the lily family (Liliaceae) is found on dry shallow soils of metavolcanic origin, in open areas near Gunsight Peak in the Klamath National Forest, Siskiyou County.

Only a few occurrences of Siskiyou mariposa lily are known and these appear to be declining due to competition from introduced weedy plants and heavy browsing by deer. Near the summit of Gunsight Peak, the habitat has been disturbed by structures and access roads for radio towers and telephone repeater stations. Known occurrences are currently monitored by the Forest Service. In 1990, Klamath National Forest, in cooperation with the California Native Plant Society, removed nonnative weeds from 10 acres of Siskiyou mariposa lily habitat. Control and test plots were also established to measure the effectiveness of the weed removal. A management plan is needed for this species; the plan should outline methods to avoid future impacts from fire management or further habitat development. Few occurrences exist, but with continued monitoring and protection from disturbance, this plant may be able to exist at stable, safe levels. A listing category of "threatened" may be more appropriate for this species since it is threatened throughout its range.

**The overall trend for Siskiyou mariposa lily is one of decline.**

## Tiburon mariposa lily

*(Calochortus tiburonensis)*

CA - Threatened (1978)
FED - Candidate 2

General Habitat: • Valley and Foothill Grassland

Tiburon mariposa lily is a bulb-forming perennial herb in the lily family (Liliaceae) with long, narrow, basal leaves, and late-blooming, greenish-brown flowers. This unusual lily was discovered on the Tiburon Peninsula of Marin County in 1972 and is known only from a serpentine grassland on the north slope of Ring Mountain. Its distribution encompasses roughly three major populations.

Ring Mountain is now owned by The Nature Conservancy (TNC), which manages the site as a preserve, thus protecting it from a previously proposed development. Off-road vehicle activity has been restricted from the area. TNC considered restoring a serpentine ridge at Ring Mountain that had been graded by the U.S. Army in the 1950s, however, the discovery in 1989 of a large number of Tiburon mariposa lilies on the site resulted in abandonment of this plan. Although minor problems exist with occasional vehicle intrusion, TNC is managing the habitat successfully and the lily populations appear to be increasing. As a result of the protection efforts at Ring Mountain, the Fish and Game Commission in 1987 changed the listing category for Tiburon mariposa lily from endangered to the less critical level of threatened.

**The trend for Tiburon mariposa lily over the last five years is one of increase.**

## Stebbins' morning glory

*(Calystegia stebbinsii)*

CA - Endangered (1981)
FED - Candidate 2

General Habitat: • Chaparral

Stebbins' morning glory is a prostrate perennial herb with long slender stems, deeply divided leaves, and large funnel-shaped white flowers. This member of the morning glory family (Convolvulaceae) grows on red clay soils of the Pine Hill gabbro formation in the Sierra foothills of El Dorado County and on scattered serpentine soils in Nevada County. In El Dorado County, Stebbins' morning glory is often associated with four other State-listed plants: Pine Hill ceanothus (*Ceanothus roderickii*), Pine Hill flannelbush (*Fremon-*

*todendron decumbens*), El Dorado bedstraw (*Galium californicum* ssp. *sierrae*), and Layne's butterweed (*Senecio layneae*).

In El Dorado County, rapid residential development in the vicinity of Cameron Park and Shingle Springs since 1974 has extirpated several morning glory occurrences and the losses are increasing. Of the six occurrences seen in 1987, all but two are near Highway 50 in areas undergoing rapid development. Much of the chaparral habitat of this species has been subdivided into five-acre lots. A habitat conservation plan is needed for Stebbins' morning glory and the other State-listed plants that occur on Pine Hill gabbro soils. DFG is working with the El Dorado County Planning Department to identify high priority areas for protection and develop means to secure them through the land use planning process. DFG has identified a proposed Ecological Reserve near Salmon Falls along the South Fork of the American River in part of a 2,000 acre Conceptual Area Plan for western El Dorado County. The site has also been identified by DFG's Significant Natural Areas Program as a Significant Natural Area of top priority for acquisition with Proposition 70 funds. In 1990, the Wildlife Conservation Board approved purchase of a 40 acre parcel with Proposition 70 funds to begin the Ecological Reserve. Another forty acres were acquired in the Salmon Falls area in 1991 using Proposition 117 funds. An MOU is being developed between DFG, BLM, and the Bureau of Reclamation to protect rare plant habitat along the South Fork of the American River by cooperatively acquiring and managing land. In 1989, DFG initiated an MOU with Nevada County for protection of Stebbins' morning glory during construction and use of a new County Animal Shelter. Also in Nevada County, a 1990 landfill expansion eliminated Stebbins' morning glory habitat. Protection of the remaining habitat is needed to ensure conservation of the species in Nevada County.

**The recent trend for Stebbins' morning glory is one of continued decline.**

## White sedge
*(Carex albida)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Marshes and Swamps

White sedge, a member of the sedge family (Cyperaceae), is a short, tufted, grass-like perennial herb with erect stems that sprout from a creeping rhizome, flattened leaves and flowers in dense terminal spikes. This species is restricted to moist sites adjacent to freshwater marshes and creeks in Sonoma County. Only five occurrences have ever been reported and only one of these, Lower Pitkin Marsh, has been confirmed in the last 10 years. White sedge grows with two other State-listed endangered plants: Pitkin Marsh lily (*Lilium pitkinense*) and Pitkin Marsh Indian paintbrush (*Castilleja uliginosa*).

Habitat conversion has eliminated several historic white sedge occurrences from other Sonoma County freshwater marshes. Pitkin Marsh, the only extant white sedge habitat, is subject to persistent development pressures. Any change in the hydrological regime of the marsh, including draining, could threaten the white sedge and other rare plant species there. All of the marsh habitat is privately owned and there is currently no protection for this species.

**The trend for white sedge is one of continued decline.**

## Tompkins' sedge
*(Carex tompkinsii)*

CA - Rare (1979)
FED - None

General Habitat: • Cismontane Woodland
• Lower Montane Conifer Forest

Tompkins' sedge, a member of the sedge family (Cyperaceae), is a perennial, densely-tufted, grass-like herb which grows in granitic soils on steep, dry, rocky canyon walls in the Sierra Nevada. It is known from less than twenty scattered occurrences in Fresno and Mariposa counties.

There are no management plans for Tompkins' sedge, but all occurrences are on USFS or NPS lands (Sequoia and Sierra National Forests; Kings Canyon and Yosemite National Parks) and therefore they receive some protection. Occurrences located near roads may be subject to threats from highway maintenance activities and herbicide spraying. Field surveys are needed to determine the effects of 1987 forest fires on several occurrences.

**Recent population data are not available to assess the trend for Tompkins' sedge.**

## Tree-anemone
*(Carpenteria californica)*

CA - Threatened (1990)
FED - Candidate 1

General Habitat: • Cismontane Woodland
• Chaparral

Tree-anemone, a member of the mock orange family (Philadelphaceae), is an erect to spreading evergreen shrub. Its flowers, which bloom from May through July, are large and showy, with white petals and yellow centers. Tree-anemone is an extremely localized endemic species that is found only in eastern Fresno County, about 30 miles north-

denuded much of that area, destroying the native vegetation and threatening several endemic plant species. The U.S. Navy owns San Clemente Island and has used portions of it for military activities. To guide protection efforts, the USFWS has written management and recovery plans for San Clemente Island Indian paintbrush. The Navy has a feral animal removal program underway and is planning to perform native plant surveys in the next few years.

**The trend for San Clemente Island Indian paintbrush is one of stability to decline since population numbers are still well below historic levels.**

## Tiburon Indian paintbrush
*(Castilleja neglecta)*

CA - Threatened (1990)
FED - Candidate 1

General Habitat: • Valley and Foothill Grassland

Tiburon Indian paintbrush is a low perennial herb in the figwort family (Scrophulariaceae) with woody basal stems, narrow lobed leaves, and showy yellow to red-yellow flowers which bloom from March through June. It is a root hemi-parasite, meaning its roots develop interconnections with the roots of other plants to increase water and nutrient flow. Tiburon Indian paintbrush is endemic to serpentine-derived soils and south to west-facing slopes within native bunchgrass communities.

Tiburon Indian paintbrush occurs at American Canyon in Napa County and at three sites on the Tiburon Peninsula in Marin County. Combined, the four occurrences contain approximately 1500 individuals within 32 to 40 acres of habitat. Only a portion of one occurrence is protected; this is on The Nature Conservancy's Ring Mountain Preserve in Marin County. Tiburon Indian paintbrush is threatened by urbanization on the Tiburon Peninsula and by mining at American Canyon. In the immediate future, proposed mining and urbanization could eliminate 65 to 72 percent of the species' habitat. The four small populations are at risk of extirpation from random or chance event such as severe disease outbreak, fire, or another natural or human-caused calamity.

**The trend for Tiburon Indian paintbrush is one of continued decline.**

## Pitkin Marsh Indian paintbrush (Castilleja uliginosa)

CA - Endangered (1978)
FED - Candidate 1

General Habitat: • Marshes and Swamps

Pitkin Marsh Indian paintbrush is an herbaceous perennial in the figwort family (Scrophulariaceae). This extremely rare plant produces several unbranched stems with simple hairs and a spike of yellow flowers. Historically, it was restricted to the wet marsh habitat of upper Pitkin Marsh, Sonoma County. Reports in the 1950s suggest there was a large population scattered throughout the area. Loss of marsh habitat has greatly reduced the distribution of this species. Since the late 1970s, only a single plant remains in the wild. Pitkin Marsh Indian paintbrush occurs with two other State-listed endangered plants: Pitkin Marsh lily (*Lilium pitkinense*) and white sedge (*Carex albida*).

Pitkin Marsh Indian paintbrush requires two plants for pollination, so the single known plant cannot reproduce. Under an MOU with DFG, the Jepson Herbarium developed tissue cultures and other vegetative propagation techniques to increase Pitkin Marsh Indian paintbrush numbers. In addition, researchers have successfully hybridized and backcrossed the paintbrush with related species. Pitkin Marsh is in private ownership and the rare species there are unprotected and threatened by grazing. In recent years the landowner has not allowed DFG personnel on his property to cut back competing vegetation or monitor the health of the single fenced individual. This last wild plant may already be gone. In order to properly manage the habitat, protection of the hydrological regime and control of competing vegetation will be necessary. Federal listing would also afford this species greater protection.

**The trend for Pitkin Marsh Indian paintbrush is one of continued decline.**

## California jewelflower
*(Caulanthus californicus)*

CA - Endangered (1987)
FED - Endangered (1990)

General Habitat: • Chenopod Scrub
• Valley and Foothill Grassland

California jewelflower, a member of the mustard family (Brassicaceae), is an herbaceous annual, that branches from the base, with upper leaves clasping the succulent stems, and purple-tipped (white upon opening) flowers arranged along one side of the stem. This species historically occurred in slightly alkaline sandy loam in native grasslands of the southern San Joaquin Valley and adjacent valleys. Its range once included Fresno, Kern, Kings, Santa Barbara, San Luis Obispo and Tulare counties, but now it is known only from occurrences on the western edge of its range in Santa Barbara, San Luis Obispo, and Fresno counties. A transplanted population is being maintained at TNC's Semi-

tropic Ridge Preserve in Kern County.

Loss of habitat, as a result of conversion to agriculture or alteration by grazing, has nearly eliminated this species from its native range. California jewelflower is now found in only four locales -- the hills of southwestern Fresno County, two areas of the Carrizo Plain, and farther south, in the Cuyama Valley of Santa Barbara County. The populations in Fresno County, owned by the BLM, contain only a few hundred plants. Carrizo Plain populations grow on public lands managed as part of the Carrizo Plain Natural Area, a cooperative effort between the BLM, TNC, and DFG. Populations there also occur on private land. The largest population of California jewelflower occurs on private land in Santa Barbara County.

Under an MOU with DFG, Los Padres National Forest has attempted to establish a new population on suitable but unoccupied habitat within the Forest boundary. Because California jewelflower population sizes fluctuate yearly, continued monitoring is needed before determining the success of this introduction effort. DFG has also entered into an MOU with UC Berkeley to study taxonomic relationships within the *Caulanthus* genus.

**The trend for California jewelflower is one of stability to decline since the largest populations occur on private, unprotected land.**

## Slender-pod jewelflower
*(Caulanthus stenocarpus)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Chaparral

Slender-pod jewelflower is a coarse-haired, herbaceous annual with narrow leaves and small purple and white flowers. This slender, erect member of the mustard family (Brassicaceae) is found on dry slopes of chaparral in San Diego County and Baja California.

Less than a dozen occurrences of slender-pod jewelflower are known in California, and some contain fewer than 100 individuals. Habitat ownership is divided between BLM, Cleveland National Forest, and private owners. Maintenance of fuel breaks with herbicides and grazing pose potential threats to this species. None of the occurrences are currently protected and little is known about the reproductive biology or habitat requirements of this plant. The slender-pod jewelflower appears after chaparral burns which suggests that controlled burning may improve habitat conditions.

**The trend for slender-pod jewelflower is one of decline due primarily to grazing and herbicide spraying.**

## Hearst's ceanothus
*(Ceanothus hearstiorum)*

CA - Rare (1981)
FED - Candidate 2

General Habitat: • Maritime Chaparral
• Coastal Prairie

Hearst's ceanothus is a prostrate, mat-forming evergreen shrub in the buckthorn family (Rhamnaceae) with bright green leaves and deep blue flowers. It grows in coastal prairies and chaparral in the Arroyo de la Cruz region of San Luis Obispo County. It is associated with a number of State-listed plants including the State-listed endangered Hearst's manzanita (*Arctostaphylos hookeri* ssp. *hearstiorum*) and the State-listed rare maritime ceanothus (*Ceanothus maritimus*) as well as several unlisted, but equally rare species.

There are only five known Hearst's ceanothus occurrences, and all are located on the Hearst Ranch. Ranching operations and rangeland conversion there may impact this and other woody species. Research is needed to determine the role of fire in the ecology of Hearst's ceanothus and other rare species in the Arroyo de la Cruz region. Cooperation with the management of the Hearst Ranch is necessary to preserve this species.

**The trend for Hearst's ceanothus is one of stability to decline.**

## Maritime ceanothus
*(Ceanothus maritimus)*

CA - Rare (1978)
FED - Candidate 2

General Habitat: • Maritime Chaparral
• Valley and Foothill Grassland

Maritime ceanothus is a prostrate, mat-forming evergreen shrub in the buckthorn family (Rhamnaceae) with dark, glossy green leaves and small light

to deep blue flowers. It occurs in coastal prairie and chaparral on coastal bluffs near Arroyo de la Cruz, San Luis Obispo County. Associated species include the State-listed rare Hearst's ceanothus (*Ceanothus hearstiorum*) and the endangered Hearst's manzanita (*Arctostaphylos hookeri* ssp. *hearstiorum*) as well as several unlisted, but equally rare species.

There are fewer than seven occurrences of maritime ceanothus known, and all occur on the Hearst Ranch. Rangeland conversion at the Ranch may impact maritime ceanothus and other rare plants in the Arroyo de la Cruz area. Frequent fire and brush clearing activities are potential threats. The role of fire in the ecology of maritime ceanothus is not known. The cooperation of the property owners is needed to preserve this species.

**The trend for maritime ceanothus is one of stability to decline.**

## Mason's ceanothus

*(Ceanothus masonii)*

CA - Rare (1978)
FED - Candidate 2

General Habitat: • Chaparral

Mason's ceanothus is an erect, spreading, evergreen shrub with shiny opposite leaves and dark blue to violet flowers. This member of the buckthorn family (Rhamnaceae) occurs in manzanita chaparral or mixed serpentine chaparral. The entire global distribution of Mason's ceanothus is one confirmed occurrence at Bolinas Ridge in Marin County.

The only known occurrence of Mason's ceanothus is owned jointly by Golden Gate National Recreation Area and Marin Municipal Water District, and thus is afforded some protection. Mason's ceanothus reproduction is dependent on fire. Long-term fire suppression may be detrimental to this species as plants are overtopped by taller shrubs in the absence of fire.

**The trend for Mason's ceanothus is believed to be one of stability.**

## Pine Hill ceanothus

*(Ceanothus roderickii)*

CA - Rare (1982)
FED - Candidate 1

General Habitat: • Chaparral

Pine Hill ceanothus is an evergreen shrub in the buckthorn family (Rhamnaceae) with prostrate branches radiating from a central trunk as in a wagon wheel, and small white flowers tinged with blue. This ceanothus occurs on red clay soils of the Pine Hill gabbro formation within openings in chaparral and oak woodland in the Sierra foothills of El Dorado County. It is commonly associated with four other State-listed plants: Stebbins' morning-glory (*Calystegia stebbinsii*), Pine Hill flannelbush (*Fremontodendron decumbens*), El Dorado bedstraw (*Galium californicum* ssp. *sierrae*), and Layne's butterweed (*Senecio layneae*). Fewer than ten occurrences of Pine Hill ceanothus are known. A small proportion of the available ceanothus habitat is protected on DFG's Pine Hill Ecological Reserve. Here the ceanothus is protected as part of an ensemble of species.

Unfortunately, the majority of Pine Hill ceanothus occurrences are on private land near Highway 50 in areas undergoing rapid residential development. A habitat conservation plan is needed for Pine Hill ceanothus and the other rare plants that occur on Pine Hill gabbro soils. DFG staff is working with the El Dorado County Planning Department to identify high priority areas for protection and to develop means to secure them through the land use planning process. DFG has identified a proposed Ecological Reserve near Salmon Falls along the South Fork of the American River in part of a 2,000 acre Conceptual Area Plan for western El Dorado County. The site was also identified by DFG's Significant Natural Areas Program as a Significant Natural Area of top priority for acquisition with Proposition 70 funds. In 1990, the Wildlife Conservation Board approved purchase of a 40 acre parcel with Proposition 70 funds to begin the Ecological Reserve. Another forty acres was acquired in the Salmon Falls area in 1991 using Proposition 117 funds. An MOU is being developed between DFG, BLM, and the Bureau of Reclamation to protect rare plant habitat along the South Fork of the American River by cooperatively acquiring and managing land.

**The overall trend for Pine Hill ceanothus is one of continued decline.**

## Slender-horned spineflower

*(Centrostegia (= Dodecahema) leptoceras)*

CA - Endangered (1982)
FED - Endangered (1987)

General Habitat: • Coastal Scrub

Slender-horned spineflower is a delicate prostrate annual with red spreading stems, oblong basal leaves, and tiny reddish flowers inside a ring of six spined teeth. This member of the buckwheat family (Polygonaceae) is restricted to sandy, flood-deposited river terraces and washes in Los Angeles, Riverside, and San Bernardino counties. The alluvial sage scrub that supports slender-horned spineflower is an en-

dangered community. More than two-thirds of historic spineflower occurrences are extirpated or have not been seen for many years. In 1989, a new population center was discovered near Vail Lake in southern Riverside County, part of which occurs in the Cleveland National Forest. This population is unusual because it occurs in chaparrai. Most occurrences are on private land and are unprotected.

In 1987, both California and the Federal Government designated slender-horned spineflower as endangered. This species and its habitat are seriously threatened by urbanization, flood control activities, competition from nonnative plants, agricultural conversion, off-road vehicles and illegal dumping. In 1989, a portion of the Temescal Canyon occurrence in Riverside County was vandalized by illegal grading activities. The Tujunga Wash occurrence in Los Angeles County is threatened by a proposed golf course. A large population center on the upper Santa Ana River Wash near Redlands is seriously threatened by gravel mining, off-road vehicles and the Seven Oaks Flood Control Dam. Several new populations were discovered on the Santa Ana River Wash in 1991. Another new population, which is threatened by a mobile home development, was discovered in 1991 on the Santa Clara River Flood Plain.

The Army Corps of Engineers purchased a 900 acre easement on alluvial sage scrub habitat in the Santa Ana River Wash as compensation for losses sustained during dam construction upstream, but few spineflowers actually occur on their preserve. Establishment of an interagency Preserve from Norton Air Force Base to Seven Oaks Dam would be the best prospect for spineflower conservation in the Santa Ana River Wash. The Bureau of Land Management has taken initial steps to fence a portion of this area to protect the spineflower. San Bernardino National Forest has also partially fenced their Bautista Canyon occurrence in Riverside County to protect it from vehicle damage. In 1990, the Cleveland National Forest, which owns a portion of the largest population, completed an interim management guide for this species. In 1991, the Forest prepared a Survey and Monitoring Report of that population, partially funded by California Endangered Species Tax check-off funds. The survey looked at historic spineflower habitat in San Bernardino and Angeles National Forests, but did not relocate any populations. Forest personnel also coordinated rebuilding of a fence that protects a slender-horned spineflower population. Coordinated habitat conservation planning is critically needed for this species. High priority should be given to preserving the remaining slender-horned spineflower habitat, especially at Vail Lake, Big Tujunga Wash, Santa Clara River, Santa Ana River Wash near Redlands, San Jacinto River near Hemet, and on National Forest lands. Research on species biology and ecology are needed to develop management plans for slender-horned spineflower. Toward this end, germination studies were conducted in 1991 by a private consulting firm through an MOU with DFG.

**The trend for slender-horned spineflower has been one of continued decline, although recently discovered populations present new opportunities for protective action.**

## Santa Catalina Island mountain mahogany

*(Cercocarpus traskiae)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Chaparral

Santa Catalina Island mountain mahogany is a small evergreen tree in the rose family (Rosaceae). Plants have clusters of small greenish flowers and leathery leaves that are white-woolly beneath. Since this species was first described in 1897, it has been found only on Santa Catalina Island. Today the natural distribution is limited to one small population of seven trees in an arroyo (Wild Boar Gully) in the Salta Verde region of the island.

Rooting by feral pigs and browsing by introduced deer and goats have disturbed the soil and prevented seedling establishment. The Santa Catalina Island Conservancy, which owns and manages the island, has used California Endangered Species Tax Check-off funds to carry out protection and recovery actions. Following fencing of mountain mahogany habitat to exclude exotic animals, natural recruitment in the fenced area accounted for 74 seedlings in the spring of 1988. Monitoring in 1990 determined that about 40 of these are still alive, although there was evidence that feral animals have found a way into the fenced area. Repairs to the fence are planned. Propagated seedlings have also been planted into the wild to encourage the growth of a larger population. In 1990 the Conservancy began a program of eradicating feral goats and pigs from the Island.

**Although in recent years there have been indications that the population may soon increase in size, the overall trend for Santa Catalina Island mountain mahogany is one of decline almost to extinction.**

## Camatta Canyon amole

*(Chlorogalum purpureum* var. *reductum)*

CA - Rare (1978)
FED - Candidate 1

General Habitat: • Cismontane Woodland

Camatta Canyon amole is a perennial herb in the lily family (Liliaceae) that arises from a bulb. It has a basal cluster of long, linear leaves and an elongate open-branched flowering stem topped by deep blue-purple flowers. The entire global distribution of this plant is a single vulnerable occurrence in upper Camatta Canyon, San Luis Obispo County, on the Los Padres National Forest. Camatta Canyon amole grows in open areas with low vegetation cover in hard-packed, gravelly red serpentine soil within the blue oak woodland community.

Part of the population has been damaged by road construction and off-road vehicle activity. Cattle grazing also occurs on this site, which may compact the soil. Uranium mining projects proposed in the area are potential threats. Since Camatta Canyon amole appears intolerant of shading, it may have benefitted from a fire which burned part of the occurrence in 1982 and removed competing vegetation. The Forest Service fenced part of the occurrence in 1984 to redirect ORV activity, and conducted an ecological study in 1989. In 1990, a long-term monitoring program for the species was designed, and in 1991 a soil properties survey was conducted at the site. There are still several hundred to over one thousand individuals, but the population has declined in recent years.

**The trend for Camatta Canyon amole is one of slow decline.**

## Howell's spineflower

*(Chorizanthe howellii)*

CA - Threatened (1987)
FED - Proposed Endangered (1991)

General Habitat: • Coastal Dunes
• Coastal Prairie

Howell's spineflower is a small, shaggy-haired annual with spine-enclosed clusters of tiny white and rose-colored flowers. Plants branch from the base and produce basal, oblong leaves. This member of the buckwheat family (Polygonaceae) is known only from the vicinity of MacKerricher State Park in the Ten Mile Dunes north of Fort Bragg, Mendocino County. It is generally restricted to northern dune scrub habitat and occurs with the State-listed endangered Menzies' wallflower (*Erysimum menziesii*) and the rare Northcoast phacelia (*Phacelia insularis* var. *continentis*).

Three of the four Howell's spineflower occurrences are threatened or have been damaged by road maintenance activities, trampling by people and horses, and competition from nonnative plants such as iceplant. These threats could easily extirpate those occurrences. State Park personnel are aware of the plant on State property and are planning to protect Howell's spineflower by fencing some areas and controlling competing nonnative plants. As part of an ongoing project which began in 1989 with the Department of Parks and Recreation, Howell's spineflower has been reintroduced into an historical site at MacKerricher State Park.

**The trend for Howell's spineflower one of decline.**

## Orcutt's spineflower

*(Chorizanthe orcuttiana)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Coastal Scrub

Orcutt's spineflower is a prostrate annual herb in the buckwheat family (Polygonaceae). It has basal leaves, leaf-like bracts in pairs, and small white flowers. The historic range of Orcutt's spineflower extended from Oceanside south to Point Loma in San Diego County. Ten occurrences were known from sandy soils in coastal plains and mesas, but only one population has been seen recently.

This species was considered extirpated throughout its range for over ten years until it was seen in 1979 at Torrey Pines State Reserve. This population was last seen in 1987. In 1991 a new population was discovered in a city park near Encinitas. Much of the original habitat for Orcutt's spineflower in coastal San Diego County has been converted to residences. A careful survey of all historic sites is needed to determine if suitable habitat remains. No management plans currently exist for this species.

**The trend for Orcutt's spineflower is one of severe decline due to destruction of habitat.**

## Sonoma spineflower

*(Chorizanthe valida)*

CA - Endangered (1990)
FED - Proposed Endangered (1991)

General Habitat: • Coastal Prairie

Sonoma spineflower is a robust annual herb in the buckwheat family (Polygonaceae). It has broad, lance-shaped basal leaves, and bears headlike clusters of spine-tipped bracts and pinkish flowers that bloom from June through August. The worldwide distribution of Sonoma spineflower is limited to one site in Marin County, just south of Abbott's Lagoon on a working cattle ranch within Point Reyes National Seashore. This species occupies less than 2.5 acres of land within an enclosed pasture of about 360 acres.

Until its rediscovery in 1980, Sonoma spineflower was thought to be extinct. At its only known occurrence, this species occurs exclusively in the coastal prairie plant community within a larger surrounding area of northern coastal scrub. Hikers visiting Abbott's Lagoon have trampled the spineflower. Trampling by cattle, which are allowed on the site by permit from the National Park Service, also causes some damage to the plants. However, a four year study of the effects of grazing on this species, conducted by Liam Davis of Sonoma State University, has shown that light grazing may benefit Sonoma spineflower by reducing nonnative plant competition. Field observations suggest that this species relies on insect pollinators for reproductive success. Although the seed dispersal mechanism is not known, the seeds are light enough to be dispersed short distances by wind, and have spines that could easily become attached to the fur of small animals. Because Sonoma spineflower consists of only one extant population, it is extremely susceptible to random or chance events that could eliminate the population and cause extinction of the species. The California Native Plant Society monitors this population annually.

**The trend for Sonoma spineflower is one of decline.**

## Ashland thistle

*(Cirsium ciliolatum)*

CA - Endangered (1982)
FED - None

General Habitat: • Cismontane Woodland

Ashland thistle, a perennial member of the sunflower family (Asteraceae), produces from a buried rhizome a tall stem with short lateral branches and yellowish-white flower heads. California populations are known from the vicinity of Montague (Siskiyou County), and several sites occur in southern Oregon. This thistle often grows in dry plains and open grassland habitats, where the soils are thin with rocky outcrops present.

Of the approximately half dozen occurrences of Ashland thistle reported from California, only one has been visited (and seen) in recent years. All known occurrences are on private land in agricultural areas devoted to grazing and grain production. Historical occurrences need to be relocated and suitable habitat should be searched for new populations. Management plans are needed to provide permanent protection for surviving California populations. There is some question as to the validity of this taxon. The new Jepson Manual (expected to be completed in 1992) will present the most recent taxonomy for this plant.

**The overall trend for Ashland thistle is stable, but at unsafe levels.**

## Fountain thistle

*(Cirsium fontinale var. fontinale)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Valley and Foothill Grassland

Fountain thistle is an herbaceous perennial with several stout, erect, reddish stems and large white to pinkish flowering heads. This member of the sunflower family (Asteraceae) occurs in the extremely restricted serpentine seeps of the Crystal Springs region, San Mateo County. It sometimes grows with other rare plants like fragrant fritillary (*Fritillaria liliacea*) and San Francisco wallflower (*Erysimum franciscanum*).

The three existing fountain thistle occurrences are on public land controlled by CalTrans, San Mateo County, and the San Francisco Water District. Construction of Interstate 280 contributed to the decline of fountain thistle by destroying habitat and altering the drainage patterns feeding the seeps in its serpentine grassland plant community. A fire in 1988 burned some of the populations, but initial reports indicate that they sustained little if any permanent damage. There are no management plans or protection programs for any populations of fountain thistle. Coordinated activities are needed by the land holding agencies to prevent further destruction of the habitat. Under a Memorandum of Understanding with UC Davis, research on germination requirements and taxonomy will be conducted. The overall trend for fountain thistle has been one of decline, with a sharp decline when Highway 280 was built and a slower rate following that initial disturbance.

**The recent trend for fountain thistle is one of stability.**

## Chorro Creek bog thistle
*(Cirsium fontinale* **var.** *obispoense)*

CA - Candidate Endangered (1991)
FED - Proposed Endangered (1991)

General Habitat:
- Chaparral
- Cismontane Woodland

Chorro Creek bog thistle is a short-lived perennial in the sunflower family (Asteraceae). This thistle is distinguished by its nodding, pinkish flower heads which bloom from February to July. Chorro Creek bog thistle is of extremely limited distribution, found only in perennial serpentine seeps and springs in western San Luis Obispo County.

Only eight populations of Chorro Creek bog thistle are known to exist. The type locality, at Chorro Creek, was eliminated by livestock trampling. Seven populations remain in the vicinity of San Luis Obispo, and one population exists about thirty miles to the northwest, near Cambria. Current threats include livestock trampling, water diversion, residential and commercial development, roadside maintenance, and drought. One population is managed within a bioreserve at Cal Poly, San Luis Obispo. A private landowner has voluntarily agreed to protect a portion of another site under a non-binding agreement with The Nature Conservancy. The City of San Luis Obispo has fenced a small area of seeps that support the plant near Laguna Lake to exclude cattle. All other sites are unmanaged and unprotected. This species was proposed for Federal listing as endangered by the USFWS in December of 1991.

**The overall trend for Chorro Creek bog thistle is one of decline.**

## La Graciosa thistle
*(Cirsium loncholepis)*

CA - Threatened (1990)
FED - Candidate 1

General Habitat:
- Coastal Dunes
- Marshes and Swamps
- Riparian Scrub

La Graciosa thistle is a bushy biennial or short-lived perennial herb with large, smooth to slightly hairy leaves and clustered heads of white flowers. This member of the sunflower family (Asteraceae) is known from coastal San Luis Obispo and Santa Barbara counties from Pismo Beach south to Los Alamos. Its habitat is freshwater and brackish marshes, especially among dunes, and river bottom lands with high subsurface moisture levels. Seven sites are now known (1990) for this species, with the largest, consisting of several thousand plants, at the mouth of the Santa Maria River. Other populations are small, generally with less than 50 individuals. Several have declined significantly in size in recent years.

About one-third of the historic occurrences of La Graciosa thistle have been extirpated as a result of cattle grazing, agricultural land conversion, and highway construction. Continuing threats include off-road vehicle use in the dunes, proposed coastal development projects and groundwater pumping. The latter could lower the water table within coastal dune areas, resulting in loss of La Graciosa thistle wetland habitat. Most populations of this species occur on privately owned land. In 1989, The Nature Conservancy acquired title to a dune area south of Oso Flaco Lake, formerly owned by Mobil Oil, that supports a small population of this species. A commercial abalone operation now being built at the mouth of the Santa Maria River will destroy some plants of the largest population during pipeline construction. A thorough survey in 1990 of all known, suspected, and previously reported sites found that the species has been extirpated at two sites where it was recently seen. In 1990 a management strategy for this species was developed by DFG.

**The overall trend for La Graciosa thistle is one of decline.**

## Surf thistle
*(Cirsium rhothophilum)*

CA - Threatened (1990)
FED - Candidate 1

General Habitat:
- Coastal Dunes

Surf thistle is a bushy, short-lived perennial in the sunflower family (Asteraceae) with whitish flowers in dense heads. It is characterized by large rosettes of spiny, white-woolly, deeply lobed and undulating leaves. The deep roots and white-woolly herbage are adaptations to the physical stresses of the dune habitat, such as high light intensity and sand movement and abrasion. Maximum flowering occurs between May and July. Surf thistle is endemic to the dunes of the central California coast, from the Nipomo Dunes of southern San Luis Obispo County to Point Conception in Santa Barbara County. It grows in coastal foredunes on the slopes of transverse ridges in areas of active sand accumulation. At the southern extreme of its range, it is found in sand at the bases of cliffs.

Less than 20 occurrences of Surf thistle presently exist. Approximately one-third of the Surf thistle population has been eliminated by destruction of its fragile foredune habitat. Although off-road vehicles are presently excluded from Surf thistle occurrences, they have contributed to the decline of this species in the past. Pedestrian traffic still poses a threat to this species. Invasion of Surf thistle's

habitat by nonnative plants like European beach grass and ice plant also increases the likelihood of this species being excluded from its existing habitat. The largest populations of this species occur on Vandenberg Air Force Base in Santa Barbara County. Vandenberg has entered into an agreement with The Nature Conservancy to protect rare plant species, including Surf thistle, that occur on the Base. In 1990 a management strategy for Surf thistle was developed by DFG. In 1991 a portion of a Surf thistle population was transferred to TNC and will become part of the Nipomo Dunes Preserve. This habitat was originally purchased by the Coastal Commission with Proposition 70 funds. A boardwalk will be constructed at the Preserve from the parking lot to the beach that will help reduce pedestrian trampling of populations.

**The overall trend for Surf thistle is one of decline.**

## Presidio clarkia

*(Clarkia franciscana)*

CA - Endangered (1978)
FED - Candidate 1

General Habitat: • Coastal Scrub
• Valley and Foothill Grassland

Presidio clarkia is a slender, branched annual herb with narrow leaves and lavender-pink flowers. This member of the evening-primrose family (Onagraceae) occurs on serpentine soils within the coastal prairie grassland community at San Francisco's Presidio and in the Oakland Hills of Alameda County. At one location within the Presidio, this species grows in association with the state and federally endangered Presidio manzanita (*Arctostaphylos hookeri* ssp. *ravenii*). Current ownership includes East Bay Regional Parks District, the Department of Defense, and private landowners.

The historic distribution of Presidio clarkia is unknown. At present it is found at two sites in the Oakland Hills and several sites within the Presidio. Two of the Presidio occurrences have been damaged by maintenance activities. A road improvement project in 1985 destroyed some plants and a portion of the habitat, and early season mowing of the grassland for fire prevention interfered with seed set. Ornamental and weedy plants encroaching on the habitat are an additional threat. In 1987, native seed was sown to reintroduce Presidio clarkia to an additional area in the Presidio and to augment a declining population. A 1987 MOU between the Army, USFWS, NPS, and DFG is a first step toward management and recovery of the sites at the Presidio. However, the current transfer of the Presidio's jurisdiction from Department of Defense to National Park Service jurisdiction leaves the direction of future land use uncertain.

One of the populations in the Oakland Hills was thought to have been introduced, and in 1990 DFG and the East Bay Regional Parks District entered into an MOU to conduct genetic research to determine if this population was native or introduced. Preliminary results indicate that it is native. Another population was discovered in 1988 on private land in the Oakland Hills. The City of Oakland provided protection for this population by requiring the presence of a biological monitor during construction that occurred in 1989 near the clarkia population. This population will be monitored for five years. In 1991 two new populations totaling approximately 200 plants were discovered in the Oakland Hills on private land. One is threatened by residential development and both are threatened by invasive nonnative plants.

**The overall trend for Presidio clarkia is one of stability, but at numbers so low that extinction remains a distinct possibility.**

## Vine Hill clarkia

*(Clarkia imbricata)*

CA - Endangered (1978)
FED - Candidate 1

General Habitat: • Chaparral

Vine Hill clarkia, a member of the evening primrose family (Onagraceae), is a late-blooming, slender annual herb with large white or pinkish flowers. This species grows in disturbed habitats with sandy Blucher loam soils. Historically, it is known from only two natural occurrences in the Vine Hill area of Sonoma County. One of these is extirpated, leaving a single native population. A transplanted population resides at the California Native Plant Society's one acre Vine Hill Preserve.

The native population of Vine Hill clarkia is privately owned, and TNC has secured voluntary protection agreements for the site with both landowners. Late-season mowing of weeds may have accidently damaged part of the population. Efforts have been made to time future mowing more appropriately.

**Because there were only two native occurrences of Vine Hill clarkia and one has been extirpated in recent years, the trend for this species is one of decline.**

# Merced clarkia

*(Clarkia lingulata)*

CA - Rare (1982); Endangered (1987)
FED - Candidate 1

General Habitat: • Valley and Foothill Grassland
• Lower Montane Conifer Forest

Merced clarkia is a slender annual herb in the evening primrose family (Onagraceae) with bright pink flowers. The worldwide distribution of Merced clarkia consists of only two populations (about two miles apart) along Highway 140 in the Merced River Canyon, Mariposa County.

Merced clarkia grows on land administered by the Sierra National Forest, but the roadside habitat is maintained by CalTrans. The combination of herbicide spraying and poor growing seasons have reduced both populations to low levels. One population was reduced by herbicide spraying in 1984. In order to protect this species from further herbicide spraying, "No Spray" road markers have been installed. In response to a proposal by CalTrans to make improvements to Route 140, DFG has recommended that temporary fencing be installed around populations, that zones be designated for equipment storage and parking, and that a biologist be on site during construction to protect Merced clarkia. Other threats to Merced clarkia are erosion and slippage of the steep habitat and potential maintenance activities on a high tension line directly above a population. In 1989 the USFS developed a species management guide for Merced clarkia. The plan recommends protecting essential habitat for the species, establishing an interagency MOU, and conducting annual monitoring of populations. A draft interagency MOU was developed in 1990 to protect several sensitive species in the Merced River Canyon, including Merced clarkia. A fire came very near one of the two populations in August 1990, and the Sierra National Forest plans to monitor this population to determine its presence in the burned area. In 1991 money was appropriated to establish new Merced clarkia populations in the Sierra National Forest. Tasks completed during 1991 with these funds were extensive monitoring of existing populations, preliminary identification of suitable introduction sites, and seed collection and increase in a greenhouse which will continue into 1992.

**The overall trend for Merced clarkia is one of decline.**

# Pismo clarkia

*(Clarkia speciosa* **ssp.** *immaculata)*

CA - Rare (1978)
FED - Proposed Endangered (1991)

General Habitat: • Chaparral
• Cismontane Woodland

Pismo clarkia is an erect annual herb in the evening primrose family (Onagraceae). Each flower has four lavender, fan-shaped petals that appear from May to June. This species grows on dry, sandy, often disturbed soils along the margins of chaparral in open grassy sites. This plant is known only from the Pismo Beach area of San Luis Obispo County where there are less than five extant occurrences.

Several historic occurrences of Pismo clarkia in the Pismo Beach area have been destroyed by residential development. This clarkia is threatened by urbanization, sand mining, and roadside maintenance activities near several populations. All of the habitat is privately owned. TNC has secured voluntary landowner protection of two occurrences and has contacted owners of several others. The status of this plant is in need of review and protective strategies should be developed. This species was proposed for federal listing as endangered by USFWS in December of 1991.

**The overall trend for Pismo clarkia is one of decline.**

# Springville clarkia

*(Clarkia springvillensis)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Chaparral
• Cismontane Woodland

Springville clarkia is an annual herb with simple or branched stems, narrow leaves, and brilliant lavender-pink flowers punctuated by dark purplish basal spots. It is in the evening-primrose family (Onagraceae). This wildflower is restricted to grasslands near the Tule River in the Sierra Nevada foothills of Tulare County. The major portion of its range lies within a six-mile radius, with another population found near Three Rivers, also in Tulare County. One site is protected by DFG, four are on U.S. Forest Service lands, and two are privately owned.

Springville clarkia is threatened by residential development, overgrazing, roadside herbicide spraying and early-season mowing of annual grasses for fire protection. It is a late-blooming species that may not develop mature seed before the grasslands are mowed. DFG owns and protects one of the largest populations on a four and one-half acre site, the Springville Clarkia Ecological Reserve (SCER). Unfortunately, one fence is improperly aligned, so half of the Springville clarkia population on the reserve actually occurs on private land. This could jeopardize the population if the property is sold. The SCER population has been monitored since 1987 to establish baseline population data. In 1990 Springville clarkia population size at the reserve showed a

dramatic decline, possibly due to high temperatures during the flowering period coupled with severe drought. This site provides educational opportunities for grade-school science students who attend a nearby camp. In 1991 a report was prepared (using California Endangered Species Tax Check-off funds) that summarizes current population data and management strategies for Springville clarkia populations. An educational awareness guide for the SCER was also included in the report and will be distributed at the reserve.

**The overall trend for Springville clarkia is one of decline.**

## Salt marsh bird's-beak

*(Cordylanthus maritimus* **ssp.** *maritimus)*

CA- Endangered (1979)
FED - Endangered (1978)

General Habitat: • Marshes and Swamps

Salt marsh bird's-beak is a diffusely-branched annual herb with grayish-green, hairy leaves. This member of the figwort family (Scrophulariaceae) has spikes of flowers with two-lipped petals. Upper petals are beak-like with yellowish tips, and lower petals have a purplish pouch. Salt marsh bird's-beak grows in the higher reaches of coastal salt marshes, where it receives inundation only at higher tides.

Salt marsh bird's-beak was widespread in coastal marshes from Morro Bay, San Luis Obispo County, to San Diego County and northern Baja California. Presently it occurs only in scattered sites at fewer than ten remnant salt marshes. Half of the original occurrences are now extirpated. In California it is currently found at Tijuana Marsh and Sweetwater Marsh (San Diego County), Upper Newport Bay and possibly Anaheim Bay (Orange County), Ormond Beach and Mugu Lagoon (Ventura County), Carpenteria Marsh (Santa Barbara County), and Morro Bay (San Luis Obispo County). Known occurrences are under the control of Federal, State, and local governments, and private owners. Salt marsh bird's-beak's decline is due to modification of much of its original salt marsh habitat by land filling, dredging for marinas, creation of levees and roads, dumping of dredge spoils, and ORV use. The USFWS Salt Marsh Bird's-Beak Recovery Plan calls for protection of extant sites, restoration of historic sites, and continued field monitoring and biological studies. Through an interagency agreement with CalTrans, researchers at San Diego State University conducted a three year study which identified factors that contribute to the population dynamics of the bird's-beak colonies and presented methods for expanding existing colonies and reintroducing the plant into historic habitat.

**The overall trend for salt marsh bird's-beak is one of decline due to habitat destruction.**

## Soft bird's-beak

*(Cordylanthus mollis* **ssp.** *mollis)*

CA - Rare (1979)
FED - Candidate 1

General Habitat: • Marshes and Swamps

Soft bird's-beak is a sparingly-branched, semi-parasitic herbaceous annual plant in the figwort family (Scrophulariaceae). Its stems are covered by soft hairs, and it bears white two-lipped flowers. Soft bird's-beak grows in the coastal salt marshes and brackish marshes from northern San Francisco Bay to Suisun Bay in Napa, Solano, and Contra Costa counties.

There are approximately a dozen historic occurrences of soft bird's-beak, but a 1986 survey confirmed that only three remain. One occurrence is located at Benicia State Recreation Area, where a park management plan is being developed. Another site is on DFG land along the Napa River at Fagan Slough, where it may have been damaged by polluted runoff from a municipal water treatment plant. Another occurrence may be adversely affected by residential development. CNPS monitored populations at Martinez Regional Shoreline and Point Pinole Regional Shoreline in 1991. No plants were located in Martinez and several thousand were seen in Pinole. Little current information is available on the ecology of this species. Studies are needed to determine ecological requirements and factors involved in annual population size fluctuations.

**The overall trend for soft bird's-beak is one of decline.**

## Mount Diablo bird's-beak

*(Cordylanthus nidularius)*

CA - Rare (1978)
FED - Candidate 1

General Habitat: • Chaparral

Mount Diablo bird's-beak, a member of the figwort family (Scrophulariaceae), is a prostrate to ascending, branched, mat-forming annual with small

white and purple-veined flowers. Its interlacing branches form an unbroken mat over the serpentine chaparral habitat in which it grows. The entire global distribution of this unusual bird's-beak consists of one occurrence on the northeast slope of Mount Diablo in Contra Costa County.

Mount Diablo bird's-beak occurs exclusively on Mount Diablo State Park property. The area was burned in 1977, which may have benefitted this species. A 1988 survey indicated that this occurrence, which is bisected by a fire road, is composed of several hundred plants over a two acre area. Although the site is remote and there are no specific known threats, a human-caused fire at the wrong time of year or further road improvements could damage this population. There is currently no active management for this species. CNPS monitored the occurrence in 1991 and reported 800 plants. Establishing a second population would increase the species' prospects for survival.

**The trend for Mount Diablo bird's-beak is one of stability.**

## Ferris' or palmate-bracted bird's-beak

*(Cordylanthus palmatus)*

CA - Endangered (1984)
FED - Endangered (1986)

General Habitat:
- Chenopod Scrub
- Valley and Foothill Grassland

Palmate-bracted bird's-beak is a pale green-gray annual herb in the figwort family (Scrophulariaceae). The plants have spreading branches from the base, and the leaves and bracts are covered by salt deposits extruded from special glands. This species is confined to the saline-alkaline soils of the Pescadero and Solano soil series. Palmate-bracted bird's-beak is a component of alkali sink scrub vegetation in relatively undisturbed, seasonally flooded lowlands in the Central Valley. Historically, occurrences were scattered throughout the San Joaquin Valley in Fresno and Madera counties, the Livermore Valley in Alameda County and the Sacramento Valley in Colusa and Yolo counties.

Five populations of palmate-bracted bird's beak are currently known, with four in the Central Valley. In Colusa County, a large population exists at Delevan National Wildlife Refuge, and a second scattered population is found at Colusa National Wildlife Refuge. Populations at each Refuge receive no specific management and are not currently threatened. DFG's Alkali Sink Ecological Reserve in Fresno County supports another population. The fourth Central Valley population is owned by the City of Woodland who, as well as agreeing to protection, has also prepared a draft management plan for the site. The fifth population occurs in the Springtown wetlands, located north of Livermore in Alameda County.

The Springtown population, probably the largest of the remaining five, is the subject of an ongoing protection effort. Although this area still supports a large population of bird's-beak, (approximately 11,000 plants in 1991) the alkali sink habitat and adjacent uplands have been degraded by off-road vehicle use, trash dumping, disking and grazing. An interagency taskforce has been working since 1989 to establish a mechanism for protection of this site. Ownership there includes the City of Livermore, the Federal Communications Commission, and several land development companies. A preliminary management plan for the Springtown wetlands was prepared in 1989 using funding from federal Section 6 grant-in-aid and the California Endangered Species Tax Check-off Fund. This report recommended that all remaining habitat be protected and that the natural hydrology of the site be restored. In 1991, efforts focused on the establishment of a habitat mitigation bank to facilitate protection and restoration of the Springtown site. This bank would provide a mechanism for projects in the vicinity of Springtown that cannot mitigate on-site to transfer and consolidate their mitigation efforts at the Springtown site. In December of 1991 a draft plan for implementing this mitigation banking effort was under review by DFG and USFWS.

In 1990 and 1991, researchers from Stanford University's Center for Conservation Biology conducted field and laboratory experiments on the ecology of palmate-bracted bird's-beak. Their preliminary results indicate that plants are prolific seed producers and that seed germination is controlled by salinity rather than by Ph. A grid-based census showed that the population increased from about 9,000 plants in 1990 to about 11,000 in 1991. Results of these studies will be used to design the restoration program that will be a key feature of the mitigation banking effort.

**Although plans to restore and enhance the Springtown populations are underway, the long-term trend for palmate-bracted bird's-beak continues to be one of decline.**

## Seaside bird's-beak

*(Cordylanthus rigidus* **ssp.** *littoralis)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat:
- Closed-cone Conifer Forest
- Chaparral
- Cismontane Woodland
- Coastal Scrub

Seaside bird's-beak is a bushy annual herb in the figwort family (Scrophulariaceae). The branches and leaves are covered with fine hairs and its pale yellow flowers are clustered at the ends of branches. Seaside bird's-beak grows in sandy soils of stabilized dunes covered by closed-cone pine forest or maritime chaparral. Plants thrive in areas of recent

surface soil disturbance. The historic distribution of this bird's-beak was, until recently, thought to be restricted to northern Monterey County from Carmel to Elkhorn Slough. However, in the early 1980s, several collections from Burton Mesa in Santa Barbara County were identified as this subspecies. About 10 sites are known at present on privately owned lands and on Vandenberg Air Force Base. At some of these sites, subspecies *littoralis* hybridizes with subspecies *rigidus*, the latter also native to this area.

All but one of seven original Monterey County seaside bird's-beak occurrences have been extirpated or have not been relocated for many years. The remaining site is privately owned and is slated for development. Populations in Santa Barbara County on Burton Mesa are threatened by residential and energy development, off-road vehicle use and military operations at Vandenberg Air Force Base. However, a 200-acre preserve of Burton Mesa chaparral, established as mitigation for energy development impacts, protects at least one population. In addition, the County of Santa Barbara commissioned a study in 1989 to evaluate the condition and preservation potential of remaining Burton Mesa chaparral habitat, with the intention of developing a long-term habitat protection strategy. Since seaside bird's-beak occurs in this community, additional populations may receive protection as a result of the County's actions.

**The overall trend for seaside bird's-beak is one of decline.**

## Pennell's bird's-beak

*(Cordylanthus tenuis* ssp. *capillaris)*

CA - Rare (1978)
FED - Candidate 1

General Habitat:
- Closed-cone Conifer Forest
- Chaparral

Pennell's bird's-beak is a tall annual herb in the figwort family (Scrophulariaceae). It has three-parted, linear-lobed leaves, dark red stems and few-flowered, branched flower stalks of white and maroon-purple flowers. Pennell's bird's-beak is restricted to open sites and clearings in the serpentine chaparral plant community. This bird's-beak is associated with the State-listed rare Baker's manzanita (*Arctostaphylos bakeri*). Both plants are found a few miles southeast of Occidental at Harrison Grade in Sonoma County.

There are less than five occurrences of Pennell's bird's-beak, and all but one are in private ownership. Threats to this species include illegal dumping, off-road vehicle use and future residential development. A portion of one occurrence is now protected at the DFG Harrison Grade Ecological Reserve. A management plan was prepared for the Reserve, using California Endangered Species Tax Check-off funds, which addressed the preservation of rare plants. The Nature Conservancy recently negotiated a voluntary protection agreement for one private site.

**Although the overall trend for Pennell's bird's-beak has been one of decline, protection efforts by DFG and nonprofit groups during the past few years may stabilize the trend.**

## Wiggin's croton

*(Croton wigginsii)*

CA - Rare (1982)
FED - None

General Habitat:
- Desert Dunes
- Sonoran Desert Scrub

Wiggin's croton is a silvery-haired, much-branched perennial shrub in the spurge family (Euphorbiaceae). Male and female flowers are produced on separate plants. This species occurs on the Algodones Dunes in southeast Imperial County, with additional sites in Baja California and Sonora, Mexico. In California, it grows on the more stable sand areas along the west side of the Algodones Dunes system.

Although there are just over a dozen occurrences of Wiggin's croton within the dunes, most of them are large and cover extensive areas. Portions of the dune habitat have been degraded due to ORV use, and visitor use days are expected to double by the year 2000. Part of a population was lost through an unsuccessful transplantation attempt during construction of a new campground on BLM land. A northern portion of the Algodones Dunes has been closed to ORV use by BLM, primarily to protect the endemic dune plants. In 1991, BLM proposed to designate this 28,000 acres as a National Natural Landmark\Area of Critical Environmental Concern. A final decision is scheduled for 1992. BLM also prepared an Algodones Dunes habitat management plan for the area, and in 1990 they also funded baseline vegetation monitoring and development of a monitoring program for the sensitive plant species of the Algodones Dunes.

**Although the overall trend for Wiggin's croton is one of stability, the dune habitat is expected to become increasingly degraded with expanded visitor use. Long term management planning is needed to**

**avoid a downward trend.**

## Bristlecone cryptantha

*(Cryptantha roosiorum)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Subalpine Conifer Forest

Bristlecone cryptantha is a member of the borage family (Boraginaceae) that produces dense cushions of grayish leaves and compact heads of small white flowers. This diminutive perennial plant is commonly found on the gentle slopes or flats of dolomite or limestone formations, in open sunny sites of the bristlecone pine community. It occurs locally in the Inyo Mountains, Inyo County.

About five occurrences of bristlecone cryptantha are known within a small area of Inyo National Forest. Off-road vehicles and grazing threaten some sites. A trail bisects others, so trampling is also a potential threat. Monitoring was conducted in 1989 by DFG and California Native Plant Society botanists at two occurrences. There is little information available on the population biology or habitat requirements of this species.

**Further studies are needed to determine bristlecone cryptantha population trends.**

## Santa Cruz cypress

*(Cupressus abramsiana)*

CA - Endangered (1979)
FED - Endangered (1987)

General Habitat: • Closed-cone Conifer Forest

Santa Cruz cypress, a member of the cypress family (Cupressaceae), is an erect, densely-branched, compact, coniferous tree with slender branchlets and cones containing many seeds per scale. It grows on old marine sandstones or granitic soils in chaparral and closed cone pine forest communities. This cypress is restricted to a localized area within the Santa Cruz Mountains near Bonny Doon and Eagle Rock in Santa Cruz County. It also occurs at Butano Ridge in San Mateo County. Its distribution suggests that Santa Cruz cypress is a relict species, representing a type of vegetation widespread during glacial times, but now confined to scattered sites.

There are only five small populations of Santa Cruz cypress. Portions of each grove have been destroyed or are threatened by residential development, vandalism, agricultural conversion, logging, and alteration of the natural frequency of fires that maintain the cypress groves. Three of the five sites now receive some type of protection from logging and development. In 1987, a local land conservation organization donated land near Eagle Rock which supports Santa Cruz cypress to the State. This stand is now part of Big Basin Redwoods State Park. In 1989, the Wildlife Conservation Board acquired more than 500 acres for DFG's Bonnie Doon Ecological Reserve. The Butano Ridge population is now included within Pescadero Creek County Park in San Mateo County. Protection of the other significant occurrences will be necessary to protect this species. DFG has entered into an MOU with UC Berkeley to assess Santa Cruz cypress' patterns of genetic diversity and to establish a comprehensive seed bank for the species. Further studies are needed to better understand the ecological requirements of this species so effective management plans can be developed.

**The overall trend for Santa Cruz cypress is one of decline.**

## July gold

*(Dedeckera eurekensis)*

CA - Rare (1978)
FED - None

General Habitat: • Mojavean Desert Scrub

July gold, a species described in 1976, is a low, rounded, densely branched shrub in the buckwheat family (Polygonaceae). Plants are covered with small olive-green leaves and, when in bloom, masses of tiny golden flowers. It is a shrub of rocky ridges, cliffs, talus slopes, and washes in mixed desert shrub and shadscale scrub plant communities. About ten small disjunct populations are known, with six new locations reported in the Inyo National Forest in 1991. The plants seem to be restricted to dolomite and limestone formations in the Last Chance, White, Inyo, and Panamint mountains of Inyo and Mono counties on federal land managed by the U.S. Forest Service and the BLM.

Potential threats to July gold include mining, off-road vehicles, and small hydro-electric projects. There is no management plan for this species and all sites remain unprotected. The ecology of July gold remains largely unknown, however, ongoing studies of its reproductive biology indicate that although most embryos are fertilized, few healthy seeds are produced, possibiy as a result of genetic abnormalities. The reproductive capacity of this shrub is further reduced by post-germination seedling death. Some researchers believe that these factors may explain the relict nature of July gold and may eventually cause its extinction.

**The present trend for July gold is one of stability.**

## Baker's larkspur
*(Delphinium bakeri)*

CA - Rare (1979)
FED - Candidate 1

General Habitat: • Coastal Scrub

Baker's larkspur, a member of the buttercup family (Ranunculaceae), is an erect, leafy-stemmed perennial with showy blue and white flowers. Currently, only one population of Baker's larkspur is known to exist; this population occurs on a grassy bank along the edge of an old roadcut in northwestern Marin County.

Baker's larkspur, which was once known from several populations in Marin and Sonoma counties, has become endangered through extensive grazing, roadside maintenance activities, and conversion of its habitat to cultivated farmland. The single remaining occurrence is extremely small, privately owned, and unprotected. As a result this species is exceptionally vulnerable to chance catastrophic events. CNPS and the Marin County Public Works Department are working together to time roadside clearing so that it does not damage the remaining population. Although Baker's delphinium has always been rare, habitat losses have nearly caused its extinction. Research is needed to determine the habitat requirements, reproductive biology, and management needs of Baker's larkspur. It is appropriate to change the State designation from rare to endangered.

**The recent trend for Baker's larkspur is one of decline.**

## Cuyamaca larkspur
*(Delphinium hesperium* **ssp.** *cuyamacae)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Meadows and Seeps

Cuyamaca larkspur is an herbaceous perennial in the buttercup family (Ranunculaceae) with erect leafy stems that produce dense blue-violet blooms. This larkspur usually grows in low, moist areas within the grassy meadows bordering Cuyamaca Lake and nearby areas in San Diego County.

Although more than twenty occurrences of Cuyamaca larkspur are known, several have not been seen for many years and are believed to be extirpated. Most extant occurrences are located within the drainages that flow into Cuyamaca Lake, with several found at Cuyamaca Rancho State Park and on land managed by the Cuyamaca Lake Recreation and Park District. In 1991, one occurrence was discovered on Cleveland National Forest land. Other occurrences are situated on private land and remain unprotected. Threats to this larkspur are lakeside residential development and increased use and development of recreational facilities. Periodic changes in reservoir levels alter the local hydrology and change the amount of suitable Cuyamaca larkspur habitat. The California Department of Parks and Recreation has devised a management plan for the rare plants at Cuyamaca Rancho State Park, and a portion of the area supporting Cuyamaca larkspur has been designated a Natural Preserve. DFG is working with local landowners to encourage protection of rare plants on their property. The San Diego State University Foundation entered into an MOU with DFG to examine the population dynamics and habitat requirements of Cuyamaca larkspur. Although this plant is extremely rare and has declined as a result of habitat loss, these efforts may help to protect it from further decline.

**The recent trend for Cuyamaca larkspur is one of stability to decline.**

## San Clemente Island larkspur
*(Delphinium kinkiense)*

CA - Endangered (1979)
FED - Endangered (1987)

General Habitat: • Valley and Foothill Grassland

San Clemente Island larkspur is a perennial herb in the buttercup family (Ranunculaceae). Plants have divided basal leaves and elongate stalks of pale violet flowers. This species is known from about 10 sites in grasslands on the eastern slopes of San Clemente Island, Los Angeles County.

All San Clemente Island larkspur populations have been damaged by feral animals. Intense grazing by introduced goats, the accompanying soil loss and the competition from introduced weedy annual plants resulted in serious threats to this larkspur and its associated species. The U.S. Navy, which has jurisdiction over the island, has an ongoing program to remove feral goats and pigs in an effort to restore the native vegetation. In the summer of 1989 a new phase of this eradication effort was initiated. Two fenced larkspur populations have grown to several hundred plants each. The last complete survey of the Island's rare plants was done from 1985 to 1987. The Navy's biologist for the area has recommended a follow-up survey to gauge the effects of feral animal removal.

Over the last few years the Island's native vegetation has shown a general improvement, in spite of drought conditions.

**San Clemente Island larkspur populations have increased in size as a result of improved conditions and the overall trend for this species is one of stability to increase.**

## Yellow larkspur

*(Delphinium luteum)*

CA - Rare (1979)
FED - Candidate 1

General Habitat: • Coastal Scrub

Yellow larkspur is a distinctively yellow-flowered herbaceous perennial in the buttercup family (Ranunculaceae). It grows on steep, rocky outcrops, often in areas subject to active rock sliding, of the coastal sage scrub plant community. The restricted distribution of yellow larkspur is centered near the town of Bodega Bay, Sonoma County, with fewer than a dozen historic occurrences recorded.

Yellow larkspur has been declining in recent years due to cattle grazing and residential development. It is likely that there are only two extant occurrences remaining. Both occurrences are on private lands without protection or management plans, although one is near a quarry and is fenced for safety reasons. A few other questionable sites exist containing only hybrid plants. Due to the severe decline of this species, a change in status from rare to endangered may be appropriate.

**The trend for yellow larkspur is one of decline.**

## Geyser's panicum

*(Dichanthelium lanuginosum* **var.** *thermale)*

CA - Endangered (1978)
FED - Candidate 2

General Habitat: • Closed-cone Conifer Forest

Geysers panicum, a member of the grass family (Poaceae), is an unusual, tufted, velvet-haired perennial grass that is found only in the Big Sulfur Creek drainage of The Geysers area, Sonoma County. It is restricted to the hydrothermally altered soil near surface active geothermal sites and is adapted to the high acidity and high soil temperatures at these sites. *Panicum thermale* is a synonym.

Geysers panicum is currently known from seven occurrences. Extensive development for geothermal power altered the site of the largest occurrence before its historic abundance was known. Road construction and geothermal developments by Pacific Gas and Electric and Union Oil have altered the habitat of four occurrences, destroying plants and disturbing habitat. Natural recovery has occurred at those locations, but its extent is unknown. Physical disturbance of the habitat by earth-moving operations, landslides, and maintenance operations are continuing threats. DFG and the California Energy Commission have been working with private companies to avoid disturbance within the Little Geysers Natural Area which supports a large population of this plant. The initial phase of a monitoring study, which included recommendations for long-term monitoring, was recently completed by PG&E under an MOU with DFG. The occurrence at Little Geysers is declining, possibly due to drought conditions. An increase in soil temperature associated with greater surface geothermal activity has also been observed there since 1989.

**The trend for Geysers panicum is unknown.**

## Beach spectacle pod

*(Dithyrea maritima)*

CA - Threatened (1990)
FED - Candidate 2

General Habitat: • Coastal Dunes

Beach spectacle pod is a low growing, whitish-flowered perennial herb in the mustard family (Brassicaceae). It is found in swales between small transverse foredunes near the surf. Beach spectacle pod is usually found at the bases of these fragile dunes where the sand is relatively unstable.

Beach spectacle pod once occurred on mainland California from Hermosa Beach in Los Angeles County north through Santa Barbara County to the Morro Bay sandspit in San Luis Obispo County. It was reported from San Miguel Island in 1930, and healthy populations were recently seen on San Nicholas Island. By the early 1930s, the Los Angeles County populations had been extirpated. Populations throughout the rest of the original range exist, but have been heavily impacted and greatly reduced. Despite recent searches, only about half of the historic occurrences have been seen in the last decade. Much of the decline of this species can be attributed to habitat loss associated with damage by off-road vehicles, foot traffic, and activities associated with oil drilling. Vandenberg Air Force Base has entered into an agreement with The Nature Conservancy to protect rare plant species, including beach spectacle pod, that occur on the base. In 1990 a management strategy for this species was developed by DFG. In 1991 a portion of a beach spectacle pod population will be transferred to TNC and will become part of their Nipomo Dunes Preserve. This habitat was originally purchased by the Coastal Commission with Proposi-

tion 70 funds. A boardwalk will be constructed at the TNC preserve from the parking lot to the beach that will help reduce human trampling of populations there.

**The overall trend for beach spectacle pod is one of decline due to habitat loss and destruction.**

## Cuyamaca Lake downingia

*(Downingia concolor* **var.** *brevior)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Meadows and Seeps

Cuyamaca Lake downingia, a member of the bellflower family (Campanulaceae), is a small annual herb that produces blue and white flowers tinged with purple spots. It grows in the vernally moist soils in the vicinity of Cuyamaca Lake, San Diego County.

Since Cuyamaca Lake downingia is dependent on seasonal rainfall and standing water levels, plant numbers and locations of plants vary from year to year. Suitable habitat is inundated by high reservoir levels during some years, and has reduced the size of several populations. Planned lakeside development and recreational fa cilities may eliminate additional habitat. A few occurrences are protected within Cuyamaca Rancho State Park. Other sites are on land managed by the Cuyamaca Lake Recreation and Parks District or are under private ownership. DFG is preparing an MOU with the California Department of Parks and Recreation to conduct research on this species, and a portion of its habitat within Cuyamaca Rancho State Park has been designated a Natural Preserve. California Endangered Species Tax Checkoff funds are being used to fund studies by Dr. Ellen Bauder of San Diego State University on the distribution and abundance of this species.

**The overall trend for Cuyamaca Lake downingia is one of decline.**

## Short-leaved dudleya

*(Dudleya brevifolia)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Chaparral
• Coastal Scrub

Short-leaved dudleya is small, succulent perennial plant with a rosette of leaves that arise from a corm. This member of the stonecrop family (Crassulaceae) produces short stalks of white flowers with red or purple markings. Short-leaved dudleya has never been widespread and remains restricted to open sites in the chaparral communities of western San Diego County.

Short-leaved dudleya is located primarily on private land where habitat destruction by residential development and off-road vehicle recreation threaten several populations. Four sites, or about 50% of the total range, have been destroyed in the last five years. One small population is known from the City of Del Mar's Crest Canyon Preserve and two occur at Torrey Pines State Preserve, but recreational use of the habitat has damaged both sites. In 1985 a cable fence was installed around several of the Torrey Pines populations. The largest populations, on Carmel Mountain, are in areas being proposed for development. There are no protection or management plans for this species. Under a Memorandum of Understanding with CSU San Diego initiated in 1991, genetic relationships within the *Dudleya* genus will be examined.

**The trend for short-leaved dudleya is one of rapid decline which may lead to its extinction without immediate protection efforts.**

## Santa Monica Mountains dudleya

*(Dudleya cymosa* **ssp.** *marcescens)*

CA - Rare (1978)
FED - Candidate 2

General Habitat: • Chaparral

Santa Monica Mountains dudleya is a succulent perennial in the stonecrop family (Crassulaceae) with a basal rosette of leaves. Its flowers are bright yellow and often marked with red. This species grows in rocky volcanic cliffs of the Santa Monica Mountains in Little Sycamore Canyon, Ventura County and above Seminole Hot Springs, Los Angeles County.

Santa Monica Mountains dudleya has less than ten occurrences and has always been restricted by its habitat requirements. Very little ecological or reproductive information is available for this plant. Ownership is divided between the National Park Service, the Department of Parks and Recreation, and private owners. In 1987, California Native Plant Society members moved plants threatened by fire-

break maintenance to a protected area at Soltice Canyon State Park. The plants that were moved established successfully, though many were lost to grading. The new population is monitored and weeded yearly. The sheer cliff habitat supporting the transplanted population seems likely to remain undisturbed and therefore is not immediately threatened.

**The overall trend for Santa Monica Mountains dudleya is one of stability.**

## Santa Cruz Island dudleya
*(Dudleya nesiotica)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Coastal Bluff Scrub

Santa Cruz Island dudleya is a succulent perennial in the stonecrop family (Crassulaceae) with a basal rosette of leaves, and a stalked flower stalk of white flowers with erect petals. Its three populations grow on sea bluffs and coastal terraces on the west end of Santa Cruz Island, Santa Barbara County.

The effects of grazing over many years by introduced sheep severely damaged many of the native plant communities on Santa Cruz Island and may have affected Santa Cruz Island dudleya. The native vegetation has begun to recover since the removal of nearly all of the sheep by The Nature Conservancy, which, since 1988, has managed most of the island. However, in 1989 a researcher noted pig damage to Santa Cruz Island dudleya sites for the first time after nearly 20 years of continuous observations. Feral pig numbers on the Island have skyrocketed since the sheep removal effort was completed. There appears to be an additional potential threat to dudleya sites from increased vehicle use at the west end of the Island. Increased monitoring has been recommended to track the impacts of these potential threats in coming years. A change in status from rare to threatened may be appropriate for Santa Cruz Island dudleya.

**The trend for Santa Cruz Island dudleya is one of stability to decline.**

## Laguna Beach dudleya
*(Dudleya stolonifera)*

CA - Rare 1979); Threatened (1987)
FED - Candidate 1

General Habitat: • Chaparral
• Cismontane Woodland
• Coastal Scrub
• Valley and Foothill Grassland

Laguna Beach dudleya is a succulent perennial in the stonecrop family (Crassulaceae) with basal leaves and a short flower stalk of yellow-green flowers. The entire global distribution is restricted to steep, north-facing cliffs in canyons near Laguna Beach, Orange County.

All five Laguna Beach dudleya occurrences are privately owned and several are threatened by residential and commercial development. This prompted the Fish and Game Commission to list the plant as threatened in 1987. Since Laguna Beach dudleya grows on steep terrain that is generally unsuitable for development, conservation easements may be an effective means to protect habitat. The Nature Conservancy, through its Register of Natural Areas, has reached agreements with several private landowners to voluntarily protect this species. Active management is needed to protect the dudleya from encroachment by nonnative plants used to landscape the steep cliffs.

**The trend for Laguna Beach dudleya is one of continuing decline.**

## Santa Barbara Island dudleya
*(Dudleya traskiae)*

CA - Endangered (1979)
FED - Endangered (1978)

General Habitat: • Coastal Scrub

Santa Barbara Island dudleya is a small succulent perennial in the stonecrop family (Crassulaceae). The plants have short stems and ba sal rosettes of broad, thickened leaves and yellow flowers on short stalks. This dudleya is endemic to Santa Barbara Island, the smallest of California's Channel Islands, and is restricted to steep, rocky slopes and outcrops within canyons. It is found in the coastal bluff scrub plant community. Santa Barbara Island dudleya is now known from eleven populations.

Grazing by introduced herbivores, especially rabbits, and other land use practices reduced the numbers of Santa Barbara Island dudleya to such an extent that by the early 1970s the species was presumed extinct. The National Park Service, which now manages the Island, initiated a rabbit control program that eliminated the animals by 1981. Recent monitoring indicates that rabbit removal has been followed by increases in numbers of this species and improvement in the general condition of the Island's vegetation. A study completed in 1989 (partially funded by USFWS Section 6 grant-in-aid and California Endangered Species Tax Check-off funds) determined that the total population remained more or less stable from 1985 to 1987. However, the total number of plants is low and successful reproduction is limited by

drought and herbivores. Transplant experiments indicate that Santa Barbara Island dudleya could survive in sites outside of its present distribution.

**The overall trend for Santa Barbara Island dudleya appears to be one of stability, but numbers are low enough that extirpation of some populations is a continuing threat.**

## Santa Ana River woolly-star

*(Eriastrum densifolium* **ssp.** *sanctorum)*

CA - Endangered (1987)
FED - Endangered (1987)

General Habitat: • Coastal Scrub

Santa Ana River woolly-star is a much-branched, erect, bright blue flowered, perennial herb of the phlox family (Polemoniaceae). It occurs in the sandy soils of river floodplains or terraced alluvial deposits in the Santa Ana River drainage. Historically it was known to extend along 60 river miles in Orange and San Bernardino counties, but now plants occupy only about 8 miles of river floodplain in San Bernardino County.

Many activities threaten Santa Ana River woolly-star, including flood control work, sand and gravel mining, off-road vehicle recreation, and development. Wooly-star habitat in the Santa Ana River Wash receives a variety of uses. Owners include sand and gravel companies, a water district, the County of San Bernardino, the City of Redlands, and BLM. The U.S. Army Corps of Engineers also recently purchased easements on about 900 acres of woolly-star habitat in the Wash to compensate for the expected impacts caused by the Seven Oaks flood control dam, to be constructed upstream. Results of studies conducted in the late 1980s of Santa Ana River woolly-star demography, genetics, and reproductive biology are being used to create a management plan for the Corp's preserve. A management program for the entire Wash is needed that will focus on protection of the remaining alluvial scrub habitat and ensure coordination between agencies with jurisdiction over land use decisions.

**The trend for Santa Ana River woolly-star is one of continuing decline.**

## Tracy's eriastrum

*(Eriastrum tracyi)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Chaparral
• Cismontane Woodland

Tracy's eriastrum is a slender, brittle annual in the phlox family (Polemoniaceae). It grows a half foot high and produces light blue to white flowers in the spring. Tracy's eriastrum occurs in open, dry gravelly flats within closed-cone pine forest, chaparral, and serpentine scrub. There are less than twenty Tracy's eriastrum occurrences. Its range includes Trinity, Tehama, Glenn, Lake, Colusa, and Santa Clara counties.

A taxonomic revision in progress indicates that this species should be included in the species *Eriastrum brandegeae*, an equally rare taxon. This information will be published in the new Jepson Manual. Extant occurrences are being degraded by off-road vehicle activity, cattle grazing, and recreational use. Up-to-date information is lacking for several occurrences, and field surveys are needed. Site ownership is both private and public (BLM and USFS). There are no active management programs or protection plans for Tracy's eriastrum by Federal agencies. Livestock grazing and ORV activity should be eliminated from known occurrences.

**More studies are needed to evaluate the population trends for Tracy's eriastrum.**

## Indian Knob mountainbalm

*(Eriodictyon altissimum)*

CA - Endangered (1979)
FED - Proposed Endangered (1991)

General Habitat: • Chaparral

Indian Knob mountainbalm, a member of the waterleaf family (Hydrophyllaceae), is a tall evergreen shrub with dark green, sticky leaves and clusters of tubular pale lavender flowers. This shrub is restricted to a limited area in the coastal region of San Luis Obispo County. It grows on shallow, sandy soils derived from siliceous sandstone in chamise chaparral, maritime chaparral and coastal sage scrub. Indian Knob mountainbalm occurs with Morro manzanita (*Arctostaphylos morroensis*), a candidate for State-listing, at several locations. Some researchers question the taxonomic validity of this species. It is morphologically similar to *E. capitatum* (see below).

Most of Indian Knob mountainbalm's habitat is potentially threatened by off-road vehicle ac-

tivity, housing construction, tar sand mining and oil well drilling. One population is threatened by the installation of a trans-Pacific telephone cable. Four of the six known occurrences are on private, unprotected land. Habitat at one of the private occurrences is used to evaporate sewage sludge. Two sites are within Montana de Oro State Park. The Park is preparing a resource management plan that will address the habitat protection needs for populations within Park boundaries. Scientists from UC Riverside are planning studies of the genetics and reproductive biology of this species in 1992. Indian Knob mountainbalm is adapted to fire and so controlled burns may be needed to vitalize populations. USFWS proposed this species for federal listing as endangered in 1991.

**The trend for Indian knob mountainbalm is unknown since recent information on the species is not available.**

## Lompoc yerba santa

*(Eriodictyon capitatum)*

CA - Rare (1979)
FED - Candidate 1

General Habitat:
- Closed-cone Conifer Forest
- Chaparral

Lompoc yerba santa is an evergreen shrub with smooth, sticky leaves and branched inflorescences of tubular lavender flowers. It is in the waterleaf family (Hydrophyllaceae). This species is found in small populations at about 10 sites in the Santa Ynez Mountains, the Solomon Hills and on Burton Mesa, Santa Barbara County. Communities it occurs in are chaparral, coastal sage scrub, and closed-cone Bishop pine forest. Lompoc yerba santa is morphologically similar to Indian Knob mountain balm (*E. altissimum*). At least three sites occur on Vandenberg Air Force Base; the rest are on private lands. None are actively protected.

Lompoc yerba santa may be declining as a result of fire suppression activities. A study of one population at Vandenburg Air Force Base after a prescribed burn showed that existing plants either sprouted back or died, but no seedlings emerged. Few seeds are produced by the plants and it has been hypothesized that some of the existing populations consist of self-incompatible clones. Scientists from UC Riverside are planning studies of Lompoc yerba santa's reproductive biology and genetic variability in 1992. A status review is planned to determine if Lompoc yerba santa should be designated as a threatened species.

**The overall trend for Lompoc yerba santa is one of stability.**

## Trinity buckwheat

*(Eriogonum alpinum)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat:
- Subalpine Conifer Forest
- Upper Montane Conifer Forest

Trinity buckwheat is a short perennial herb in the buckwheat family (Polygonaceae). The plants are covered with a dense white felt and bear clusters of yellow flowers on short leafless stems. This buckwheat grows on subalpine ridges and slopes in the vicinity of Mt. Eddy and Cory Peak in Siskiyou County. It is apparently restricted to serpentine and ultrabasic peridotite soils and scree slopes.

All occurrences of Trinity buckwheat are managed by Klamath or Shasta-Trinity National Forests. The population status of this species was investigated in 1987 by the U.S. Forest Service (using California Endangered Species Tax check-off funds). This study identified limited threats from mining activity. The condition of the known sites was stable, and several new localized populations were found.

**The overall trend for Trinity buckwheat is one of stability.**

## Ione buckwheat

*(Eriogonum apricum* var. *apricum)*

CA - Endangered (1981)
FED - Candidate 1

General Habitat:
- Chaparral

Ione buckwheat is a compact, erect herbaceous perennial in the buckwheat family (Polygonaceae) with felt-covered lower leaves on short stems and white flowers with reddish midribs. It is confined to the gravelly kaolinitic clay soils of the Ione formation in the Sierra Nevada foothills of Amador County.

There are less than ten extant occurrences of Ione buckwheat; these are found in openings in the unique chaparral which covers several adjacent hills in the region. Ione buckwheat may have been more widespread before 1955 when it was described, but clay mining destroyed extensive Ione chaparral habitat before then. Increasing urbanization in the area of Ione is a potential threat to this species. Amador County recently completed a County general plan update that restricts development in the Ione buckwheat habitat area to one home per forty acres. Perhaps the greatest threats to this plant are clearing of vegetation for agricultural and fire protection purposes. DFG owns and

manages one small population at the Apricum Hill Ecological Reserve. Research was conducted (using California Endangered Species Tax check-off funds) to develop a management plan for the Ecological Reserve and provide information on the reproductive biology of Ione buckwheat. Caltrans is attempting to protect two populations that exist in highway rights-of-way. BLM also owns one population in its Folsom Resource Area which was discovered during a right-of-way survey.

**Although Ione buckwheat is likely to decline due to habitat loss, at present the trend is one of stability.**

## Irish Hill buckwheat

*(Eriogonum apricum* var. *prostratum)*

CA - Rare (1981); Endangered (1987)
FED - Candidate 1

General Habitat: • Chaparral

Irish Hill buckwheat is a prostrate perennial herb in the buckwheat family (Polygonaceae) with reddish-veined white flowers. This buckwheat grows on the Ione formation in a soil composed of gravelly kaolinitic clay of high acidity and high Aluminum content. The two extant populations occur in open barren areas within the Ione chaparral plant community on Irish Hill and Carbondale Mesa in Amador County.

In 1980, a fire burned Carbondale Mesa, but it did not seem to harm Irish Hill buckwheat. Off-road vehicle use of the area has damaged populations and threatens to destroy suitable habitat. Grazing affects part of one population but is not detrimental. Active clay mining operations continue to reduce the available habitat for this plant. One population is owned by a mining company that plans to extract clay. The second population is privately owned and remains open to mining. Increasing urbanization in the area of Ione is a potential threat to this species. Amador County recently completed a County general plan update that restricts development in the Irish Hill buckwheat habitat area to one home per forty acres. Perhaps the greatest threats to this plant are clearing of vegetation for agricultural or fire protection purposes since those activities are not subject to CEQA. There are no ongoing protection strategies for Irish Hill buckwheat. A research project at the Apricum Hill Ecological Reserve (using California Endangered Species Tax check-off funds) examined the ecology of the Ione Chaparral. Irish Hill buckwheat, although not present on the Reserve, should benefit from the habitat management recommendations of the study.

**The trend for Irish Hill buckwheat is one of decline due to habitat destruction.**

## Butterworth's buckwheat

*(Eriogonum butterworthianum)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Chaparral

Butterworth's buckwheat is a low, spreading, woody perennial herb in the buckwheat Family (Polygonaceae) with reddish-brown leaves covered by white felt on both surfaces, and small yellow flowers with reddish midribs. It resides in dry sandstone outcrops and crevices within chaparral or mixed evergreen forests in the Santa Lucia Mountains near the headwaters of the Arroyo Seco River in Monterey County. The four known occurrences of this species are on USFS land and were last visited in 1984.

Cattle have continued to graze throughout the habitat, without apparent damage to Butterworth's buckwheat populations. Little information is available on the ecology or population biology of this species. Updated surveys and a management plan are needed.

**The trend for Butterworth's buckwheat is one of decline due primarily to loss of habitat.**

## Conejo buckwheat

*(Eriogonum crocatum)*

CA - Rare (1979)
FED - Candidate 2

General Habitat:
- Chaparral
- Coastal Scrub
- Valley and Foothill
- Grassland

Conejo buckwheat, a member of the buckwheat family (Polygonaceae), is a short, loosely-branched, woolly perennial with bright sulfur-yellow flowers. Populations are usually found on dry slopes of volcanic rock within coastal sage scrub and chaparral plant communities. Less than a dozen occurrences of this species are known; these are restricted to Conejo Grade and Long Grade of the Santa Monica Mountains in Ventura County.

Residential development threatens Conejo buckwheat in all locations but Wildwood Park. Most of the occurrences are privately owned. Some habitat

was recently acquired by the City of Thousand Oaks to incorporate into Wildwood Park as a Conejo Buckwheat Preserve. There are no management plans for this species. This popular plant is available for horticultural use through the nursery trade.

**The trend for Conejo buckwheat is one of decline.**

## Thorne's buckwheat

*(Eriogonum ericifolium* **var.** *thornei)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Pinyon and Juniper Woodland

Thorne's buckwheat, a low spreading subshrub in the buckwheat family (Polygonaceae), has leaves which are felty below and soft-shaggy above, and bears white flowers in a compact flower stalk. It is found in the pinyon-juniper woodland community of two canyons in the New York Mountains of the eastern Mojave Desert in San Bernardino County. It grows on sandy loam soil derived from weathered quartz monzonite that is high in copper. The density and diversity of other typical desert plants decrease on this soil type.

Several mining claims exist in the habitat for Thorne's buckwheat, and the potential for renewed activity threatens this plant. There are several grazing allotments in the region, but the effects of livestock on this species are unknown. All of the Thorne's buckwheat occurrences are located in a BLM Area of Critical Environmental Concern. The BLM has withdrawn the area from future mining claims and plans to monitor the effects of grazing on the habitat. Nineteen lode claims made prior to 1985 are still in effect, and if development begins, it could impact Thorne's buckwheat.

**The overall trend for Thorne's buckwheat is one of decline due mainly to habitat loss from mining activities, but monitoring and subsequent protection efforts should help to stabilize this species in the future.**

## Santa Barbara Island buckwheat

*(Eriogonum giganteum* **var.** *compactum)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Coastal Bluff Scrub

Santa Barbara Island buckwheat is a rounded, shrubby, white-woolly perennial in the buckwheat family (Polygonaceae) with stout flowering stems and small white flowers in a dense horizontal flower stalk. It grows on rocky sea bluffs and within the coastal grasslands on Santa Barbara Island and its satellite, Sutil Island, which are part of Channel Islands National Park. One population is located on Sutil Island and about a dozen are known from Santa Barbara Island.

In the past, grazing by goats and rabbits, soil erosion caused by these animals, and plant collecting seriously threatened Santa Barbara Island buckwheat. Shortly after acquiring Santa Barbara Island, the National Park Service eliminated the introduced exotic herbivores and, as a result, the native vegetation is recovering. The NPS has supported a monitoring program, funded in part by a Federal section 6 grant-in-aid from the U.S. Fish and Wildlife Service, that was conducted from 1985-89. During this period nine of 11 sites were monitored. Numbers of individuals increased at some sites and decreased at others, with the total population at nine sites estimated at about 1100 individuals in 1985 and 3300 individuals in 1989. However, about half of the 1989 population was composed of immature plants that may never reach reproductive maturity. In addition, there is evidence that new populations are becoming established in sites that did not support the buckwheat during a 1979 census.

**The trend for Santa Barbara Island buckwheat is one of stability to increase.**

## San Nicolas Island buckwheat

*(Eriogonum grande* **var.** *timorum)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Coastal Bluff Scrub

San Nicolas Island buckwheat is a short, white-woolly perennial from a woody base with wavy or curled leaves and clusters of white flowers. It is in the buckwheat family (Polygonaceae). This subspecies is endemic to the east and south-facing cliffs of the southern part of San Nicolas Island, one of California's Channel Islands. The plants grow in soil-filled cracks and dry alluvial soils in the coastal scrub community.

Grazing by goats and sheep has diminished many native species, including San Nicolas Island buckwheat, and has encouraged the spread of exotic weeds on San Nicolas Island. The U.S. Navy, which has owned the Island since 1933, has used it as a bombing and gunnery range. Numerous naval operations and construction projects have also modified much of the Island's vegetation. The Navy is aware of rare endemic plants on San Nicolas Island and now reviews military activities and construction which may affect sensitive species. Permanent transects have been established to monitor the status of this buckwheat. A new checklist of the

plants of San Nicolas Island was completed in 1991 and extensive surveys will be conducted during the spring of 1992. The Navy is also planning nonnative plant removal projects on the island in 1992. Santa Barbara Botanic Garden is involved in these efforts.

**The overall trend for San Nicolas Island buckwheat is one of stability.**

## Kellogg's buckwheat
*(Eriogonum kelloggii)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Lower Montane Conifer Forest

Kellogg's buckwheat, a member of the buckwheat family (Polygonaceae), is a low, spreading, loosely-matted perennial, with short erect inflorescences bearing white flowers with reddish midribs. This species is known only from the Red Mountain and Little Red Mountain areas of Mendocino County. It occurs on serpentine soil found in open rocky areas within montane coniferous forest. Among its associates is McDonald's rock cress (*Arabis macdonaldiana*), which is State and Federally listed as endangered. Kellogg's buckwheat is known from fewer than ten occurrences.

Much of Red Mountain is administered by the BLM, but because of chromium and nickel deposits, extensive mining claims exist. Although the region has been recognized by BLM as an Area of Critical Environmental Concern, it remains open to mining and the rare plants are unprotected. Further studies are being conducted to determine the location and size of existing Kellogg's buckwheat colonies and their associates on Red Mountain serpentines. Occurrences of this species are owned privately, and publicly by the BLM, and by DFG on the recently acquired Little Red Mountain Ecological Reserve. Only a small portion of this species' habitat is protected on the Reserve.

**The trend for Kellogg's buckwheat is one of stability, but because mining claims exist in its restricted habitat, this species continues to warrant listing as endangered.**

## Twisselmann's buckwheat
*(Eriogonum twisselmannii)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Upper Montane Conifer Forest

Twisselmann's buckwheat, a member of the buckwheat family (Polygonaceae), is a loosely-matted woody perennial with erect flowering stems and clusters of yellow-brown to reddish-brown flowers. It grows on open, granitic outcrops in the red fir forest community of the southern Sierra Nevada. It is endemic to Slate Mountain and the Needles in Sequoia National Forest. There are fewer than a dozen occurrences, and the extent of all populations does not exceed 100 acres. All Twisselmann's buckwheat populations occur on National Forest land.

Due to its remote location, there are few threats to Twisselmann's buckwheat. If logging or ski area development were to take place at Slate Mountain, this species could become endangered because of its localized distribution and intolerance to disturbance. The U.S. Forest Service has this plant on its sensitive plant list and will continue to monitor its status.

**The trend for Twisselmann's buckwheat is one of stability.**

## Congdon's woolly sunflower
*(Eriophyllum congdonii)*

CA - Rare (1982)
FED - None

General Habitat:
- Chaparral
- Cismontane Woodland
- Lower Montane
- Conifer Forest

Congdon's woolly sunflower is an erect, freely branched annual with heads of yellow flowers. It is in the sunflower family (Asteraceae) and occurs on dry ridges of metamorphic rock, scree and talus within chaparral and oak woodlands of the Merced River Canyon in Mariposa County. There are approximately a dozen occurrences, all found within Sierra National Forest or near the western boundary of Yosemite National Park. In 1991, a new population was discovered in the Sierra National Forest which grows in the bed of an abandoned road. Thirteen more populations were reported in Stanislaus National Forest.

There are few threats to most populations of Congdon's woolly sunflower, though gold mining occurs near the newly reported population. Occurrences found near roads are subject to road maintenance activities and herbicide spraying. The ecology and population biology of this species are poorly known and the effects of disturbance and logging have not

been determined. There are no active management or protection programs for this sunflower.

**The trend for Congdon's woolly sunflower is one of stability.**

## San Mateo woolly sunflower

*(Eriophyllum latilobum)*

CA - Candidate Endangered (1991)
FED - Candidate 1

General Habitat: • Cismontane Woodland

San Mateo woolly sunflower is a spring-flowering bushy perennial in the sunflower family (Asteraceae) with golden flowers. It is known from a single population in the Crystal Springs area of San Mateo County, on a grassy to sparsely wooded steep slope consisting of serpentine influenced soils.

Only two occurrences of San Mateo woolly sunflower have been recorded, however no plants have been seen at one of the sites for many years. A portion of the remaining population occurs on San Francisco Water District property, in a road maintenance easement held by San Mateo County. The steep slope on which the plants grow is subject to erosion and soil slippage. When this occurs, road maintenance crews reshape the slope. In addition, the lower portion of the slope is mowed periodically to reduce fuel loading. These activities could inadvertently damage or eliminate San Mateo woolly sunflower plants. Maintenance of a large diameter waterline above the population by San Francisco Water District, and use of herbicides from a residential development on the top of the slope, could adversely affect the population. The San Mateo County Trails Plan includes a proposal for a paved, multi-use trail which could damage the single remaining occurrence of this species. Currently there is no management plan for this species.

**The trend for San Mateo woolly sunflower is one of decline.**

## San Diego button celery

*(Eryngium aristulatum var. parishii)*

CA - Endangered (1979)
FED - Proposed Endangered (1991)

General Habitat: • Vernal Pools

San Diego button celery, a member of the carrot family (Apiaceae), is an herbaceous biennial that can be distinguished by its low spreading appearance, heads of greenish flowers, and spine-tipped bract margins at the base of the flower stalk. This species is restricted in the U.S. to vernal pools in San Diego and Riverside counties; it is also known from Baja California. Associated State-listed species include San Diego mesa mint (*Pogogyne abramsii*), California Orcutt grass (*Orcuttia californica*), and Otay mesa mint (*Pogogyne nudiuscula*). Landowners are the U.S. Department of Defense, San Diego County, the City of San Diego (Chollas Park), CalTrans, TNC, and other private landowners.

Historically, San Diego button celery occurred in many vernal pool systems throughout San Diego County and on the Santa Rosa Plateau in Riverside County. While nearly 80 occurrences have been reported for this taxon, at least 30 are extirpated or in severe decline; another 10 are historic records and have not been seen in recent years. A recent report to DFG indicated that in a period of less than ten years, from 1979 to 1986, 23% of the existing vernal pools in San Diego County were destroyed. Projections suggest that this trend will continue or worsen. Residential development, off-road vehicle damage, dumping, alteration of drainage patterns, disking for fire control and grazing continue to degrade or destroy vernal pool habitat for San Diego button celery and its associates. The vernal pool preservation program by the City of San Diego has failed to secure vernal pool habitat. The only sites that have protection are those on TNC's Santa Rosa Plateau Preserve in Riverside County. California Endangered Species Tax Check-off funds are being used for protection, restoration and annual monitoring of vernal pool habitat at this Preserve. Under a Memorandum of Understanding with Rancho Santa Ana Botanic Garden, San Diego button celery seed will be stored at the Garden's long-term storage facilities. Caltrans completed mitigation in 1986 that created artificial vernal pools for Del Mar Mesa plants that were displaced by highway construction. In 1991, the San Diego Biodiversity Project prepared a report on the status of San Marcos area vernal pools, many of which contain San Diego button celery. In order to protect this endangered species, priority must be given to immediate formal protection of significant vernal pool systems. This species was proposed for federal listing as endangered by USFWS in November of 1991.

**The trend for San Diego button celery is one of drastic decline as a result of habitat alteration and destruction.**

## Loch Lomond button celery

*(Eryngium constancei)*

CA - Endangered (1987)
FED - Endangered (1987)

General Habitat: • Vernal Pools

The Loch Lomond button celery is a slender, herbaceous annual in the carrot family (Apiaceae). The plants are

covered with fine hairs, and produce open inflorescences of tiny white to light purple flowers. This species is endemic to the bed of a small vernal lake near the community of Loch Lomond in Lake County. The lake, surrounded by a ponderosa pine and black oak forest, is the only known site for Loch Lomond button celery, making it one of California's rarest plants.

The Loch Lomond vernal lake was privately owned and was damaged in 1984 when the owner illegally dredged part of the lakebed. He was required to return the excavated material to the site, but the damage was still visible in 1989. The Wildlife Conservation Board purchased the lake and a small area of surrounding habitat in 1988. However, adverse impacts to the site continued as a result of damage from off-road vehicles. The U.S. Fish and Wildlife Service provided funds in 1987 to purchase fencing material and in 1989 a split-rail fence allowing pedestrian access was built. The site is now protected by DFG as Loch Lomond Ecological Reserve. A design is being developed for an interpretive display to be constructed and installed at the lake in 1992.

**The trend for Loch Lomond button celery is one of stability.**

## Delta button celery

*(Eryngium racemosum)*

CA - Endangered (1981)
FED - Candidate 2

General Habitat: • Riparian Scrub

Delta button celery, a member of the carrot family (Apiaceae), is a slender, prostrate, herbaceous perennial with greenish, rounded flower heads. It occurs generally on clay soils in lowland areas of riparian and floodplain habitat. Its historic distribution includes Calaveras, Merced, Stanislaus, and San Joaquin counties.

Of the approximately 20 known Delta button celery occurrences, about a third have been extirpated by flood control activities and conversion of lowlands to agriculture, including all of the occurrences in San Joaquin County and most in Stanislaus County. The occurrence in Calaveras County has not been seen recently. A new population in Stanislaus County was reported in 1989. Most extant occurrences are found in Merced County along the San Joaquin River. These populations may be threatened by future flood control activities which could change the local hydrology and alter the habitat. Delta button celery occurrences are under private ownership, on USFWS property, and on DFG's Los Banos and North Grasslands Wildlife Areas. There are no specific protection measures being implemented for this species. USFWS's San Luis National Wildlife Refuge has an MOU with DFG to examine the effects of different grazing regimes on this species.

**The trend for Delta button celery is one of decline.**

## Contra Costa wallflower

*(Erysimum capitatum* **var.** *angustatum)*

CA - Endangered (1978)
FED - Endangered (1978)

General Habitat: • Inland Dunes

Contra Costa wallflower, a member of the mustard family (Brassicaceae), is a coarse-stemmed, erect, herbaceous biennial herb with yellowish-orange flowers. Its distinctive habitat consists of stabilized interior sand dunes that currently are densely covered with herbs, grasses, and shrubs. Only two populations remain, both at the 70-acre Antioch Dunes along the San Joaquin River which is near Antioch in Contra Costa County. The area is mainly protected as a part of the USFWS Antioch Dunes National Wildlife Refuge, and by PG&E on its adjoining property.

Loss of habitat through sand mining, industrial development, rototilling for fire control, and off-road vehicle activities have left this wallflower on the verge of extinction. The Antioch Dunes Refuge was closed to public use in 1988 to reduce erosion caused by trespass and ORVs. A Recovery Plan for this species and two others endemic to the Antioch Dunes, prepared by USFWS, calls for enhancement of existing populations and establishment of new populations within its historic range. Pacific Gas and Electric designed and paid for enhancement at the Antioch Dunes which was conducted by USFWS. Research on the Antioch Dunes populations has determined that, although Contra Costa wallflower is capable of producing large amounts of seed, seed production can be substantially reduced by environmental limitations such as low pollination rates and insect seed predation. This species retains a large seed bank in the soil and shows some ability to grow on the clay substrate that remains in areas where overlying sand has been stripped away. However, an attempt to experimentally establish plants on this clay substrate was unsuccessful. Since then the Refuge has developed several restoration and management techniques including germination of seeds at Napa Native Nursery, planting of seeds, seed collection, and the establishment of a permanent seed bank. In cooperation with PG&E, the Refuge is creating new dunes using native river sand that will be restored

through seeding and the planting of seedlings. Over 2000 seedlings will be planted on the new dunes in early 1992. The wallflower population is surveyed annually and has shown considerable increase since 1978.

**The long-term trend for Contra Costa wallflower is one of decline, though recent management activities may help to stabilize the trend.**

## Menzies' wallflower

*(Erysimum menziesii* **ssp.** *menziesii)*

CA - Endangered (1984)
FED - Proposed Endangered (1991)

General Habitat: • Coastal Dunes

Menzies' wallflower is a facultative biennial or monocarpic perennial herb found on partially stabilized sand dunes or sand flats. It is a member of the mustard family (Brassicaceae). The entire global distribution is restricted to three coastal dune systems in Humboldt, Mendocino, and Monterey counties. Urbanization and industrialization of California's coast have extirpated many dune communities and few undisturbed areas remain. This species has been nearly extirpated from the Monterey Peninsula. Ownership is divided between BLM, California Department of Parks and Recreation, The Nature Conservancy, and other private parties.

Several wallflower occurrences are located within State Parks (Asilomar in Monterey County and MacKerricher in Mendocino County), but they are threatened by visitor trampling, off-road vehicles, and displacement by invasive nonnative plants. Sites on private lands face similar threats in addition to potential elimination by development. A part of the occurrence on the North Spit of Humboldt Bay is protected by TNC's Lanphere-Christensen Dunes Preserve and by BLM. Both organizations have fenced portions of their land to control vehicle trespass. TNC uses volunteer labor annually to conduct removal of encroaching nonnative plants. BLM's Samoa Recreation Area includes an off-highway vehicle staging area which may increase impacts to adjacent habitat areas. In December of 1991, BLM enacted an emergency closure of public lands on the Samoa Peninsula because mushroom gathering on two acres of the North Spit was damaging wallflower habitat. The ban is effective until May of 1992. Efforts are continuing to protect the remaining habitat on the North Spit. An eighty acre area owned by the City of Eureka was fenced in 1991 through a Coastal Conservancy grant. Humboldt County has formed a Beach and Dune Advisory Committee to help develop a resource management program for the Humboldt Bay dune system that will protect dune habitat and allow limited vehicle use. Monitoring is continuing at the State Parks, and habitat restoration has occurred at Marina and Asilomar State Beaches in Monterey County. Humboldt State University completed a genetic conservation plan for the species in cooperation with the Humboldt Bay pulp mills and the U.S. Environmental Protection Agency.

**Overall, the trend for Menzies' wallflower is one of continuing decline.**

## Santa Cruz wallflower

*(Erysimum teretifolium)*

CA - Endangered (1981)
FED - Proposed Endangered (1991)

General Habitat: • Lower Montane Conifer Forest

Santa Cruz wallflower, a member of the mustard family (Brassicaceae), is an erect, usually simple-stemmed, herbaceous annual or biennial, with orange to yellow flowers. Its range is restricted to inland ponderosa pine sandhills near Felton, Ben Lomond, and Bonny Doon in Santa Cruz County. The habitat, which contains a combination of deep, coarse, and poorly developed soils in a relatively humid coastal climate, is rare in California.

Of approximately 20 known Santa Cruz wallflower occurrences, at least three are extirpated and several others are damaged and declining due to gravel and sand mining operations and nearby residential development. Illegal bulldozing by a quarry operator, before a permit was issued, destroyed part of one occurrence. Revegetation is planned at that site, but plan approval is still pending. A small but significant wallflower site was acquired in the Quail Hollow sandhills by Santa Cruz County and DFG. DFG also recently acquired a parcel in Bonnie Doon that protects a population of Santa Cruz wallflower. Direct acquisition of additional populations and conservation easements would provide further protection.

**The overall trend for Santa Cruz wallflower is one of decline.**

## Pine Hill flannelbush

*(Fremontodendron decumbens)*

CA - Rare (1979)
FED - Candidate 2

General Habitat • Chaparral
• Cismontane Woodland

Pine Hill flannelbush, a member of the cacao family (Sterculiaceae), is a low-growing, many-branched, spreading shrub with striking orange and yellow flowers that grows on reddish-brown clay soil derived from gabbro. It is found only

in chaparral and oak woodlands of Pine Hill and the nearby foothills of the Sierra Nevada in El Dorado County. Three State-listed rare plants are associated with this species: El Dorado bedstraw (*Galium californicum* ssp. *sierrae*), Pine Hill ceanothus (*Ceanothus roderickii*) and Layne's butterweed (*Senecio layneae*). There are approximately six known occurrences of this flannelbush, the largest of which are protected on the DFG Pine Hill Ecological Reserve. Other occurrences are on private lands nearby.

Future development in rapidly-growing western El Dorado County could threaten Pine Hill flannelbush populations on private land. Unregulated grading on existing large parcels for homes, barns and other structures is a significant and immediate threat. A further threat to this species is the construction and maintenance of fire breaks. Experimental burns on Pine Hill suggest that fire may be of benefit to this shrub by promoting resprouting and stimulating seed germination. Additional occurrences in other counties have been suggested, but initial studies indicate they belong to another taxon. A habitat conservation plan is needed for Pine Hill flannelbush and the other State-listed plants that occur on Pine Hill gabbro soils. DFG is working with El Dorado County Planning Department to identify high priority areas for protection and to develop means to secure them through the land use planning process. An MOU is being developed between DFG, BLM, and the Bureau of Reclamation to work cooperatively to acquire and manage land to protect rare plant habitat in the vicinity of the South Fork of the American River.

**The trend for Pine Hill flannel bush is stable/declining, but the species remains threatened.**

## Mexican flannelbush

*(Fremontodendron mexicanum)*

CA - Rare (1982)
FED - Candidate 2

General Habitat:
- Closed-cone Conifer Forest
- Chaparral
- Cismontane Woodland

Mexican flannelbush, a member of the cacao family (Sterculiaceae), is a stiff, robust, tree-like shrub with bright orange flowers. It occurs in the chaparral and cypress woodland plant communities of southern California. Its range once extended from northern Baja California to Los Angeles County. Today it is restricted to a few sites in San Diego County near the International Border. This flannelbush is a showy plant that is used as a drought-tolerant ornamental shrub in gardens.

The habitat of Mexican flannelbush is subject to frequent human- caused fires, which may occur too frequently to permit regrowth of the chaparral. The flannelbush must also compete for water and nutrients with annual ryegrass, which is seeded by the California Division of Forestry after a fire. Occurrences of Mexican flannelbush are owned by the BLM and private individuals and remain unprotected. The Nature Conservancy is looking into acquisition of a significant occurrence of this species. At the present time there are no management plans for this species.

**The trend for Mexican flannelbush is one of decline.**

## Roderick's fritillary

*(Fritillaria roderickii)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat:
- Coastal Bluff Scrub
- Coastal Prairie

Roderick's fritillary, a member of the lily family (Liliaceae), is a slender perennial that arises from a bulb, with narrow basal leaves and nodding greenish-brown to purplish-brown flowers. This showy wildflower is found in heavy clay soils in the oak woodland community near Boonville and in coastal prairie near sea bluffs south of Point Arena, Mendocino County.

There are only three known native occurrences of Roderick's fritillary, one of which is extirpated. The two existing native occurrences are in disturbed sites; one is in the Boonville Cemetery and the other is near the coast and privately owned with a portion in a CalTrans right-of-way. TNC has secured a voluntary protection agreement with one of the landowners. The CalTrans population was partially destroyed during work to improve Highway 1, although some plants were transplanted or fenced in 1985 to avoid damage during construction. There are no management plans for this species, but DFG has an MOU with the California Native Plant Society to salvage and relocate plants which would otherwise be lost to bluff erosion. During the past four years, several sites have been selected for transplanting salvaged plants. These include a county park, privately owned sites and the Ft. Bragg campus of the College of the Redwoods.

**The trend for Roderick's fritillary is one of decline.**

## Striped adobe lily
*(Fritillaria striata)*

CA - Threatened (1987)
FED - Candidate 2

General Habitat:
- Cismontane Woodland
- Valley and Foothill Grassland

The striped adobe lily, a member of the lily family (Liliaceae), is a slender, bulbous perennial with fragrant, white to pink bell-shaped flowers with burgundy stripes. It grows on heavy clay soils in open annual grasslands bordering blue oak woodlands. This lily is found in eastern Tulare and Kern counties in the Sierra Nevada foothills. Twelve populations are known, including several east of Porterville in Tulare County, and about 10 in Kern County in the Greenhorn and Tehachapi mountains.

Urbanization and agricultural conversion have probably extirpated striped adobe lily from some of its historic range. Most populations are on private rangeland with varying degrees of protection. One population occurs partially on Army Corps of Engineers land and land that may be purchased by DFG. Another site may be protected through mitigation for a proposed reservoir by the Fresno Flood Control District. An analysis is needed of the affects of long-term cattle grazing on the habitat. Observations indicate that low levels of livestock grazing with avoidance of the flowering season may benefit this species. California Endangered Species Tax check-off funds were used in 1991 to conduct an analysis of striped adobe lily's status and management needs. Several new populations were located and permanent protection was secured, with the help of TNC, in the form of a conservation easement with one landowner.

**The overall trend for striped adobe lily is one of stability.**

## Borrego bedstraw
*(Galium angustifolium* **ssp. borregoense)**

CA - Rare (1979)
FED - Candidate 2

General Habitat:
- Sonoran Desert Scrub

Borrego bedstraw is a slender, herbaceous perennial in the madder family (Rubiaceae) with wiry, square stems and a pyramidal cluster of light yellow flowers. It is found on north-facing steep walls and slopes in canyons and on hillsides. All six known occurrences of Borrego bedstraw are found in Anza Borrego Desert State Park in San Diego County.

Current information is lacking on Borrego bedstraw; the most recent surveys were conducted in 1978. Research is needed to better understand the reproductive biology and ecology of Borrego bedstraw. Because it grows in steep terrain, there is little threat from off-road vehicle disturbance. Other potential threats have not been identified. Monitoring of known populations would help provide information necessary to develop management strategies. Although historical records are lacking, it is possible that this species has always been rare.

**The recent trend for Borrego bedstraw is unknown.**

## Box bedstraw
*(Galium buxifolium)*

CA - Rare (1979)
FED - Candidate 2

General Habitat:
- Coastal Bluff Scrub
- Coastal Scrub
- Closed-cone Conifer Forest

Box bedstraw, a member of the madder family (Rubiaceae), is a stout, leafy, widely branching shrubby plant with small white flowers. It grows on dry rocky bluffs in coastal sage scrub or closed-cone pine forest plant communities on three of the Channel Islands. Most of the nearly dozen known occurrences are located on Santa Cruz Island, with others on Santa Rosa and San Miguel islands.

In the past, box bedstraw populations on Santa Cruz Island may have been adversely affected by high levels of sheep grazing. The Nature Conservancy, as part of its management over a large portion of the island, has removed all of the sheep. Box bedstraw populations and other native vegetation are expected to benefit from reduced grazing pressure. Observations on Santa Cruz Island in 1989 indicate that the potential for feral pig damage is the only threat known at present. The population on San Miguel Island has not been seen since 1979. There is no current information on the Santa Rosa Island populations. Both San Miguel and Santa Rosa islands are now part of Channel Islands National Park. However, Santa Rosa Island was privately owned until recently and has been severely degraded by years of overgrazing by livestock and other exotic species.

**The overall trend for box bedstraw cannot be assessed given currently available information.**

## El Dorado bedstraw
*(Galium californicum* **ssp.** *sierrae)*

CA - Rare (1979)
FED - Candidate 2

General Habitat:
- Cismontane Forest
- Chaparral
- Lower Montane Conifer Forest

El Dorado bedstraw is a low, sprawling, slender-stemmed herbaceous perennial with pale yellow flowers. It is a member of the madder family (Rubiaceae). Plants are restricted to gabbro-derived soils underlying chaparral and oak woodlands in the vicinity of Pine Hill, El Dorado County. This species occurs with four other State-listed plants, Pine Hill flannelbush (*Fremontodendron decumbens*), Pine Hill ceanothus (*Ceanothus roderickii*), Layne's butterweed (*Senecio layneae*) and Stebbins' morning glory (*Calystegia stebbinsii*). A habitat conservation program is needed for El Dorado bedstraw and the other Pine Hill gabbro endemic plants.

There are seven known occurrences of El Dorado bedstraw, only one of which is protected on the DFG's Pine Hill Ecological Reserve. Other occurrences on private lands are threatened by rapid residential development, road construction and maintenance, and herbicide spraying. There is little information on the biology or ecology of El Dorado bedstraw. Additional monitoring is needed to determine the status of most occurrences.

**The recent trend for El Dorado bedstraw is one of decline.**

## San Clemente Island bedstraw
*(Galium catalinense* **ssp.** *acrispum)*

CA - Endangered (1982)
FED - Candidate 2

General Habitat:
- Sea Cliffs
- Coastal Bluff Scrub

San Clemente Island bedstraw is a small shrub in the madder family (Rubiaceae) with four small leaves in a whorl, and clusters of tiny white or greenish-yellow flowers. It grows on steep, rocky cliffs and slopes overlooking the sea or in adjoining canyons on San Clemente Island, one of California's Channel Islands.

These steep rocky slopes offer the only refuge for San Clemente Island bedstraw from the destructive activities of introduced goats and pigs. Erosion of canyon slopes, caused in part by loss of vegetation, is eliminating some of the cliff refuges. The U.S. Navy uses the island as a bombing and gunnery range. Although military activities continue to damage portions of the habitat, the Navy is attempting to remove all of the feral herbivores from San Clemente Island in order to allow recovery of the native vegetation. Slope stabilization and other protective measures are needed for the bedstraw habitat.

**The overall trend for San Clemente Island bedstraw is one of decline.**

## Sand gilia
*(Gilia tenuiflora* **ssp.** *arenaria)*

CA - Threatened (1987)
FED - Proposed Endangered (1991)

General Habitat:
- Coastal Dunes

Sand gilia is a short, sticky-haired annual herb in the phlox family (Polemoniaceae) with a basal rosette of leaves that produces tiny purple flowers. Plants are confined to bare, wind-sheltered areas amidst the coastal sand dunes adjoining Monterey Bay. This species is typically found in the central dune scrub community from the mouth of the Salinas River south to the Monterey Peninsula. Associated species include two State-listed endangered plants, Menzies' wallflower (*Erysimum menziesii* ssp. *menziesii*) and Tidestrom's lupine (*Lupinus tidestromii* var. *tidestromii*).

There are fewer than ten known sand gilia occurrences, and those on the Monterey Peninsula are threatened by residential development and recreational impacts. Trampling is a threat at all sites. Aggressive nonnative plants are also invading the habitat and displacing native dune vegetation. Most populations of sand gilia occur on private land and are unprotected. Populations also occur within Marina State Beach and Salinas River State Beach in proposed natural preserves. In a 1987 mitigation project sand gilia and other endangered species were introduced onto sixty acres of artificially-created dunes on private land near Spanish Bay as mitigation for loss of habitat. A Memorandum of Understanding was initiated in 1991 between DFG and CSU San Jose for study of the population ecology and germination requirements of this species.

**The trend for sand gilia is one of continuing decline.**

# Boggs Lake hedge-hyssop

*(Gratiola heterosepala)*

CA - Endangered (1978)
FED - Candidate 2
General Habitat: • Vernal Pools
• Lake Margins

Boggs Lake hedge-hyssop is a small, semi-aquatic, herbaceous annual in the figwort family (Scrophulariaceae). It has opposite leaves, blunt, unequal sepals, and yellow and white flowers on short stalks. This species is found in shallow waters or moist clay soils of vernal pools and lake margins in scattered sites from Lassen County south to Fresno County. Two other State-listed species, many-flowered navarretia (*Navarretia pleiantha*) and slender Orcutt grass (*Orcuttia tenuis*), are found with Boggs Lake hedge-hyssop at TNC's Boggs Lake Preserve in Lake County.

The vernal pool habitat of this species has been lost through agricultural conversion, overgrazing, and urbanization. The present distribution contains large gaps where the species once may have occurred, but human activities destroyed intervening habitat. Today, several populations are found in Lassen, Lake, Madera, Placer, and Sacramento counties. Most occurrences on both public and private lands are unprotected. Boggs Lake is protected by The Nature Conservancy, but the population of hedge-hyssop on their Preserve has not been seen in recent years. According to TNC's 1990 Element Monitoring Report, water levels at the lake were exceptionally low in 1989-90, and with drought conditions continuing, grassland species are invading rare plant habitat. In 1991, BLM initiated a project to repair part of a damaged vernal pool that contains Boggs Lake hedge-hyssop. The pool is part of the Timbered Crater Wilderness Study Area in the Alturas Resource Area. BLM owns another population in Fresno County that was fenced in 1990 to protect it from grazing. Two new populations were discovered in Lassen County in 1989. In 1991 new populations were discovered in Sacramento and Solano counties, and three more sites were located in Lassen National Forest.

**The overall trend for Boggs Lake hedge-hyssop has been one of decline due to habitat loss, although the discovery of additional populations may allow for increased protection of the species.**

# Algodones Dunes sunflower

*(Helianthus niveus* **ssp.** *tephrodes)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Desert Dunes

Algodones Dunes sunflower is a silvery-white, semi-shrubby perennial in the sunflower family (Asteraceae) with a woody base, large hairy leaves, and reddish-purple centered flowers surrounded with bright yellow rays. It occurs on unstabilized sand dunes in the Algodones Dunes system of Imperial County.

All of the habitat for Algodones Dunes sunflower in California is managed by the BLM, which has closed a portion of the dunes to off-road vehicle use to protect several rare species. In 1991, BLM proposed to designate this 28,000 acres of the Algodones Dunes as a National Natural Landmark\Area of Critical Environmental Concern. A final decision of this is scheduled for 1992. The dunes are a popular recreation area, and most of the dune vegetation has been eliminated in areas open to ORV use. Visitor use days are expected to double by the year 2000, thereby increasing habitat disturbance. The BLM has prepared a draft Algodones Dunes Wildlife Management Plan which addresses monitoring of impacts to rare plant populations. In 1990, a study completed for the BLM found that Algodones Dunes sunflower is very susceptible to disturbance, as no occurrences were found in areas experiencing heavy ORV use.

**The overall trend for Algodones Dunes sunflower is one of decline.**

# Red Rock tarplant

*(Hemizonia arida)*

CA - Rare (1982)
FED - Candidate 1

General Habitat: • Mojavean Desert Scrub

Red Rock tarplant, a member of the sunflower family (Asteraceae), is a much-branched, glandular and mildly odorous annual, with deep yellow flowers. This plant is usually found in the creosote bush scrub plant community in moist to dry places where water collects in ephemeral streams and washes. The species is endemic to Red Rock Canyon and adjacent south-draining canyons of the Mojave Desert in Kern County. There are fewer than ten occurrences scattered in the canyons around Red Rock Canyon State Park and on adjacent BLM lands.

Off-road vehicle use of the habitat, especially on Federal lands, poses the greatest threat to Red Rock tarplant. Introduced tamarisk, an invasive weedy tree, is encroaching into the habitat and could displace Red Rock tarplant. Red Rock Canyon State Park personnel are monitoring the tarplant populations and have searched potential habitat and located new populations. During the past two years, populations in the State Park have experienced an estimated 95% reduction in size, probably due to lack of rainfall. DFG has an MOU with UC Davis to study the evolutionary relation-

ships of this taxon with other members of its genus.

**The general trend for Red Rock tarplant is believed to be stable, although the species has experienced a significant decline during the last few years due to drought.**

## Otay tarplant

*(Hemizonia conjugens)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Coastal Scrub

Otay tarplant is an aromatic, glandular and much-branched herbaceous annual with mostly solitary, yellow flower heads. This member of the sunflower family (Asteraceae) grows on clay soils in coastal southern San Diego County and northern Baja California. It is found within coastal sage scrub and grassland communities in open, often mildly disturbed areas.

Loss of Otay tarplant habitat due to land development seriously threatens this species and may hinder reintroduction and recovery efforts. Only a few remaining occurrences are known, most of which have not been seen in many years. A survey of historical locations and searches for additional populations are needed to determine the status of Otay tarplant. Only one site was located in a 1987 survey. Another site was seen in 1988, but the habitat was partially destroyed by housing construction. In 1989, this site was designated as open space. Since all sites are privately owned and unprotected, a significant part of the remaining habitat will need protection to preserve this species.

**The trend for Otay tarplant is one of decline due to heavy development pressure and habitat loss.**

## Gaviota tarplant

*(Hemizonia increscens* **ssp.** *villosa)*

CA - Endangered (1990)
FED - Candidate 1

General Habitat: • Coastal Scrub
• Coastal Grassland

Gaviota tarplant is a summer-flowering aromatic annual herb in the sunflower family (Asteraceae). Plants of this species are widely branched, with small, gray-green, sticky leaves, and heads of small yellow flowers. This tarplant is restricted to one extended population along a two-mile stretch of coastal terrace near Gaviota in Santa Barbara County. It grows only on sandy loam soils of the Milpitas-Positas-Concepcion series that have a subsurface clay layer that is first encountered from about 18 to 36 inches below the soil surface. These areas are dominated by annual grassland, which may contain scattered shrubs of the coastal sage scrub community. Since 1982 when this subspecies was described, likely sites along the coast near the present population and inland have been searched, but no other populations were located. 1991 was an excellent year for tarplant numbers, but there was no range expansion. Ownership includes the California Department of Parks and Recreation and private landowners.

Several colonies of Gaviota tarplant have been destroyed by construction activities associated with oil and gas development. The potential for increased energy-related development within the range of Gaviota tarplant remains the predominant threat. As mitigation, one new colony was established and has persisted for several years, although it declined in size in 1990. Another re-establishment effort is being planned as mitigation for impacts of a pipeline project. A mitigation plan has been finalized and a suitable site has been selected, but the agreement with DFG that formalizes activities has not been signed, so on-the-ground activities have not begun. Mitigation for plant losses during construction of several underground pipelines in 1991 involved removal of soil in layers, construction, and replacement of the soil layers. Several emergency fire roads have also been built in the area through Gaviota tarplant habitat. In most cases mitigation has been to remove soil and place it next to the road or in a designated mitigation site. Vista Del Mar School District also moved a school recently and impacted tarplant habitat.

**The recent trend for Gaviota tarplant is one of decline.**

## Santa Susana tarplant

*(Hemizonia minthornii)*

CA - Rare (1978)
FED - Candidate 2

General Habitat: • Chaparral
• Coastal Scrub

Santa Susana tarplant is a perennial subshrub with slender ascending stems, sticky leaves, and yellow flower heads. This sunflower relative (Asteraceae) grows in crevices of sandstone bluffs and outcrops in

chaparral in the Santa Susana and Santa Monica mountains of Los Angeles and Ventura counties. There are over twenty recorded occurrences of this tarplant, but one-fourth of these have not been seen in many years and their status is unknown. Land ownership is both private and public (Los Angeles Department of Water and Power).

Several of the remaining Santa Susana tarplant occurrences are threatened by residential development, road construction and road maintenance activities. California Native Plant Society volunteers performed Santa Susana tarplant germination experiments in 1987 and introduced seedlings onto protected habitat at Soltice State Park. Members monitor and weed this population annually. A mitigation project in 1989 involved transplantation of wild plants and nursery stock by the Las Virgenes Municipal Water District to slopes surrounding a newly constructed reservoir. Little Santa Susana tarplant habitat is protected and conservation easements or permanent dedications should to be negotiated to ensure permanent preservation. In order to develop long-term management priorities, further research is needed on the reproductive biology, germination and growth, and habitat requirements of this species.

**The trend for Santa Susana tarplant is one of decline.**

## Mojave tarplant

*(Hemizonia mohavensis)*

CA - Endangered (1981)
FED - Candidate 1

General Habitat: • Riparian Scrub

Mojave tarplant is a sparsely branched, aromatic, sticky annual herb with yellow flower heads arranged in compact clusters. This member of the sunflower family (Asteraceae) has not been seen for certain in over 50 years. Historical collections of this plant come from a single occurrence on a sand bar along the Mojave River on the north slope of the San Bernardino Mountains in San Bernardino County. A second, apparently erroneous occurrence was reported from Riverside County in a chaparral plant community, habitat which was not previously known to support this tarplant.

In 1988, Red Rock Canyon State Park personnel reported a possible Mojave tarplant occurrence within the park (Kern County). To confirm the identification, specimens from this population were sent for chromosome analyses, but the amount of material received was insufficient to determine if the population is indeed Mojave tarplant. The population still exists and if it is not determined to be Mojave tarplant, it is Red Rock tarplant, a State-listed rare species. All of the original habitat for Mojave tarplant has been altered by flood control activities and ORV recreation. Additional searches in suitable habitat, along the tributaries of the Mojave River, are needed to determine the status of this extremely rare, possibly extinct species. If it is determined that populations exist, they must be protected to avoid the extinction of this species.

**The trend for Mojave tarplant is one of severe decline.**

## Marin dwarf flax

*(Hesperolinon congestum)*

CA - Candidate Threatened (1981)
FED - Candidate 1

General Habitat: • Serpentine Grassland
• Serpentine Chaparral

Marin dwarf flax is a delicate annual plant in the flax family (Linaceae), with congested clusters of small rose to whitish flowers. It is found on serpentine bunchgrass ridges from Marin County to San Mateo County and in a serpentine chaparral association in Marin County.

Twenty-five percent of the historically known populations of Marin dwarf flax have been lost to residential development and construction of roads and freeways. Extensive searches in suitable habitat have resulted in the discovery of three additional populations in the past four years; however two of these populations are small and may not be viable. Only one of the fifteen extant populations is actively managed to benefit the species, on The Nature Conservancy's Ring Mountain Preserve in Marin County. Another population in Marin County occurs near St. Hillary's Church on private land planned for development. In San Mateo County, the largest and most significant populations are within the San Francisco watershed on property owned by the San Francisco Water District. In the past, public access to these lands has been restricted, but much of the habitat for this species is designated as a recreational easement. San Mateo County has published plans for an extensive trail system that could damage at least two Marin dwarf flax populations. Plants also occur at Edgewood County Park which in the past has been proposed for golf course development. One site in San Mateo County has been developed and four in Marin are on private land proposed for development. No management plan exists for this species.

**The overall trend for Marin dwarf flax is one of decline.**

## Lake County dwarf flax
*(Hesperolinon didymocarpum)*

CA - Endangered (1981)
FED - Candidate 1

General Habitat:
- Chaparral
- Cismontane Woodland
- Valley and Foothill Grassland

Lake County dwarf flax is an erect, narrow-stemmed, annual herb with widely spreading branches and open inflorescences of white to pink flowers. This member of the flax family (Linaceae) is known only from serpentine soils of alluvial origin in the Big Canyon drainage north of Middletown, Lake County. The surrounding plant community is either grassland or chaparral. Presently there are six known occurrences of this species, all grouped in clusters of small related colonies on serpentine islands in a six square mile area.

Lake County dwarf flax habitat is privately owned and subject to light to moderate cattle grazing with unknown effects on the plant. A change in land use could seriously endanger Lake County dwarf flax because of its restricted distribution. Information is needed on the population and reproductive biology of this species in order to provide a basis for long-term management strategies. A 1988 study on Lake County serpentine endemics, financed by the California Endangered Species Tax Check-off Fund, included the dwarf flax.

**The overall trend for Lake County dwarf flax is one of stability.**

## Santa Cruz tarplant
*(Holocarpha macradenia)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat:
- Coastal Prairie
- Valley and Foothill Grassland

Santa Cruz tarplant is a spreading, aromatic and glandular annual herb in the sunflower family (Asteraceae) with yellow flowers in dense heads. This tarplant was once found in most San Francisco Bay Area counties, south to Monterey County. Today it has been extirpated from Marin and Alameda counties and the last wild population in Contra Costa County was approved for development in 1987. About 10 wild populations still exist in Santa Cruz and Monterey counties. One of these occurs on State Park property, with the others on private, unprotected land. Santa Cruz tarplant grows in the clay soils of coastal or near-coastal grasslands. Some investigators think that this species is a poor competitor and does best under light livestock grazing.

Santa Cruz tarplant continues to face threats from residential development and agricultural land conversion. In 1982, seed salvaged from a proposed shopping center site near Pinole was introduced to five sites at Wildcat Canyon Regional Park in Contra Costa County. In subsequent years, additional introductions were made to Wildcat Canyon for a total of 22 sites. Monitoring of these introduced populations by California Native Plant Society members began in 1983 and continues annually. In 1989, 18 sites were still found to support Santa Cruz tarplant populations; five of those sites had 1000 or more individuals. According to CNPS, in 1991 populations at Wildcat Canyon crashed dramatically and are at one percent of their 1989 levels. These results may indicate that the transplantation attempt failed.

A habitat conservation plan is needed for Santa Cruz tarplant which should include reintroduction of the species into protected, historic habitat in Marin, Alameda, and Contra Costa counties. Efforts should also be made to protect known locations in Santa Cruz tarplant's southern range. Under a Memorandum of Understanding initiated in 1990, demographic and ecological research was conducted on an existing natural population, and an experimental population was introduced into suitable habitat at DFG's Watsonville Wildlife Area. Another MOU is in progress with a UC Davis researcher who will examine the amount of genetic diversity in the genus. In 1991 the Watsonville City Council voted to route a road to a proposed housing development in Santa Cruz County around the largest known Santa Cruz tarplant population.

**The trend for Santa Cruz tarplant is one of steady decline.**

## Tahquitz ivesia
*(Ivesia callida)*

CA - Rare (1982)
FED - None

General Habitat:
- Upper Montane Conifer Forest

The Tahquitz ivesia is a spreading dwarf perennial, with glandular, hairy, divided leaves, and small white flowers on a short flowering stalk. This member of the rose family (Rosaceae) is found on steep slopes

of decomposing granitic outcrops in the San Jacinto Mountains of Riverside County. Previously presumed extinct, this plant was rediscovered in 1980 at two sites in the San Jacinto Wilderness Area of the San Bernardino National Forest.

Human disturbances and threats are unlikely due to the relative inaccessibility of Tahquitz ivesia's rocky habitat. Potential threats include disturbance during fire suppression actions, trail building, and rock climbing activities. There are no management or protection plans for this species, although the Forest Service is aware of the populations. In 1988, DFG monitored both occurrences and found them to be stable.

**The trend for Tahquitz ivesia is one of stability.**

## Burke's goldfields

*(Lasthenia burkei)*

CA - Endangered (1979)
FED - Endangered (1991)

General Habitat: • Vernal Pools
• Meadows and Seeps

Burke's goldfields is an erect herbaceous annual herb, with narrow opposite leaves and small heads of yellow flowers. This sunflower relative (Asteraceae) grows in vernal pools and moist depressions in the vicinity of Santa Rosa in Sonoma County and to a lesser extent at sites in Lake County. It often occurs with two other State- and Federally-listed endangered plants, Sebastopol meadowfoam (*Limnanthes vinculans*) and Sonoma sunshine (*Blennosperma bakeri*).

Urbanization, conversion of land to row crops, widening along Highway 101, effluent irrigation, and overgrazing by sheep and cattle have impacted this species in Sonoma County. Extensive gully erosion at Manning Flat in Lake County is destroying the habitat there. Burke's goldfields occurs at the Department of Fish and Game's Todd Road Ecological Reserve. There are several populations of this species at the Sonoma County Airport. An MOU between DFG and the Airport addresses management and revegetation of vernal pools on airport property. In recent years, many development projects have been approved in the Santa Rosa area with significant impacts to Burke's goldfields and other vernal pool species. Approved mitigations have relied on transplantation into experimentally created vernal pool habitat rather than preservation of existing habitat. In 1989, a vernal pool preservation program was developed for Sonoma County funded by the California Endangered Species Tax Check-off Fund. The final report has been received by Sonoma County and is being revised by County planning staff prior to adoption of the conservation program. Sonoma State University has entered into an MOU with DFG to examine the amount and pattern of genetic diversity within and between Burke's goldfields populations throughout its range. Under an MOU with DFG, Rancho Santa Ana Botanic Garden will store Burke's goldfields seed at its long-term storage facilities. Another MOU was developed in 1991 by the Sonoma County Vernal Pools Regional Task Force concerning regional conservation of vernal pools and their associated endangered plants in Sonoma County. This species was Federally-listed as endangered in 1991.

**The trend for Burke's goldfields is one of drastic decline.**

## Beach layia

*(Layia carnosa)*

CA - Endangered (1990)
FED - Proposed Endangered (1991)

General Habitat: • Coastal Dunes

Beach layia is a small, succulent annual herb with low spreading branches and heads of short, white to pink ray flowers and yellow disk flowers. The leaves and branches have sticky glands that allow sand to adhere to the plant. This sunflower relative (Asteraceae) occurs on semi-stabilized sand in sparse coastal dune scrub vegetation. Historically, this plant was known to occur on five dune systems from Humboldt County to Santa Barbara County. Human impacts have nearly eliminated the species from the southern half of its range. Currently, the entire global distribution of beach layia is restricted to approximately a dozen occurrences in Humboldt, Marin, and Monterey counties. The species occurs with other State-listed plants at various localities, including Menzies' wallflower (*Erysimum menziesii*) and Tidestrom's lupine (*Lupinus tidestromii* var. *tidestromii*). In 1989, a population was discovered at DFG's Eel River Wildlife Area in Humboldt County and in 1990 another was discovered on the South Spit of Humboldt Bay.

Beach layia habitat is threatened by coastal development, off-road vehicles, recreational activities, and invasive nonnative plants. A part of the occurrence on the North Spit of Humboldt Bay is protected by TNC's Lanphere-Christensen Dunes Preserve and by BLM. Both organizations have fenced portions of their land to control vehicle trespass. TNC uses volunteer labor annually to conduct removal of encroaching nonnative plants. BLM's Samoa Recreation Area includes an off-highway vehicle staging area which may increase impacts to adjacent habitat areas. In December of 1991, BLM enacted an emergency closure of public land on the Samoa Peninsula because mushroom gathering on two acres of the North Spit was damaging beach layia habitat. The ban is effective until May of 1992. Efforts are continuing to protect the remaining habitat on the North Spit. An eighty acre area owned by the City of Eureka was fenced in 1991 through a Coastal Conservancy grant. Humboldt County has formed a Beach and Dune Advisory Committee to help develop a resource management program for the Humboldt Bay dune system that will protect dune habitat and allow

limited vehicle use. Habitat restoration has occurred at Asilomar State Beach in Monterey County. Many opportunities exist for habitat protection and recovery. Research on the population genetics of this species is being conducted through an MOU with UC Davis.

**The trend for beach layia is one of steady decline.**

## San Francisco lessingia
*(Lessingia germanorum)*

CA - Endangered (1990)
FED - Candidate 1

General Habitat: • Coastal Scrub

San Francisco lessingia, a member of the sunflower family (Asteraceae), is a slender annual herb with clusters of lemon-yellow flowers. This species occurs in remnant areas of coastal dune scrub habitat on the San Francisco Peninsula. It appears to require open sandy soils that are relatively free of competing plants. San Francisco lessingia probably evolved on semi-active dunes, for it appears to require some degree of sand movement and disturbance. Historic collections of San Francisco lessingia are all from the San Francisco area, with the range reported to include San Mateo County. Today, four natural populations and one experimentally introduced population exist within the Presidio of San Francisco, which is under the jurisdiction of the U.S. Army. These populations are within one half mile of each other on remnant areas of coastal dune scrub habitat. The Presidio occurs within the boundaries of the Golden Gate National Recreation Area, which is administered by the National Park Service. An additional occurrence was discovered in 1989 on San Bruno Mountain in San Mateo County.

San Francisco lessingia faces a variety of threats. Damage to lessingia and its habitat has occurred from trampling by hikers, bikers, and joggers. Sand excavation at the Presidio has eliminated most of one population, while proposed development threatens another. All sites at the Presidio have occasional unapproved vehicle use. Disturbance from trampling can directly destroy lessingia plants and encourage the invasion of competing exotic plants such as ice plant (*Carpobrotus* sp.). Ice plant threatens San Francisco lessingia at all sites. In addition, pampas grass is encroaching on lessingia habitat on San Bruno Mountain. CNPS volunteers currently weed lessingia sites when possible, which is critical to preventing the displacement of the lessingia by ice plant or other exotics. The current transfer of the Presidio from Department of Defense to National Park Service jurisdiction leaves the direction of future land use in the Presidio uncertain.

**Without special protection and management, San Francisco lessingia will continue its declining trend.**

## Congdon's lewisia
*(Lewisia congdonii)*

CA - Rare (1982)
FED - None

General Habitat: • Chaparral
• Lower Montane Conifer Forest

Congdon's lewisia, a perennial member of the purslane family (Portulacaceae), has a basal rosette of semi-succulent leaves and produces rose-colored flowers. It grows on dry talus slopes and in rock crevices in the chaparral and oak woodland plant communities of the Merced River Canyon, Mariposa County, and along the Kings River Canyon, Fresno County.

Less than ten occurrences of Congdon's lewisia are known and several of these are along roads where herbicide spraying, road improvements and maintenance, and trash dumping are threats. All of the occurrences are on USFS lands. Habitat requirements and reproductive biology of this species are areas for future research. Additional field surveys may result in the discovery of new populations in suitable habitat between the presently known scattered occurrences. Plant surveys are also needed of the areas recently burned in Sierra Nevada forest fires.

**The trend for Congdon's lewisia is one of decline.**

## Mason's lilaeopsis
*(Lilaeopsis masonii)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Marshes and Swamps
• Riparian

Mason's lilaeopsis is a minute, turf-forming perennial plant in the carrot family (Apiaceae). It spreads by rhizomes and produces long, narrow, jointed leaves. This species is semi-aquatic and is

usually found on saturated clay soils which are regularly inundated by waves and tidal action. Its known distribution extends from the margins of the Napa River in Napa County, east to the channels and sloughs of the Sacramento-San Joaquin Delta in Contra Costa, Solano, Sacramento, Yolo, and San Joaquin counties.

Currently, about fifty occurrences of Mason's lilaeopsis are known, but many are expected to be lost because of proposed habitat modifications. The cumulative effects of several proposed projects will combine to threaten this species. These activities include flood control projects (riprap), widening of Delta channels for water transport, dredging and dumping of spoils, recreational development, and changes in water quality resulting from decreased flows in the Delta. Although much of the habitat is privately owned, several State and Federal agencies have jurisdiction over the Delta waterways. One site is protected in Solano County on a DFG Ecological Reserve. DFG contracted with researchers at San Francisco State University to investigate the habitat characteristics of Mason's lilaeopsis. The research was funded by California Endangered Species Tax Check-off funds. DFG entered into a mitigation agreement with the Department of Water Resources in 1988 to transplant populations of Mason's lilaeopsis as mitigation for impacts from rock revetment work done in Barker Slough in Solano County. Transplants took place in 1989. The success of the transplants will be determined after five years of monitoring. In response to a 1988 oil spill that contaminated at least two populations, the Shell Oil Spill Litigation Settlement Trustee Committee awarded funds to DFG to initiate research into the restoration and recovery of Mason's lilaeopsis. In 1991, DFG entered into a MOU with researchers at San Francisco State University to conduct research on the salt tolerance of Mason's lilaeopsis. The future trend for this small perennial herb is one of imminent decline due to numerous modifications planned for its habitat.

**The trend for Mason's lilaeopsis is one of decline.**

## Western lily

*(Lilium occidentale)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat:
- Coastal Scrub
- Marshes and Swamps
- North Coast Conifer Forest

Western lily is a tall perennial herb that arises from a rhizome. It has a slender stem and long, narrow, whorled leaves. The flowers of this member of the lily family (Liliaceae) are crimson, except at the base of the petals where they are yellow-orange or green with maroon spots. In California this showy lily is known from near the southern perimeter of Humboldt Bay, Humboldt County, and from two newly discovered sites approximately 90 miles to the north in Del Norte County. Another form of this plant occurs along Oregon's coast; this form is somewhat different and hybridizes with *L. columbianum*. In 1991 two new western lily locations were reported in Oregon, one by Harris State Park and one just north of Rainbow Rock.

Western lily is threatened by habitat loss, over-collecting of bulbs, and cattle grazing in its habitat. Yearly monitoring is needed to assess effects of illegal bulb collecting and grazing at all populations. Some measures have already been taken to protect this species. The DFG Table Bluff Ecological Reserve contains a population which is monitored annually. Since 1989, California Endangered Species Tax Check-Off funds have been used for this monitoring. A preserve management plan and a demographic study of western lily are in progress; preliminary results indicate that in areas where shading spruces were thinned, western lily has increased and successfully flowered. TNC has secured voluntary protection agreements with the landowners of three privately owned western lily occurrences. The Crescent City Marsh population, a portion of which occurs within DFG's Crescent City Marsh Wildlife Area, is the largest population known. Another population was discovered in 1991 on Point St. George, northwest of Crescent City. This area is proposed for development and the biological inventory was funded by the Coastal Conservancy.

**The overall trend for western lily has been one of decline, but recent monitoring and protection efforts have resulted in a more stable trend.**

## Pitkin Marsh lily

*(Lilium pitkinense)*

CA - Endangered (1978)
FED - Candidate 1

General Habitat:
- Marshes and Swamps

Pitkin Marsh lily is an herbaceous perennial with tall slender stems, narrow whorled leaves, and showy, nodding yellow-orange flowers with deep maroon dots and red tips. This member of the lily family (Liliaceae) arises from a rhizome. There are three recorded occurrences of Pitkin Marsh lily, only two of which have been seen recently. These occurrences are confined to a small portion of Sonoma County, near fresh water marshes in the vicinity of Sebastopol and Cunningham.

Land clearing and draining operations, cattle grazing, and horticultural bulb collecting have impacted all Pitkin Marsh lily populations. Introduced blackberry plants also compete with the lily at Pitkin Marsh. In 1989, TNC entered into voluntary protection agreements with landowners for the two confirmed occurrences. Invasive blackberry plants were removed at one site, and cattle exclosures constructed at both

locations. Under an MOU with DFG, The Berry Botanic Garden will provide for long-term storage of plant material.

**Although the overall trend for Pitkin Marsh lily has been one of decline, recent focused attention has helped to create greater stability.**

## Baker's meadowfoam

*(Limnanthes bakeri)*

CA - Rare (1978)
FED - Candidate 2

General Habitat: • Marshes and Swamps
• Valley and Foothill Grassland

Baker's meadowfoam is an herbaceous annual in the false mermaid family (Limnanthaceae) with dissected leaves and funnel-shaped flowers of white or cream. The primary habitat for this species is seasonally saturated or inundated clay soil in low swales, roadside ditches, and along margins of marshy areas. Its distribution is restricted to Mendocino County near Laytonville, Covello, Ukiah, and Little Lake Valley near Willits. Less than a dozen occurrences are known and all are found on private lands.

Most of the habitat for Baker's meadowfoam is used for grazing. Some discing has occurred, but meadowfoam populations appear to tolerate light disturbance or grazing. The greatest potential threats to this plant are the alteration of local drainage patterns and the removal of standing water to prepare the land for agriculture. Residential development on the outskirts of Willits would also destroy habitat where most populations are found. TNC has entered into voluntary landowner agreements to protect some of the occurrences of this species. A Memorandum of Understanding between DFG and Caltrans, initiated in 1991, will analyze genetic variation between and within populations and assess germination, dormancy, population size and vigor of Baker's meadowfoam populations. Results of this MOU may be used to evaluate expected impacts caused by a realignment of Highway 101 through the center of large Baker's meadowfoam populations. Preliminary results of the MOU in 1991 indicate that the Little Lake Valley metapopulation is much larger than previously recorded. A large new population was also discovered in 1991 near Covello. Another population of six plants near Ukiah is declining due to introduced grasses and drought conditions.

**The overall trend for Baker's meadowfoam has been one of decline due primarily to habitat destruction and development.**

## Point Reyes meadowfoam

*(Limnanthes douglasii* **var.** *sulphurea)*

CA - Endangered (1982)
FED - Candidate 2
General Habitat: • Marshes and Swamps

Point Reyes meadowfoam, a member of the false mermaid family (Limnanthaceae), is an herbaceous annual with 3-5-lobed leaves and bell-shaped yellow flowers. There are fewer than 10 occurrences of this species known; most of these are on the Point Reyes Peninsula in Marin County. One occurrence is near Pescadero in San Mateo County. This species occurs primarily in vernally moist depressions in open, rolling coastal prairies and meadows. At Point Reyes it is also found in roadside ditches.

The Marin County Point Reyes meadowfoam populations are on Point Reyes National Seashore property, some of which is leased to ranchers. The NPS has a regular monitoring program for Point Reyes meadowfoam and other rare species at the seashore. Threats include trampling by cattle, competition from exotic weeds, altered drainage patterns, and highway maintenance. The Point Reyes populations appear to be relatively stable; the only San Mateo County site has been damaged by a Christmas tree operation.

**The overall trend for Point Reyes meadowfoam is one of stability to decline.**

## Butte County meadowfoam

*(Limnanthes floccosa* **ssp.** *californica)*

CA - Endangered (1982)
FED - Proposed Endangered (1991)

General Habitat: • Vernal Pools
• Valley and Foothill Grassland

Butte County meadowfoam is a small, white-flowered annual herb in the false mermaid family (Limnanthaceae). The plants are covered with soft hairs and have sparsely distributed leaves divided into 5-11 leaflets. This subspecies is potentially economically valuable because it possesses the ability to transfer important traits to other species of meadowfoam that are being bred for commercial use as suppliers of a substitute for sperm whale oil. Butte County meadowfoam is restricted to vernal swales and vernal pools in the Chico area. Recent surveys discovered about eight

new sites for this subspecies, which was known from only four areas in 1987.

All but one of the sites for Butte County meadowfoam are on private land. Most of these lie within the sphere of influence of the City of Chico in areas that the City has designated as regions of future development. Recognizing the potential for adverse impacts, the City and the Department of Fish and Game began working together in the spring of 1988 to devise a mechanism for protecting the plants in their natural habitat. After surveys located new populations, a draft habitat conservation plan was prepared for Butte County meadowfoam sites within the Chico area, using funds from the California Endangered Species Tax Check-off program. In 1989 the Chico City Council adopted an amended version of the plan after an extensive period of review and public input. The plan is designed to protect at least two of the largest, best quality sites, and under the plan at least two additional sites may be restored. Developers of land occupied by Butte County meadowfoam will either donate preserve sites or contribute to restoration activities as a condition of their development permits. This conservation plan does not protect the three or more populations outside the immediate Chico area. These are threatened by overgrazing, agricultural land conversion and residential development.

**The overall trend for Butte County meadowfoam is one of decline.**

## Parish's meadowfoam

*(Limnanthes gracilis* **var.** *parishii)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Meadows and Seeps

Parish's meadowfoam is small herbaceous annual in the false mermaid family (Limnanthaceae) with wide-spreading branches, divided leaves, and white bowl-shaped flowers that fade to pink. This species is known from the mountain meadows of San Diego County with one additional occurrence on The Nature Conservancy's Santa Rosa Plateau Preserve in Riverside County. It is a plant of moist habitats, often growing in vernal pools, wet meadows and near springs and seeps.

Today, less than thirty occurrences of Parish's meadowfoam are known. These are centered around Cuyamaca Lake and the Laguna Mountains of San Diego County. Extensive habitat was probably lost during the inundation of meadows behind the dam which formed Cuyamaca Lake. The remaining habitat near the lake is threatened by lakeside development, grazing, wetland habitat manipulation, and intense recreational use. The U.S. Forest Service and DPR are aware of the occurrences of Parish's meadowfoam on their lands. The Cleveland National Forest has implemented a habitat improvement project for the meadowfoam, and is recommending seasonal deferral of grazing in the meadowfoam habitat. In 1990 and 1991 the Cleveland N.F. discovered a few new occurrences on their land. Forest botanists also coordinated the construction of an exclosure to protect a large meadowfoam population. Cuyamaca Rancho State Park staff is writing a plan to protect and manage the rare plants in the Park through an MOU with DFG, and a portion of the habitat has been designated a Natural Preserve. Dr. Ellen Bauder of San Diego State University is conducting ecological monitoring of Parish's meadowfoam to increase knowledge of its distribution and abundance. This research is funded in part by California Endangered Species Tax Check-off funds.

**The trend for Parish's meadowfoam is one of decline.**

## Sebastopol meadowfoam

*(Limnanthes vinculans)*

CA - Endangered (1979)
FED - Endangered (1990)

General Habitat: • Meadows and Seeps
• Vernal Pools

Sebastopol meadowfoam is an annual herb with divided leaves and bowl-shaped white flowers. This member of the false mermaid family (Limnanthaceae) grows in seasonally wet meadows, pasture and vernal pools primarily in the drainage of the Laguna de Santa Rosa in Sonoma County. Most occurrences are on private land within five miles of the City of Santa Rosa. Sebastopol meadowfoam often occurs with two other State- and Federally-listed endangered plants, Burke's goldfields (*Lasthenia burkei*) and Sonoma sunshine (*Blennosperma bakeri*).

Several Sebastopol meadowfoam occurrences are threatened by imminent urbanization since they occur on parcels zoned for residential or commercial use. Indirect effects of urban growth, such as alteration of local and regional drainage patterns, and effluent irrigation also threaten this species. Heavy grazing and off-road vehicle recreation adversely affect populations as well. Without protection most extant occurrences could soon be lost. CalTrans owns populations along Highway 12, and the U.S. Army owns one occurrence at their Santa Rosa Army Reserve Center. The City of Santa Rosa owns another population next to the Sebastopol Campground. The Department of Fish and Game protects sites at their Laguna de Santa Rosa Ecological Reserve and one of its nearby extensions. The remaining populations are privately owned. In recent years, many development projects with significant impacts to vernal pool species have been approved in the Santa Rosa area. Approved mitigations have relied on transplantation into ex-

perimentally-created vernal pool habitat rather than preservation of existing habitat. In 1989, a vernal pool preservation program was developed for Sonoma County financed by the California Endangered Species Tax Check-off Fund. The final report has been received by Sonoma County and is being revised by County planning staff prior to the County's adoption of the conservation program. Under a Memorandum of Understanding with Rancho Santa Ana Botanic Garden, Sebastopol meadowfoam seed will be stored at the Garden's long-term storage facilities. Another MOU was developed in 1991 by the Sonoma County Vernal Pools Regional Task Force concerning regional conservation of vernal pools and their associated endangered plants in Sonoma County.

**The trend for Sebastopol meadowfoam is one of decline.**

## San Clemente Island woodland star

*(Lithophragma maximum)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Coastal Bluff Scrub
• Coastal Scrub

San Clemente Island woodland star is a perennial herb in the saxifrage family (Saxifragaceae) with three-parted leaves, stout flowering stems, and glandular white to pinkish flowers. This species is extremely rare and at one time was thought to be extinct. Today less than 50 plants are thought to remain in the wild in two remote locations, although there have been no recent surveys for this species. Plants are restricted to moister habitats on north-facing slopes in nearly inaccessible canyons on the east side of San Clemente Island.

Much of San Clemente Island woodland star's essential habitat has been damaged by feral goats, feral pigs, former ranching activities and military operations. The U.S. Navy, which has jurisdiction over the island, has been removing goats and pigs as part of its Feral Animal Removal Program and improvements in the condition of the native vegetation have been noted. A propagation program may be needed to achieve recovery for this species.

**The trend for San Clemente Island woodland star is one of decline.**

## San Clemente Island bird's-foot trefoil

*(Lotus argophyllus* **ssp.** *adsurgens)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Coastal Scrub

San Clemente Island bird's-foot trefoil is an erect, shrubby perennial with crowded silvery leaves, short pods, and small yellow-orange flowers. It is a member of the pea family (Fabaceae). This species inhabits only a few sites on the southern tip of San Clemente Island, Los Angeles County. Each site has less than 50 individuals. This plant grows on wave cut marine terraces in the cholla phase of maritime desert scrub vegetation.

Ranching operations on the Island resulted in overgrazing and elimination of much of the native vegetation before the distributions of several rare plants were determined. Sheep were removed in 1934 but, more recently, the feral goat population increased substantially and nearly denuded large portions of the Island. The U.S. Navy, which currently controls San Clemente Island, has used it as a bombing and gunnery range, but military operations have not directly affected this subspecies. The Navy has implemented a goat eradication program in an effort to recover the vegetation. In 1989 a new phase of this program began. There has been a noticeable improvement in habitat quality since the beginning of this program. The Navy has contracted with a nursery to propagate San Clemente Island bird's-foot trefoil and other rare plant species of the Island, and plans to use nursery stock to enhance the existing populations.

**The trend for San Clemente Island bird's-foot trefoil is one of decline.**

## Santa Cruz Island bird's-foot trefoil

*(Lotus argophyllus* **ssp.** *niveus)*

CA - Endangered (1981)
FED - Candidate 2

General Habitat: • Chaparral
• Coastal Scrub

Santa Cruz Island bird's-foot trefoil is a low much-branched perennial covered with silvery silky hairs. The plants have divided leaves and produce yellow and brown or purple flowers. It is a member of the pea

family (Fabaceae). This subspecies is found only on Santa Cruz Island, the largest of the Channel Islands. It grows on rocky slopes, stony floodplains and dry canyon stream beds in coastal sage or chaparral plant communities.

As a result of long-term overgrazing by cattle and especially sheep, much of the native vegetation was destroyed on Santa Cruz Island and weedy exotic plants became established. The Nature Conservancy now owns and manages most of Santa Cruz Island and has succeeded in eliminating all of the sheep. This action has resulted in a substantial recovery for Santa Cruz Island bird's-foot trefoil, especially on high ground within floodplain areas. Although the feral pig population has increased following sheep removal, no adverse impacts to this subspecies have been noted.

**The long-term trend for Santa Cruz Island bird's-foot trefoil is one of decline, but some recovery has been noted in the last few years.**

## San Clemente Island lotus

*(Lotus dendroideus* **var.** *traskiae)*

CA - Endangered (1982)
FED - Endangered (1977)

General Habitat:
- Coastal Scrub
- Valley and Foothill Grassland

San Clemente Island lotus is a small subshrub with erect, often silky branches, leaflets usually in threes, and yellow or red-tinged flowers. This member of the pea family (Fabaceae) grows on open grassy north-facing slopes at the mouth of a canyon and on hillsides at several sites on San Clemente Island. The extent of its historic distribution is unknown; currently there are about a dozen existing sites.

San Clemente Island is under the jurisdiction of the U.S. Navy, which has initiated a Feral Animal Control Program to remove the pigs and goats that have destroyed much of the Island's native vegetation. The Navy has contracted with a nursery to propagate and reintroduce San Clemente Island lotus and other rare plant species as provided for in the recovery plan prepared by the U.S. Fish and Wildlife Service. Surveys conducted from 1985 to 1987 found several previously unknown sites. Many populations have increased in size since the removal of some feral animals.

**The trend for San Clemente Island lotus is one of stability to increase.**

## Mariposa lupine

*(Lupinus deflexus)*

CA - Threatened (1990)
FED - Candidate 2

General Habitat:
- Chaparral
- Cismontane Woodland

Mariposa lupine, a member of the pea family (Fabaceae), is an annual plant with long spikes of white or pinkish flowers. This species is found in foothill woodlands on decomposed granite domes on the western slope of the Sierra Nevada in southwestern Mariposa County, south of the town of Mariposa.

Although historical records are lacking, it is likely that this species was always rare, and has become threatened by urbanization and grazing. All four occurrences of Mariposa lupine occur on private land. The total area covered by this species is less than 50 acres within a five square mile area. Rapidly accelerating subdivision and development of the area is a serious potential threat to this lupine. Grazing and trampling by sheep and cattle also threaten this species. At one time, two sites were heavily grazed and another site was disturbed when a parking pad was excavated. The landowners of three of the four sites have entered into voluntary protection agreements with The Nature Conservancy.

**The trend for Mariposa lupine is one of decline.**

## Milo Baker's lupine

*(Lupinus milo-bakeri)*

CA - Rare (1978); Threatened (1987)
FED - Candidate 2

General Habitat:
- Cismontane Woodland

Milo Baker's lupine, a member of the pea family (Fabaceae), is a tall herbaceous annual with pale blue to yellow flowers and silky leaves. It occurs in the wet roadside ditches and streams of Round Valley near the town of Covelo in Mendocino County, and in the Bear Valley region of Colusa County. There are approximately a dozen known extant occurrences of this species, most of them in Mendocino County; four occurrences in Mendocino County have been extirpated.

Milo Baker's lupine occurs on private land and on highway rights-of-way. It is threatened by roadside maintenance activities and herbicide spraying. CalTrans sprayed some populations in the past, but is aware of the problem and has obtained an MOU with DFG to establish new populations to offset those losses. One of the privately-owned occur-

rences is voluntarily protected through an agreement with TNC. The U.S. Department of Agriculture also entered into an MOU with DFG to determine whether this lupine is adversely affected by exposure to larvae of a naturalized insect used for biocontrol of gorse.

**The trend for Milo Baker's lupine is one of stability to decline.**

## Nipomo Mesa lupine
*(Lupinus nipomensis)*

CA - Endangered (1987)
FED - Candidate 1

General Habitat: • Coastal Dunes

Nipomo Mesa lupine is a low-growing, blue-flowered annual herb in the pea family (Fabaceae). It is restricted to dry sandy flats of stabilized coastal dunes that lie west of Nipomo Mesa in San Luis Obispo County. It occurs in areas of light soil disturbance within the central coastal dune scrub community. Surveys in 1988 found five populations including one previously unknown site. At least three historic populations have been extirpated, including the type locality.

The existing populations of Nipomo Mesa lupine are threatened by off-road vehicle activity and coastal development within the habitat. This species also is threatened by habitat degradation resulting from expansion of introduced weedy plants, such as veldt grass and ice plant, within the backdune scrub community. All existing occurrences are on private land and remain unprotected.

**The recent trend for Nipomo Mesa lupine is one of decline.**

## Father Crowley's lupine
*(Lupinus padre-crowleyi)*

CA - Rare (1981)
FED - Candidate 2

General Habitat: • Great Basin Scrub
• Riparian Scrub
• Upper Montane Conifer Forest

Father Crowley's lupine is a bushy perennial herb covered with gray spreading hairs, with leaves divided into 7-8 leaflets and creamy white flowers. This member of the pea family (Fabaceae) occurs in the understory of red fir forest and on sagebrush flats on the eastern slope of the Sierra Nevada in Inyo County. There are four reported populations consisting of about 10 subpopulations. Local subpopulations are generally comprised of scattered individuals on steep avalanche chutes, in sunny sites in drainages, and in valley bottoms. All known sites are within Inyo National Forest.

Historic and current threats to Father Crowley's lupine include mining, logging, heavy grazing and recreational off-road vehicle use of the habitat. A complete status review of the species in 1981 reported that no extirpated populations were known. In 1987 the Inyo National Forest botanist surveyed four populations and found generally low levels of disturbance and successful reproduction. Overgrazing was identified as a potential threat although grazing levels are under the control of the Forest Service. The USFS does not have a management plan for Father Crowley's lupine. Long-term monitoring on a regular basis is planned.

**The trend for Father Crowley's lupine is one of stability.**

## Tidestrom's lupine
*(Lupinus tidestromii* **var.** *tidestromii)*

CA - Endangered (1987)
FED - Proposed Endangered (1991)

General Habitat: • Coastal Dunes

Tidestrom's lupine is a low creeping perennial with whorls of blue flowers, black-spotted pods, and bright yellow roots. It occurs on partially stabilized coastal dunes of the Monterey Peninsula in Monterey County. This member of the pea family (Fabaceae) is sometimes associated with two other State-listed endangered plants, Menzies' wallflower (*Erysimum menziesii* ssp. *menziesii*) and sand gilia (*Gilia tenuiflora* ssp. *arenaria*).

Tidestrom's lupine is threatened throughout its limited range by recreational use of dunes, housing developments, and golf course construction and maintenance activities. Its remaining habitat is being invaded by sea fig (*Carpobrotus* sp.), an invasive nonnative plant of coastal dunes. This lupine occurs at Asilomar State Park, which has restored native dune habitats. In a 1987 mitigation project Tidestrom's lupine and other endangered species were introduced onto sixty acres of artificially-created dunes on private land near Spanish Bay as mitigation for loss of habitat. This species is also found on a 20-acre open space preserve planned by the privately-owned Pebble Beach Foundation. Other sites are on private property, several of which are in backyards of recent sub-

divisions and remain unprotected.

**The trend for Tidestrom's lupine is one of decline.**

## Laguna Mountains aster

*(Machaeranthera asteroides* **var.** *lagunensis)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Lower Montane Conifer Forest

Laguna Mountains aster is an herbaceous perennial in the sunflower family (Asteraceae). It has stout, branching stems covered with fine gray hairs and large lavender flowers. This species is found in a localized area of the southern Laguna Mountains in San Diego County growing on dry, sandy loam soils, often in disturbed sites of the oak-pine woodland plant community.

The several known California occurrences of Laguna Mountains aster are found on public (USFS) and private lands. In 1988, USFS personnel surveyed sites within the Cleveland National Forest and the Descanso Ranger District. The surveys resulted in the discovery of several new populations, and another was located on the Cleveland National Forest in 1991. The USFS will implement management strategies to reduce or eliminate threats to these populations. Threats include heavy grazing, which prevents seed set, recreational activities, and roadside maintenance. Suggested protection measures include fencing to exclude cattle and light soil disturbance to stimulate colonization by seedlings.

**Although the trend for Laguna Mountains aster has been one of decline, recent attention by the USFS has resulted in the prospect of more stable conditions in the future.**

## Nevin's barberry

*(Mahonia (= Berberis) nevinii)*

CA - Endangered (1987)
FED - Candidate 1

General Habitat: • Chaparral
• Coastal Scrub

Nevin's barberry is a blue-green evergreen shrub in the barberry family (Berberidaceae). It has prickly compound leaves and yellow flowers that produce round yellow-red berries. This species occurs in coastal sage scrub and chaparral communities in the margins of dry washes in the foothills of the Transverse and Peninsular ranges. Plants are found growing on either steep north-facing slopes or low grade sandy washes. Although once more widespread, the extant range of Nevin's barberry includes about a half-dozen disjunct populations in portions of Los Angeles, San Bernardino, Riverside, and perhaps San Diego counties.

Habitat for Nevin's barberry has largely been urbanized. Two populations in San Francisquito Canyon, Los Angeles County, occur on land managed by the Angeles National Forest (ANF). In 1989, a Species Management Guide for the ANF was prepared by Rancho Santa Ana Botanic Garden and the USFS. Threats to these populations, including invasion by Spanish broom, road maintenance activities and gold extraction were identified in the study and will be addressed throughout a five-year action plan. Residential development and flood control projects threaten sites elsewhere. A plant was relocated in 1988 for a development. In 1986, TNC entered into a voluntary protection agreement with the owner of one Nevin's barberry occurrence located in San Timoteo Canyon, San Bernardino County. Studies are needed on the factors limiting seed production in the wild and pollination requirements.

**The trend for Nevin's barberry has been one of sharp decline due to habitat destruction, but the trend should stabilize as the monitoring plan for Angeles National Forest is implemented.**

## Island barberry

*(Mahonia (= Berberis) pinnata* **ssp.** *insularis)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Closed-cone Conifer Forest
• Cismontane Woodland
• Coastal Scrub

Island barberry is an evergreen shrub in the barberry family (Berberidaceae). The plants have glossy divided leaves, yellow flowers, and blue berries. This endemic barberry is known from three of the Channel Islands: West Anacapa, Santa Cruz and Santa Rosa. It grows in closed-cone pine forest, coastal chaparral and coastal sage scrub communities. Five small populations are known, one on Santa Rosa, three on Santa Cruz and one, consisting of a single shrub, on West Anacapa Island.

Intensive sheep and cattle grazing has degraded the vegetation of Santa Cruz and Santa Rosa islands and has probably reduced or eliminated occurrences of island barberry. TNC removed the sheep from its lands on Santa Cruz Island and recovery of barberry populations there is expected. The National Park Service manages West Anacapa; there are no threats to the barberry plant on that island. NPS recently acquired Santa Rosa Island but lacked funding that year to

begin surveys or plan for rare plant management. The current status of island barberry on Santa Rosa Island is unknown. Cattle grazing will continue on the Island for the near future.

**The long-term trend for island barberry is one of decline; current information from Santa Rosa Island is needed to assess future prospects for recovery.**

## Truckee barberry

*(Mahonia (= Berberis) sonnei)*

CA - Endangered (1979)
FED - Endangered (1979)

General Habitat: • Riparian Forest

Truckee barberry is an upright evergreen shrub in the barberry family (Berberidaceae) with divided spiny leaves, small clusters of yellow flowers, and blue-black berries. Only one natural occurrence of Truckee barberry exists. It occurs on alluvial granitic soils along the upper banks of the Truckee River in the town of Truckee, Nevada County. The only other occurrence of this species is a population that was experimentally introduced in 1988 to a site about five miles northeast of Truckee.

The single known natural population of Truckee barberry could easily be extirpated if not carefully protected. Currently impacts are competition from riparian vegetation, polluted runoff from urban sources, vandalism, and encroachment of development. Since there is only one established population of this species, it is vulnerable to chance catastrophic events which could lead to its extinction. The introduced site, with less than 15 individuals, has not been established long enough to evaluate success. A regular monitoring program and protection of both sites is necessary for the long-term survival of this species. A 1987 report on the taxonomy of several closely related species of barberry, funded by a Federal Section 6 grant-in-aid, concluded that Truckee barberry is a variant of the more widespread *Mahonia repens*. Once this information is published delisting may be recommended. In 1988 the USFWS supervised the outplanting of nursery-grown plants in areas of historic distribution.

**The recent trend for Truckee barberry is one of stability.**

## San Clemente Island bush mallow

*(Malacothamnus clementinus)*

CA - Endangered (1982)
FED - Endangered (1977)

General Habitat: • Valley and Foothill Grassland

San Clemente Island bush mallow is a rounded evergreen shrub with numerous ascending branches, large leaves that are lobed and hairy, and inflorescences of crowded pink flowers. This member of the mallow family (Malvaceae) is found on sedimentary rock walls and ridges of San Clemente Island. Six small populations were found during the most recent surveys completed in 1985 and 1986. San Clemente Island is managed by the U.S. Navy.

Feral goat and pig populations have caused serious degradation of the native vegetation of the Island. The surviving populations of San Clemente Island bush mallow are restricted to cliffs and steep slopes that protect them from feral goat and pig grazing. Goats were recently removed during an eradication program and vegetation recovery has been observed. San Clemente Island is used for military activities. Bush mallow habitat in one canyon is in an area used as a bombing impact zone, resulting in increased erosion and potentially posing a direct threat to the plants. The U.S. Fish and Wildlife Service has prepared a recovery plan that makes management recommendations for all of the Federally listed plant species of the Island.

**The recent trend for San Clemente Island bush mallow is one of stability, but the total population is so small that it remains critically endangered.**

## Santa Cruz Island bush mallow

*(Malacothamnus fasciculatus* var. *nesioticus)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Chaparral

Santa Cruz Island bush mallow is a tall evergreen shrub with slender wand-like branches covered with woolly hairs, large, lobed leaves, and open inflorescences of pinkish flowers. It is a member of the mallow family (Malvaceae). This plant is known from a single occurrence at the west end of Santa Cruz Is-

land. It grows on a dry, south-facing canyon slope in coastal chaparral and sage scrub vegetation. The single population contains less than 50 plants and may consist of one large clone.

Past overgrazing by sheep and cattle denuded much of the Island and caused the near-extinction of this bush mallow. The Nature Conservancy now owns most of Santa Cruz Island and has succeeded in removing all of the sheep, thus eliminating a major threat. The population was fenced in 1989 to protect it from the rooting and foraging of feral pigs, which continue to pose a significant threat. None of the plants have flowered for several years. Efforts should be made to re-establish the plant in suitable habitat sites. There are established plantings of Santa Cruz Island bush mallow at the U.C. Research Station on the Island and at the Santa Barbara Botanic Garden.

**The overall trend for Santa Cruz Island bush mallow is one of serious decline.**

## Rock lady

*(Maurandya (= Holmgrenanthe) petrophila)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Mojavean Desert Scrub

Rock lady is a soft-hairy, herbaceous perennial in the figwort family (Scrophulariaceae). It has short, hanging stems from a woody base, rounded, bristly leaves, and creamy yellow flowers. Rock lady is found in the transition zone of the mixed desert scrub and creosote bush scrub plant communities of Fall and Titus canyons, in the Grapevine Mountains in Inyo County. It grows as scattered individuals in limestone rock crevices of steep canyon walls. The habitat is owned by the National Park Service and is located in Death Valley National Monument.

This beautiful and unusual plant has been recently confirmed at its one site in Titus Canyon. Suitable habitat exists in unsearched canyons nearby. Little is known of the ecology or population biology of rock lady. Before a management plan can be developed, a full status survey and identification of any potential threats is needed. No threats to this plant are currently known.

**Although it is an extremely rare plant, the trend for rock lady appears to be one of stability.**

## Willowy monardella

*(Monardella linoides* **ssp.** *viminea)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Riparian Scrub

Willowy monardella, a member of the mint family (Lamiaceae), is a perennial with erect stems from a woody base, silvery minute hairs, narrow leaves, and tiny rose-lavender flowers in dense heads. It grows in rocky or sandy areas within canyons, mostly in washes or floodplains. Its U.S. distribution is restricted to San Diego County, mostly north of San Diego near Poway. This taxon also occurs in Baja California. Most occurrences are on Federal (Department of Defense) and private lands, with a few on City and County of San Diego property.

Because of its location, willowy monardella is vulnerable to urbanization and highway construction. About half of the approximately two dozen known occurrences of willowy monardella in California are either damaged and declining or have been extirpated. At least seven occurrences which were extant in 1981 have been extirpated by development or transplanted by CalTrans as part of mitigation for highway construction. Caltrans found that willowy monardella plants need native soil to survive in cultivation, but are easily propagated from seed and cuttings. No specific management or protection measures have been implemented for this species.

**Recent studies suggest that the trend for willowy monardella is one of rapid decline throughout its range.**

## Few-flowered navarretia

*(Navarretia pauciflora)*

CA - Threatened (1990)
FED - Candidate 2

General Habitat: • Vernal Pools

Few-flowered navarretia is a small annual herb in the phlox family (Polemoniaceae). This plant grows unbranched or with a few short, spreading branches. The tiny flowers occur in clusters and are white or pale blue. Few-flowered navarretia occurs in drying vernal pools on volcanic substrate in the north coast ranges of Lake and Napa counties. It has always been restricted to this very specialized habitat. It often occurs with other rare plants such as the State- and Federally-listed endangered *Lasthenia burkei* (Burke's goldfields).

Historically, few-flowered navarretia was collected from about nine sites in Lake and Napa counties. Today, it is known from only three sites, all of which occur on private land. Threats include urban development, off-road vehicle activity, hydrologic changes to the habitat, erosion, grazing and land conversion to agriculture. Immediate action will be necessary to forestall extinction of this species. Total habitat loss has been estimated to be as much as 67%.

**The trend for few-flowered navarretia is one of steady decline.**

## Many-flowered navarretia

*(Navarretia plieantha)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Vernal Pools

Many-flowered navarretia is a prostrate, mat-forming, spiny annual herb, with widely-spaced narrow leaves and heads of small, pale blue flowers. This member of the phlox family (Polemoniaceae) is known from moist habitats in volcanic ash vernal pool systems in Lake and Sonoma counties. Only one of two reported Sonoma County sites has been seen in recent years.

Historically, about eight sites for many-flowered navarretia were known. The Sonoma County occurrence is threatened by trampling and ORVs and is currently grazed by sheep. The four remaining Lake County occurrences are mostly in good condition. However, off-road vehicle use and cattle grazing in the pool habitat are continuing threats to this plant. The occurrence at Boggs Lake is owned and protected by The Nature Conservancy; California Endangered Species Tax Check-off funds were used to establish a trail and to build a boardwalk, parking area, and interpretive sign at TNC's Boggs Lake Preserve. Another site, at Loch Lomond, has been purchased by the Wildlife Conservation Board for the protection of several endangered species. DFG recently provided fencing to prevent off-road vehicles in this fragile pool habitat. The two other Lake County occurrences are privately owned and unprotected. In 1989, a vernal pool preservation program was developed for Sonoma County financed by the California Endangered Species Tax Check-off Fund. The final report has been received by Sonoma County and is being revised by County planning staff prior to the County's adoption of the conservation program. An MOU was developed in 1991 by the Sonoma County Vernal Pools Regional Task Force concerning regional conservation of vernal pools and their associated endangered plants in Sonoma County.

**The overall trend for many-flowered navarretia has been one of decline. However, recent protection efforts have stabilized the status of this species.**

## Twisselmann's nemacladus

*(Nemacladus twisselmannii)*

CA - Rare (1982)
FED - Candidate 2
General Habitat: • Upper Montane Conifer Forest

Twisselmann's nemacladus is an inch-high, gray-hairy annual herb with basal leaves in rosettes, and small, short stemmed, white flowers. This member of the bellflower family (Campanulaceae) grows in small colonies on loose gravels and granitic soils amid sparse Jeffrey pine forests at the rim of the Kern Plateau in Kern and Tulare counties.

There are only two known occurrences of Twisselmann's nemacladus, and both are in Sequoia National Forest. At present, this species does not appear to be threatened. There is little commercial timber and remote locations preclude heavy recreational use of the habitat. The U.S. Forest Service is monitoring the populations. This species was probably always extremely restricted in distribution.

**The overall trend for Twisselmann's nemacladus is one of stability.**

## Colusa grass

*(Neostapfia colusana)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Vernal Pools

Colusa grass is a coarse, pale green annual member of the grass family (Poaceae), with several stems of loosely folded, clasping leaves and thick terminal spikes of flowers. This grass occurs only on the adobe muds of large or deep vernal pools in Merced, Stanislaus and Solano counties. Colusa grass has been extirpated at its type locality in Colusa County. Associated species in some locations include hairy Orcutt grass (*Orcuttia pilosa*) and San Joaquin Valley Orcutt grass (*O. inaequalis*), both also State-listed as endangered.

With the loss of 90% of California's vernal pools, many occurrences of Colusa grass and other as-

sociated species have been destroyed. In December 1989, the USFWS released the final report of a status survey on the Central Valley Orcuttieae, including Colusa grass. This report indicates that, of nearly 50 known occurrences of this species, 20 percent have been extirpated; another 20 percent are damaged and declining. Heavy grazing and competition from introduced weedy species threaten to displace Colusa grass. Many occurrences are on unprotected private land and are subject to agricultural conversion. The Solano County occurrence of Colusa grass is protected by The Nature Conservancy at its Jepson Prairie Preserve. TNC's 1990 Element Monitoring Report reported small population numbers on the Preserve in the 1989-1990 season. In 1991, California Endangered Species Tax Check-off funds were used for development of an interpretive trail and guide to Jepson Prairie. TNC has also secured conservation easements on the Flying M Ranch of Merced County to protect a large expanse of valley grassland vernal pool habitat.

**The overall trend for Colusa grass is one of decline.**

## Amargosa nitrophila
*(Nitrophila mohavensis)*

CA - Endangered (1979)
FED - Endangered (1985)

General Habitat: • Meadows and Seeps

Amargosa nitrophila is a small erect perennial in the goosefoot family (Chenopodiaceae). This compact plant has smooth pinkish stems with rounded opposite leaves clasping them and minute rose-colored flowers at the base of the leaves. It is found in open alkali flats and low sand deposits in the Amargosa River drainage of Inyo County, California and Nye County, Nevada. This area includes the Carson Slough drainage near Tecopa, and Ash Meadows, a unique desert oasis.

There are only three known occurrences of Amargosa nitrophila worldwide, two of which are in California. This species requires natural and unaltered hydrology for its survival. As such, modifications to either site could be detrimental. Mining, grazing, ORV's, roadside maintenance, and residential development also pose direct threats. A significant portion of one of the sites, which is privately owned, was recently destroyed by filling. The other California site, which is managed by the Bureau of Land Management, is threatened by grazing. In April 1990, this occurrence was damaged by vehicles from an unauthorized mining survey; fortunately the damage was minimal. As a result of these mining actions, a botanical survey of suitable habitat in the vicinity was required to obtain current information on the condition and trend of the population. Formal protection of the private occurrence is needed. The BLM should maintain the natural hydrology of its site, minimize or eliminate any grazing effects, and establish a long-term monitoring program for this species.

**The overall trend for Amargosa nitrophila is one of decline due to habitat destruction.**

## Dehesa nolina
*(Nolina interrata)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Chaparral

Dehesa nolina is a large, yucca-like perennial with rosettes of long flat leaves, and tall, much-branched flower stalks. The white male and female flowers occur on separate plants. This agave family (Agavaceae) member is found in chaparral plant communities in a limited area of south-central San Diego County and adjacent Baja California.

Dehesa nolina is limited to about a half-dozen occurrences which are threatened by residential development and collection of plants for sale in the nursery trade. TNC recently established a preserve on McGinty Mountain which protects part of the largest known occurrence. This important site contains over half of California's existing plants. Studies are needed to determine if fire management will increase the reproduction of this species. Transplanting may be needed to introduce plants of the opposite sex into populations containing only same sex individuals.

**The overall trend for Dehesa nolina has been one of decline, but recent efforts to protect the largest and most vigorous population should help stabilize the trend.**

## Eureka Dunes evening-primrose
*(Oenothera avita* ssp. *eurekensis)*

CA - Rare (1978)
FED - Endangered (1978)

General Habitat: • Desert Dunes

Eureka Dunes evening-primrose is a perennial herb with large showy white flowers that age to red. This member of the evening primrose family (Onagraceae) grows in the flat to gently sloping sand areas bordering larger desert sand dunes of Eureka Valley in Inyo County. Eureka Dunes evening-primrose is associated with the State-listed rare Eureka Valley dune grass (*Swallenia alexandrae*), although the grass often grows much higher on the dunes. There are only three known occurrences of Eureka Dunes evening-primrose; all are confined to the southern portion of Eureka Valley.

The Bureau of Land Management (BLM) manages all three Eureka Dunes evening-primrose occurrences. In 1976, BLM closed the dunes to off-road vehicle (ORV) activity to protect the dunes and associated vegetation. Since the closure, dune vegetation has recovered dramatically. However, illegal entry by ORVs is still a threat to the vegetation there. Recent research, done under contract to DFG using Federal endangered species funds, revealed that although Eureka Dunes evening-primrose is short-lived and suffers high mortality, it produces abundant, long-lived seeds.

**The trend for Eureka Dunes evening-primrose is one of stability.**

## Antioch Dunes evening-primrose

*(Oenothera deltoides* **var.** *howellii)*

CA - Endangered (1978)
FED - Endangered (1978)

General Habitat: • Inland Dunes

Antioch Dunes evening-primrose is a showy, white-flowered, highly branched perennial herb with grayish toothed or divided leaves. It is a member of the evening primrose family (Onagraceae). This plant grows in loose sand and semi-stabilized dunes in a small area along the San Joaquin River near Antioch, Contra Costa County. The area is protected by San Francisco Bay National Wildlife Refuge and PG&E. The State and Federally-endangered Contra Costa wallflower (*Erysimum capitatum* var. *angustatum*) grows in the same area as the evening-primrose.

The Antioch Dunes have been reduced to about 70 acres as a result of industrial development, sand mining, and agricultural conversion. The remaining habitat has been degraded by fire control activities, off-road vehicle use and invasion by exotic species. In 1970, this species was introduced from seed to two sites in Brannan Island State Recreation Area. A survey in 1988 determined that the first site at Brannan Island supported about 60 individuals, and the second contained only six plants that were not likely to survive.

The San Francisco Bay Wildlife Refuge was closed to public use to reduce erosion caused by trespass and ORVs. The USFWS prepared a recovery plan for Antioch Dunes evening-primrose and two other endangered species found at the Dunes. Pacific Gas and Electric designed and funded an enhancement program at the dunes that was carried out by USFWS. Research funded by a grant-in-aid from USFWS determined that although plants of this species typically produce large amounts of seed, seed set by the plants at Antioch Dunes is reduced, possibly due to pollination limitations. This research also concluded that seedlings were unable to survive on the clay soils now present in areas where overlaying dune sand was removed. Advances in management techniques have included the ongoing creation of new sand dunes at the Refuge, which will be seeded and planted with 300 primrose seedlings. Antioch Dunes evening-primrose has been found to be a colonizer after wildfires, so prescribed burning and primrose seeding is planned in the next two years. In 1988 a permanent plot was established at the Refuge for long-term monitoring. The population is surveyed every other year and during alternate years the population is subsampled. Primrose plant totals have increased from the 1988 surveys.

**The recent trend for Antioch Dunes evening-primrose is one of stability, but its total population size and distribution still leave this plant in a very precarious position.**

## Bakersfield cactus

*(Opuntia basilaris* **var.** *treleasei)*

CA - Endangered (1990)
FED - Endangered (1990)

General Habitat: • Chenopod Scrub
• Valley and Foothill Grassland

Bakersfield cactus is a succulent, spiny member of the cactus family (Cactaceae) with large, showy magenta flowers that bloom from March through June. It is a spreading perennial plant with gray-green stems which form flat joints (pads). This species grows on coarse, cobbly, well-drained granitic sand on bluffs, low hills, and flats in the valley and foothill grasslands of Kern County.

Bakersfield cactus once formed extensive colonies in the area around the present city of Bakersfield, extending up the Kern River Canyon to the northeast, through the Caliente Creek drainage to the southeast, and to the Tejon Hills, about twenty miles to the south. Much of the historical habitat for this species has been destroyed by impacts associated with human activities. The rapidly accelerating urbanization of this area poses a severe threat to the species today. Agricultural conversion of land, oil field development, overgrazing by sheep and cattle, off-road vehicle activity, dumping, sand mining, and invasion of weedy grasses have contributed to the decline of this species and destruction of its habitat throughout its range. As these activities continue, they threaten the existence of

Bakersfield cactus.

**The overall trend for Bakersfield cactus is one of dramatic decline.**

## California Orcutt grass
*(Orcuttia californica)*

CA - Endangered (1979)
FED - Proposed Endangered (1991)

General Habitat: • Vernal Pools

California Orcutt grass, a member of the grass family (Poaceae), is a bright green, sticky, aromatic annual with flowers borne in dense spikes. This species was once commonly found in the volcanic terrace and valley vernal pool systems of southern California in Los Angeles, Riverside and San Diego counties.

At least half of approximately 25 historic occurrences have been extirpated or are damaged and declining as a result of urbanization, roadbuilding activities, and conversion of land to agriculture. Extensive urbanization has extirpated California Orcutt grass from Los Angeles County and reduced the number of sites in the other two counties. Most San Diego County occurrences are found on private land on Otay Mesa and are threatened by development associated with the International Border crossing. Of ten populations historically reported from Otay Mesa, only four were located in 1985, and only two in 1990. Another population occurs on U.S. Navy Land at Mirimar Naval Air Station. Some of the Riverside County occurrences are protected and monitored on The Nature Conservancy's Santa Rosa Plateau Preserve. California Endangered Species Tax Check-off funds are being used to finance rare plant habitat protection efforts at TNC's Santa Rosa Plateau Preserve; this project includes protection and restoration of native habitat on preserve land and installation of interpretive signs. The other Riverside County occurrence, discovered in 1984, is located on private property that was planned for development. High quality pools need to be identified so that priority can be given to long-term protection of the most viable populations of rare plants. Under a Memorandum of Understanding with Rancho Santa Ana Botanic Garden, California Orcutt grass seed will be stored at the Garden's long-term storage facilities. This species was proposed for federal listing by the USFWS in November 1991.

**The overall trend for California Orcutt grass is one of continued decline as a result of habitat alteration and destruction.**

## San Joaquin Valley Orcutt grass
*(Orcuttia inaequalis)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Vernal Pools

San Joaquin Valley Orcutt grass is a grayish-green, sticky, aromatic annual in the grass family (Poaceae) with a terminal inflorescence of overlapping flowers. This grass was once common in vernal pools in Stanislaus, Merced, Fresno, Madera, and Tulare counties. Associated species in some locations include Colusa grass (*Neostapfia colusana*), Boggs Lake hedge-hyssop (*Gratiola heterosepala*) and succulent owl's clover (*Orthocarpus campestris* var. *succulentus*), all of which are State-listed endangered.

In December, 1989, the USFWS released their final report on a status survey of the Central Valley Orcuttieae, including San Joaquin Valley Orcutt grass. This report indicated that over 60 percent of the approximately 30 known occurrences of this species have been extirpated, primarily as a result of conversion of suitable habitat to agriculture. San Joaquin Valley Orcutt grass has been completely extirpated from Stanislaus and Tulare counties. Most of the extant occurrences are concentrated in two small areas in eastern Merced County. Several populations have been damaged and are declining due to heavy grazing, discing and competition from weedy exotic species. Only six of the extant occurrences are considered stable. Occurrences of San Joaquin Valley Orcutt grass on the Flying M Ranch in Merced County are protected through conservation easements with The Nature Conservancy. TNC recently acquired habitat on Table Mountain in Fresno County. BLM owns another occurrence in Fresno County. Plants on the BLM parcel seem to be recovering since part of the population was fenced in 1990 to protect it from grazing. Management for the area will include annual monitoring, additional fencing, and small controlled burns to manage introduced brome. A draft proposal for designating this site as an Area of Critical Environmental Concern (ACEC) has been prepared. The other occurrences are privately owned and unprotected.

**The general trend for San Joaquin Valley Orcutt grass is one of decline.**

## Hairy Orcutt grass
*(Orcuttia pilosa)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Vernal Pools

Hairy Orcutt grass is a yellow-green, aromatic, tufted annual in the grass family (Poaceae), with sticky hairs throughout and a branched flower stalk of numerous flowers. This grass occurs in vernal pools in Stanislaus, Merced, and Madera counties in the San Joaquin Valley, with several more populations farther north in Tehama and Butte counties. Associated species in some locations include two other State-listed grasses, Colusa grass (*Neostapfia colusana*) and Greene's tuctoria (*Tuctoria greenei*).

Hairy Orcutt grass is severely threatened by conversion of its vernal pool habitat to agriculture. A USFWS report released in December, 1989, on the status of Central Valley Orcuttieae indicated that nearly 40 percent of the approximately 30 known occurrences have been extirpated as a result of conversion of habitat to irrigated agriculture. All of the occurrences in Merced County are believed to be extirpated. Existing habitat continues to be threatened by overgrazing, discing, and competition from weedy plants, and several of the extant occurrences are damaged and declining. It appears that hairy Orcutt grass can tolerate some grazing, but livestock impacts on occurrences should be monitored. Several occurrences receive protection on TNC's Vina Plains Preserve in Tehama County. Baseline monitoring of populations at the Preserve began in 1989. In 1991, Department of Fish and Game Tax Check-off funds were used to remove introduced weeds from a pool supporting hairy Orcutt grass at TNC's Vina Plains Preserve. Occurrences in the San Joaquin Valley are not protected.

**The overall trend for hairy Orcutt grass is one of decline due to loss of vernal pool habitat.**

## Slender Orcutt grass

*(Orcuttia tenuis)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Vernal Pools

Slender Orcutt grass is a blue-green, sticky, aromatic annual member of the grass family (Poaceae), with a branched, several-flowered flower stalk. This grass occurs in the bottom of vernal pools associated with valley grassland and blue oak woodland communities. It has been reported from Lake, Sacramento, Shasta, Siskiyou, and Tehama counties. Associated species that are also State-listed include many-flowered navarretia (*Navarretia plieantha*), Boggs Lake hedge-hyssop (*Gratiola heterosepala*), and Greene's tuctoria (*Tuctoria greenei*).

Much of slender Orcutt grass' vernal pool habitat has been damaged or lost as a result of agricultural conversion. The remaining habitat is threatened by development at the Redding Municipal Airport, overgrazing, and changes in pool hydrology. A 1989 report by the USFWS on the status of Central Valley Orcuttieae indicated that nearly a third of the approximately 45 known occurrences of slender Orcutt grass have been damaged, are in marginal condition, or are extirpated. TNC protects and monitors a few occurrences of slender Orcutt grass at their Vina Plains and Boggs Lake preserves. Other occurrences on BLM, USFS and private rangeland are subject to cattle grazing. Populations on USFS's Lassen National Forest are being monitored, and California Environmental License Plate funds have been approved to fence a vernal pool that supports slender Orcutt grass. Four populations in Lassen National Forest were monitored in 1991. A species management guide has been developed cooperatively by USFS and BLM. In 1991, BLM initiated a project to repair part of a damaged vernal pool that contains slender Orcutt grass. The pool is part of the Timbered Crater Wilderness Study Area in the Alturas Resource Area. California Endangered Species Tax Check-off funds have been used to implement management and protection measures at TNC's Boggs Lake Preserve. This project included installing an interpretive trail and signs as well as constructing a fence to restrict ORV and equestrian access. The trail includes a floating dock that allows visitors access to the lake without adversely impacting the environmentally sensitive site.

**Although discoveries of additional populations in recent years have extended the known range of this species, the overall trend for slender Orcutt grass is one of decline as a result of habitat alteration and loss.**

## Sacramento Orcutt grass

*(Orcuttia viscida)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Vernal Pools

Sacramento Orcutt grass is a blue-green, tufted, sticky aromatic annual plant in the grass family (Poaceae) with flowers crowded into bristly heads. It flowers in dry vernal pool beds within either blue oak woodland or valley grassland communities. This grass is restricted to several vernal pool complexes in Sacramento County and is the rarest and most narrowly distributed member of the genus *Orcuttia*. At one site, Sacramento Orcutt grass is associated with State-listed endangered Boggs Lake hedge-hyssop (*Gratiola*

*heterosepala*). Fewer than 10 occurrences of Sacramento Orcutt grass have been reported; one of these was artificially established in 1979 by seeding a vernal pool. Most occurrences are on private land and remain unprotected.

A 1989 USFWS report on the status of the Central Valley Orcuttieae tribe indicated that two of the known occurrences of this species have been extirpated by urban development and hydrologic modification. Only five extant occurrences are currently considered stable. Threats to this species include residential development, overgrazing, and conversion to agriculture. One site at Phoenix Field is owned and managed by DFG as an Ecological Reserve and a management plan has been written for this site. Sacramento Orcutt grass also occurs nearby on the City of Fair Oaks recreational park land that is frequently disturbed by hikers and mountain bikes. Other occurrences are owned by the County of Sacramento and Sacramento Municipal Utility District. Mitigation, involving transplantation to a wetland preserve, is planned for a population in Sacramento County that would be impacted by development.

**The trend for Sacramento Orcutt grass is one of rapid decline.**

## Succulent owl's-clover

*(Orthocarpus campestris* **var.** *succulentus)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Vernal Pools

Succulent owl's-clover is a succulent annual herb in the figwort family (Scrophulariaceae) with brittle narrow leaves and heads of bright yellow flowers. This species grows in drying vernal pools in valley grassland or woodland areas at the base of the Sierra Nevada foothills in Fresno, Madera, Merced and Stanislaus counties.

Agricultural conversion, discing of pools, competition from introduced weeds, overgrazing, and urbanization in the San Joaquin Valley have eliminated vernal pool habitat and continue to threaten succulent owl's clover occurrences. Succulent owl's clover occurs primarily on private land. A new population was discovered in 1991 on private property. Some plants are now protected from cattle grazing on BLM land in Fresno County. As a result, introduced annual grasses need an alternate control there. The Nature Conservancy has secured protection of vernal pool habitat for this and other State-listed vernal pool species through conservation easements with private landowners in Merced County.

**The overall trend for succulent owl's clover is one of decline.**

## Lake County stonecrop

*(Parvisedum leiocarpum)*

CA - Endangered (1990)
FED - Candidate 1

General Habitat: • Valley and Foothill Grassland
• Vernal Pools

Lake County stonecrop is a diminutive, succulent annual in the stonecrop family (Crassulaceae). It has reddish stems from 1 to 2 inches tall, small fleshy leaves and pale yellow flowers that appear in April or May. This stonecrop grows in volcanic ash vernal pools that are seasonally wet and dry out in late spring. Lake County stonecrop has always been rare and is restricted to a few sites in Lake County.

At least 50% of the historical habitat of Lake County stonecrop has been lost. Six historical collections for this species are known. Recent surveys determined that there are only three sites left, and these cover only about three acres. The number of plants, though variable, is estimated to be about 4400. Lake County stonecrop only occurs on private land. Its small population sizes and presence on private land make it extremely vulnerable. Threats include urban development, grazing, hydrologic changes to the habitat, land conversion to agriculture and off-road vehicle activity. Immediate protection actions are needed to prevent further losses.

**The overall trend for Lake County stonecrop is one of decline.**

## Dudley's lousewort

*(Pedicularis dudleyi)*

CA - Rare (1979)
FED - None

General Habitat: • Chaparral
• North Coast Conifer Forest
• Valley and Foothill Grassland

Dudley's lousewort is a short perennial herb with mostly compound, basal leaves and stalks of pinkish flowers. This member of the figwort family (Scrophulariaceae) grows under shaded conditions in the coastal redwood and mixed evergreen forest communities of San Luis Obispo, Monterey, Santa Cruz, and San Mateo Counties.

There are fewer than ten known occurrences of Dudley's lousewort. The majority of these are within Los Padres National Forest or on State Park land and are threatened there by recreational activities. In 1988, an occurrence in the Pico Blanco Boy Scout Camp (Monterey County) was afforded some protection as a result of contact with camp officials. The plant populations there had been damaged, but a

monitoring program is currently in place. No permanent management programs for this species exist. A change in listed status to threatened seems appropriate for this plant considering the low population numbers, the variety of impacts to populations, and the absence of permanent protection.

**The overall trend for Dudley's lousewort is one of decline, and unless permanent protection plans are implemented, the trend will undoubtedly continue.**

## White-rayed pentachaeta
*(Pentachaeta bellidiflora)*

CA - Candidate Endangered (1991)
FED - Candidate 2

General Habitat: • Serpentine Grassland

White-rayed pentachaeta is a small annual plant with heads of yellow disk flowers surrounded by white to purple ray flowers. This member of the sunflower family (Asteraceae) is currently known from a serpentine bunchgrass community in one small area of San Mateo County.

Only one of the nine historically known populations of white-rayed pentachaeta still exists. Urbanization, highway construction, and off-road vehicle damage have eliminated six historical populations. Although suitable habitat appears to exist at two historically known sites in Santa Cruz County, white-rayed pentachaeta has not been seen at these locations in many years. The single remaining population occurs in Edgewood County Park and on San Francisco Water District property east of Crystal Springs Reservoir. Population size fluctuates widely from year to year at both sites. Although public access to San Francisco Water District property has been restricted in the past, the area is part of a recreational easement and paved trails have been proposed there. Foot traffic could damage the white-rayed pentachaeta population. A proposal to locate a golf course on Edgewood Park is another serious threat to the species. Recent years of drought appear to have been favorable for white-rayed pentachaeta, perhaps due to reduced competition from other plant species. However, this single remaining population is extremely vulnerable to chance catastrophic events; any damage to the remaining habitat could lead to the extinction of white-rayed pentachaeta.

**The overall trend for white-rayed pentachaeta is one of drastic decline.**

## Lyon's pentachaeta
*(Pentachaeta lyonii)*

CA - Endangered (1990)
FED - Candidate 1

General Habitat: • Chaparral
• Valley and Foothill Grassland

Lyon's pentachaeta is an herbaceous annual plant in the sunflower family (Asteraceae). It has yellow ray and disk flowers arranged in heads that bloom from March to August. Habitat for Lyon's pentachaeta consists of grassy openings within chaparral as well as the edges of artificially created clearings adjacent to firebreaks and roads. Currently, Lyon's pentachaeta is known only from the coastal mountain region of northern Los Angeles County and southern Ventura County in the Santa Monica Mountains and in the Simi Valley. Populations on the Palos Verdes Peninsula and on Santa Catalina Island have not been seen for many years.

Only nine of the sixteen historical occurrences of Lyon's pentachaeta remain. Since most populations are on privately owned land, and urbanization is occurring throughout much of southern California, the remaining Lyon's pentachaeta populations have been seriously affected by numerous development-related disturbances. Golf course construction, illegal dumping, road construction, transplantation attempts, and housing developments have contributed to the decline of this species and its habitat, and continue to jeopardize its existence. Populations on State and Federal park lands are threatened by trampling by park visitors. Natural impacts, including drought and gopher disturbance, have also reduced populations. A mitigation project, initiated in 1988, involved removal of plants for development of a golf course. In conjunction with this project, Rancho Santa Ana Botanic Garden is growing Lyon's pentachaeta and has seed stored from the project site.

**The overall trend for Lyon's pentachaeta is one of steady decline.**

## Yreka phlox
*(Phlox hirsuta)*

CA - Endangered (1987)
FED - Candidate 1

General Habitat: • Lower Montane Conifer Forest

Yreka phlox is a low, cushion-like perennial subshrub, with hairs throughout, leaves crowded on

short stems, and attractive pink to purple flowers. This phlox family (Polemoniaceae) member occurs in juniper woodlands and open Jeffrey pine forests on granitic soils in the general vicinity of Yreka, Siskiyou County. There are two known occurrences, owned privately and by the USFS in the Klamath National Forest.

In the past, Yreka phlox occurrences have been disturbed by road building activity associated with a subdivision, and logging activities. The site in Yreka is being considered for construction of a hospital. The Forest Service protects the occurrence on its land. The Nature Conservancy has secured voluntary protection agreements with private landowners in Yreka through their Register of Natural Areas Program.

**Though the trend for Yreka phlox is currently one of decline, the status of this species may be stabilizing.**

## San Francisco popcornflower

*(Plagiobothrys diffusus)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Valley and Foothill Grassland

San Francisco popcornflower is a low, herbaceous annual, with narrow leaves and a branched flower stalk of white flowers. This member of the borage family (Boraginaceae) is known only from the Presidio of San Francisco and from one occurrence near the City of Santa Cruz. The type locality near Mountain Lake in San Francisco has been altered by landscaping with trees and shrubs, and introduced annual grasses.

San Francisco popcornflower has not been seen in many years on the Presidio and may be extirpated from San Francisco. Until a population is relocated, any remaining historic habitat on the Presidio should be protected. The current conversion of the Presidio from Department of Defense jurisdiction to National Park Service jurisdiction leaves the direction of future land use uncertain. Specimens from Empire Grade in Santa Cruz County (previously not thought to be *P. diffusus*) have since been identified as San Francisco popcornflower. There is some dissention among experts on the taxonomy of this species. Some have suggested combining it with a more common taxon, while others maintain it should remain as a distinct species. The new Jepson Manual (due for publication in late 1992) will present an updated taxonomy for this species. No management plans exist for this plant.

**The overall trend for San Francisco popcornflower is one of decline due to loss of habitat and encroachment of introduced species.**

## Calistoga popcornflower

*(Plagiobothrys strictus)*

CA - Threatened (1990)
FED - Candidate 1

General Habitat: • Broadleaved Upland Forest
• Meadows and Seeps
• Valley and Foothill Grassland

Calistoga popcornflower is an annual herb in the borage family (Boraginaceae). It is slender-stemmed, with narrow leaves and small white flowers. This species grows in vernal pools adjacent to active geysers and hot springs. These seasonal wetlands are underlain by a gravelly loam interbedded with clay, and water tables are close to the surface. Concentrations of boron, arsenic, and sulphates are high in these pools and a unique flora has evolved that can exist there.

Only two of the three historic occurrences of Calistoga popcornflower remain. These are near the town of Calistoga, in Napa County. Urbanization and viticulture have extirpated one historic occurrence and eliminated over 70 percent of the species' habitat. Both extant occurrences exist on privately owned land. One population has declined in the last decade due to disturbances such as grass mowing, traffic, and vehicle parking. Both populations are small and at risk of extirpation by a random or chance event such as a severe disease outbreak, a fire, or other natural or human-caused disaster.

**The overall trend for Calistoga popcornflower is one of decline.**

## North Coast semaphore grass

*(Pleuropogon hooverianus)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Broadleaved Upland Forest

North Coast semaphore grass, a member of the grass family (Poaceae), is a large, succulent perennial grass, with long and flat ribbon-like leaves and a terminal unbranched spike of widely spaced spikelets. It grows in moist sites of redwood forest and mixed evergreen forest communities, and in the margins of vernal pools at DFG's Todd Road Preserve in Sonoma County. This species is a northwest California endemic known only from Marin, Sonoma, and Mendocino counties.

There are only about a dozen known occurrences of North Coast semaphore grass, many of which have not been

east of Fresno. It grows on well-drained granitic soils, and is most abundant on north-facing ravines and drainages in chaparral and cismontane woodland communities. The total range of this species covers an area of approximately 225 square miles, within which there are fewer than ten native populations. This species appears to require specific conditions for successful sexual reproduction. No seed germination or seedling establishment in nature had ever been observed until 1990 when germination occurred following the 1989 Powerhouse fire. Fire may be an important ecological requirement of this species; burned tree-anemone plants have been observed to resprout vigorously.

Threats to the continued existence of tree-anemone consist of highway construction, foothill development, off-road vehicle use, illegal dumping, hydroelectric operations, logging, and incompatible fire management techniques. Approximately 60 percent of the population distribution of tree-anemone occurs on private land; the remainder is on U.S. Forest Service land. The landowners of one occurrence have entered into a voluntary protection agreement with The Nature Conservancy to protect tree-anemone on their property. The Forest Service has established a Carpenteria Botanical Area encompassing a portion of the largest tree-anemone occurrence, and its Backbone Creek Research Natural Area (RNA) supports another population. Monitoring of seedling survival was conducted at these locations recently. Although seedling mortality was high, as might be expected with the continued drought, seedlings that were established along moist seeps appear vigorous. California Endangered Species Tax Check-off funds and matching funds from Sierra National Forest were used in 1991 to continue this effort. A portion of the RNA was fenced in 1990 to prevent access by cattle, which had been trampling and grazing on the seedlings and stump sprouts. A draft species management plan was prepared by the Forest Service in 1990. In 1991, a new tree-anemone population was discovered in the Sierra National Forest during a survey for a large salvage timber sale. Forest botany personnel worked with the marking crew for the sale and flagged a wide buffer around the population. A Memorandum of Understanding (MOU) was initiated for this species in 1991 between DFG and the University of California's Mosquito Control Research Lab. The research will determine if tree-anemone has any biological activity against mosquito larvae and adults.

**The trend for tree-anemone appears to be one of stability to decline due to habitat loss and low seedling establishment.**

## Mt. Gleason Indian paintbrush

*(Castilleja gleasonii)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Lower Montane Conifer Forest

Mt. Gleason Indian paintbrush is a grayish, hairy perennial herb in the figwort family (Scrophulariaceae) with scarlet flowers. It occurs on open flats or slopes in the granitic soils of ponderosa pine forests and montane chaparral plant communities in the San Gabriel Mountains, Los Angeles County. There are several known occurrences near Mount Gleason in the Angeles National Forest.

Mt. Gleason Indian paintbrush is threatened by human activities including illegal off-road vehicle use of the habitat, local foot traffic, grazing and trampling by horses and cattle, and brush clearing for forest management. In 1987, Angeles National Forest conducted field surveys and completed a management plan for Mt. Gleason Indian paintbrush. An update of the management plan is imminent. Annual monitoring is being conducted by Rancho Santa Ana Botanic Garden. One new occurrence was reported on the Forest in 1991.

**The recent trend for Mt. Gleason Indian paintbrush is one of decline.**

## San Clemente Island Indian paintbrush

*(Castilleja grisea)*

CA - Endangered (1982)
FED - Endangered (1977)

General Habitat: • Coastal Scrub

San Clemente Island Indian paintbrush is a branched perennial herb in the figwort family (Scrophulariaceae). Plants are covered with matted hairs and produce elongated flower stalks of yellow flowers. This paintbrush grows in maritime desert scrub on the rocky slopes and canyons of San Clemente Island. Forty-five populations are scattered around the island, and about half contain fewer than ten individuals.

In the 1930's this plant was relatively common on the southeastern coast of the island, but feral goats

seen recently. Impacts to roadside populations of North Coast semaphore grass occurred from road maintenance activities and herbicide spraying. A survey conducted in 1988 indicated that one of the Marin County occurrences may be extirpated by construction of a housing development. Elimination of habitat and disruption of natural hydrologic conditions have resulted in population declines. Insect predation may also threaten this species. One North Coast semaphore grass occurrence is on DFG's Laguna de Santa Rosa Ecological Reserve, but no active management strategy has been initiated there. The other occurrences are privately owned and subject to land conversion, which alters the hydrologic conditions necessary to support this grass. Thorough field surveys are needed at historic locations to up-date information on this grass.

**The trend for North Coast semaphore grass is one of decline.**

## Napa bluegrass

*(Poa napensis)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Meadows and Seeps

Napa bluegrass is a tufted perennial bunchgrass that lacks rhizomes and has fertile stems crowded with purplish flowers. This rare grass is known from just two sites near Calistoga in Napa County. It grows in moist alkaline meadows that are fed by runoff from nearby hot springs.

Both Napa bluegrass populations are on private land, and have been reduced by the development of health spas and other construction near the Calistoga Airport. Continuing threats include alteration of the hot springs hydrology, early season mowing before flowering or seed set, and potential residential and commercial development. There is no management plan for Napa bluegrass. Population numbers are declining, and preservation efforts through acquisition of habitat by DFG or by conservation easements are essential to this species' survival.

**The trend for Napa bluegrass is one of decline.**

## San Diego mesa mint

*(Pogogyne abramsii)*

CA - Endangered (1979)
FED - Endangered (1978)

General Habitat: • Vernal Pools

San Diego mesa mint, a member of the mint family (Lamiaceae), is a small, aromatic herbaceous annual, with opposite leaves and two-lipped, violet to reddish-purple flowers. It is restricted to vernal pools within grasslands, chamise chaparral, and coastal sage scrub on the mesas of western San Diego County. In some locations, this species is associated with San Diego button-celery (*Eryngium aristulatum* var. *parishii*), also State- and Federally-listed as endangered.

Although approximately 40 occurrences of San Diego mesa mint remain, nearly all are seriously threatened by agricultural development, urbanization, off-road vehicle activity, illegal dumping, and gravel mining operations. About half of the known sites are damaged and declining, and at least ten others have already been extirpated. A 1986 habitat survey (using Federal Endangered species funds) reported significant losses during the last several years in the City of San Diego. The San Diego Vernal Pool Preservation Plan has failed to preserve significant habitat for this species and additional vernal pools within the City of San Diego continue to be lost. Significant pools are on Federal land at the Mirimar Naval Air Station; ownership of other occurrences include State (CalTrans), municipal (City of San Diego), and private. DFG acquired some pools as mitigation for a CalTrans project and has given the USFWS responsibility for their management. To preserve San Diego mesa mint, the high quality vernal pool habitat remaining in San Diego County should be formally protected. A Federal Section 6 grant-in-aid is being used to continue efforts to restore and monitor damaged vernal pools that support San Diego mesa mint.

**The trend for San Diego mesa mint is one of decline as a result of habitat alteration and destruction.**

## Santa Lucia mint

*(Pogogyne clareana)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Riparian Woodland

Santa Lucia mint is a strong-smelling, herbaceous annual, with low- spreading branches, and narrow head-like clusters of reddish-purple flowers. This member of the mint family (Lamiaceae) is known only

from the tributaries of the Nacimiento River on the Hunter-Liggett Military Reservation in Monterey County. It grows in moist, sandy soil in riparian habitats.

The distribution and ecological requirements of Santa Lucia mint are poorly known. Suitable habitat should be identified, and management plans developed to address real and potential threats. Emphasis should be placed on working cooperatively with the Army to secure the known occurrences and prevent their accidental destruction by military activity.

**The overall trend for Santa Lucia mint is one of stability, but at levels which are deemed too low to ensure its long-term survival.**

## Otay Mesa mint

*(Pogogyne nudiuscula)*

CA - Endangered (1987)
FED - Proposed Endangered (1991)

General Habitat: • Vernal Pools

Otay mesa mint is an aromatic annual herb with two-lipped, lavender flowers and a branched and somewhat spreading habit. This small member of the mint family (Lamiaceae) grows in vernal pools on Otay Mesa in southwestern San Diego County in association with two other State-listed endangered species: California Orcutt grass (*Orcuttia californica*) and San Diego button-celery (*Eryngium aristulatum* var. *parishii*). Otay Mesa mint also occurs on the extension of Otay Mesa in the state of Baja California.

There are fewer than six stable or viable occurrences of Otay Mesa mint in California, with several more declining or possibly extirpated. Although once considered widespread near Balboa Park, Mission Valley and University Heights, urbanization has destroyed those occurrences. The Otay Mesa habitat is threatened with development, heavy cattle grazing, agricultural conversion, and increased activities around the second International Border crossing. Cattle are degrading many of the vernal pools, and one of the largest and most vigorous populations of Otay Mesa mint is at the periphery of a prison site. Most of the habitat is privately owned and under the jurisdiction of the City of San Diego or San Diego County. There is no ongoing management plan, and the City of San Diego Vernal Pool Preservation Plan has not preserved habitat for this species. Under a Memorandum of Understanding with Rancho Santa Ana Botanic Garden, Otay Mesa mint seed will be stored at the Garden's long-term storage facilities. Only four Otay Mesa mint populations were confirmed in a 1990 survey. This species was proposed for federal listing by USFWS in November of 1991.

**The trend for Otay Mesa mint is one of decline due to habitat destruction and urbanization.**

## Hickman's cinquefoil

*(Potentilla hickmanii)*

CA - Endangered (1979)
FED - Candidate 1

General Habitats: • Coastal Bluff Scrub
• Closed-cone Conifer Forest

Hickman's cinquefoil is an herbaceous, slender-stemmed perennial member of the rose family (Rosaceae), with leaves divided into many leaflets, and numerous yellow flowers. Historically, there were four occurrences of Hickman's cinquefoil, one in coastal San Mateo County, and three sites on the Monterey Peninsula. It was known from seepage areas and other wet sites in coastal prairies or open forested areas along the central coast.

Today, only one site is thought to be extant, in the Del Monte Forest of the Monterey Peninsula. This occurrence is owned by the Pebble Beach Foundation, which has fenced an area containing some of the plants. Much of the habitat was previously destroyed by fill to construct a baseball field. Suitable habitat should be searched for additional populations. Cooperation with the Pebble Beach Foundation is essential in management efforts. Only five plants were seen in 1991. This species appears to need moist conditions and so may recover after the current drought. Construction is proposed in the area and plants could be affected by changes in the drainage patterns due to the construction.

**The trend for Hickman's cinquefoil has been one of decline in recent years.**

## Hartweg's pseudobahia

*(Pseudobahia bahiifolia)*

CA - Endangered (1981)
FED - Candidate 2

General Habitat: • Valley and Foothiull Grassland

Hartweg's pseudobahia, also known as Hartweg's golden sunburst, is a member of the sunflower family (Asteraceae) with small heads of bright yellow flowers. It is a small, sometimes branched annual herb covered with white woolly hairs. Historically, Hartweg's pseudobahia was scattered but locally abundant in valley and foothill grasslands of the Central Valley. 1990 surveys revealed only sixteen remaining occurrences, and several of these were heavily damaged by cattle. The species is now restricted to the east

side of the San Joaquin Valley, in eastern Stanislaus County, and on the border of Madera and Fresno counties.

Most Hartweg's pseudobahia habitat is privately owned and is subject to agricultural conversion, intensive grazing, nonnative plant encroachment and levee construction. A portion of one population is protected under a conservation agreement between TNC and the U.S. Bureau of Reclamation. No other populations of this species receive formal protection.

**The overall trend for Hartweg's pseudobahia is one of stability to decline.**

## Tulare pseudobahia
*(Pseudobahia peirsonii )*

CA - Endangered (1987)
FED - Candidate 1

General Habitat: • Valley and Foothill Grassland

Tulare pseudobahia is a small, erect, yellow-flowered, woolly annual herb in the sunflower family (Asteraceae). It grows on the grassy valley floors and rolling foothills of the eastern San Joaquin Valley, in scattered pockets from northern Kern County to Tulare and Fresno counties. One population occurs on land administered by the U.S. Army Corps of Engineers, and another is located in a Caltrans easement. All other populations occur on private land.

Approximately one-third of the more than 20 historical Tulare pseudobahia sites have been extirpated by agricultural development. Existing populations are seriously threatened or damaged by agriculture, urbanization, overgrazing by cattle and sheep, competition from introduced weeds, and a flood control project in Fresno County. The Fresno Flood Control District is currently negotiating with DFG and landowners to purchase habitat as mitigation for reservoir construction. Several populations are also within the study corridor of a proposed Highway. A 1989 Tulare pseudobahia management plan recommends that preserves be established to protect one or more populations, and that studies be initiated to determine the environmental requirements of the species and evaluate the effects of livestock grazing and competition from exotic plants. Toward this end, a Population Status and Management Analysis was conducted for the species in 1991 using California Endangered Species Tax Check-off funds. One new site was discovered east of Clovis during the study. DFG is involved in negotiating mitigation for one population that may be destroyed by a housing development. In Tulare and Fresno counties, TNC is working with interested landowners to establish voluntary protection of plants on their properties.

**The trend for Tulare pseudobahia is one of decline.**

## Gambel's watercress
*(Rorippa gambelii)*

CA - Threatened (1990)
FED - Proposed Endangered (1991)
General Habitat: • Marshes and Swamps

Gambel's watercress is an herbaceous perennial in the mustard family (Brassicaceae). This species characteristically roots from the stem, which bears scattered compound leaves and dense clusters of white flowers. Gambel's watercress is found in freshwater or brackish marsh habitats at the margins of lakes and along slow-flowing streams. It grows in or just above the water level, and requires a permanent source of water. Historically, Gambel's watercress occurred in interior wetland areas of San Diego, San Bernardino, and Los Angeles counties, as well as coastal wetland areas of San Luis Obispo and Santa Barbara counties. A population from Mexico is thought to be extirpated. Of a dozen historical locations of Gambel's watercress in California, only three small populations in San Luis Obispo County remain. These populations support a total of about 700 plants.

The primary threat to Gambel's watercress today is loss of suitable wetland habitat. Two of the populations, in the Oso Flaco Lake area, are within DPR's Pismo Dunes State Vehicular Recreation Area. The Oso Flaco Lake occurrence is threatened by the encroachment of unsecured sand from adjacent dunes. These dunes have in the recent past been used heavily by off-road vehicles (ORVs); such use has resulted in the removal of much of the stabilizing native vegetation which secured the dune sand. This threat has been partially mitigated by restrictions placed on areas in which the ORVs may operate. Attempts to manually revegetate the adjacent dunes have not been successful. At Little Oso Flaco Lake, fluctuating water levels due to agricultural activities on adjacent farmland is a serious threat. In 1990, the Off Highway Vehicle Commission approved cooperative management of the Oso Flaco Lake Natural Area by DPR's Off Highway Motor Vehicle Recreation Division (OHMVRD) and TNC. In 1991, the California Coastal Commission decided to officially close the Oso Flaco Natural Area to equestrian traffic as of March, 1992.

The Black Lake Canyon Gambel's watercress occurrence is seriously threatened by encroachment of

eucalyptus trees and the proposed drilling of water wells up-canyon. The San Luis Obispo Land Conservancy recently purchased twelve acres in Black Lake Canyon which includes Gambel's watercress habitat. San Luis Obispo County also designated a portion of Black Lake Canyon as a Sensitive Resource Area, although the boundaries of such an area can be altered by amendment to the County General Plan. In 1990 a management strategy for this species was developed by DFG. A draft management plan is being developed by the San Luis Obispo Land Conservancy for all of Black Lake Canyon.

**The overall trend for Gambel's watercress is one of decline.**

## Tahoe yellow cress

*(Rorippa subumbellata)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Lower Montane Conifer Forest
• Meadows and Seeps

Tahoe yellow cress is a creeping herbaceous perennial with divided leaves and terminal, elongate inflorescences of yellow to white flowers. This member of the mustard family (Brassicaceae) grows on sandy deposits in riparian communities and along lakeshore margins. Today populations exist on the margins of Lake Tahoe in El Dorado and Placer counties, and in Nevada's Douglas and Washoe counties. Historically this plant occurred at Tallac Lake and near Truckee in Nevada County, but it is considered extirpated at those sites.

This species has declined in recent years from heavy recreational use of beaches, soil disturbance, private and commercial development and cattle grazing. In addition, artificial changes in the water level of Lake Tahoe have inundated shoreline habitat. Some populations of Tahoe yellow cress occur on privately-owned land, others are on National Forest and State Park lands in the Tahoe Basin. One population is at Placer County's Tahoe Park. Monitoring and protection activities, including fencing, have been initiated by these agencies. The USFS Lake Tahoe Basin Management Unit has developed an interim management guide for the species and has completed a third full year of monitoring of the planted populations. The overall condition of the enclosed, planted populations has declined, while the surrounding natural population has improved. Eight new occurrences were also discovered by the USFS in 1991. In 1989 the State Lands Commission initiated steps to develop a coordinated bi-state habitat conservation program for Tahoe yellow cress to address the cumulative impacts of development on its habitat. This program will identify high priority areas for protection and establish mechanisms to conserve the species' habitat through the shoreline development permitting process. The State Lands Commission is coordinating the program with the Tahoe Regional Planning Agency, the Department of Fish and Game, and other State, Federal and local agencies. A Memorandum of Understanding was initiated in 1989 between DFG and the Department of Parks and Recreation for establishment of a new Tahoe yellow cress population at D.L. Bliss State Park. Seeds from this and other populations are banked at Berry Botanic Garden, and staff there will perform germination tests on the seeds.

**These new programs should help arrest or reverse the declining trend of Tahoe yellow cress.**

## Small-leaved rose

*(Rosa minutifolia)*

CA - Endangered (1989)
FED - None

General Habitat: • Coastal Scrub

Small-leaved rose is a spiny shrub in the rose family (Rosaceae). It has slender gray shoots, small compound leaves, and showy rose-pink flowers. It grows in the coastal sage scrub plant community of southern California and Baja California. In the United States, this species is known from a single population, discovered in 1985 on Otay Mesa in southern San Diego County.

The existing California small-leaved rose occurrence occupies only 75 to 100 square yards, and is located close to an area of unauthorized off-road vehicle use. Impacts to the habitat from ORV activity have resulted in the complete removal of vegetation on two sides of the colony. This single remaining California occurrence is within an intense urban development zone of the City of San Diego. A major subdivision has been proposed for the site. Development on the coastal plain in Mexico is converting small-leaved rose habitat to farmland and housing developments.

**The overall trend for small-leaved rose is one of decline.**

## Adobe sanicle

*(Sanicula maritima)*

CA - Rare (1981)
FED - Candidate 2

General Habitat: • Meadows and Seeps
• Valley and Foothill Grassland

Adobe sanicle grows as a stout, aromatic, perennial herb with large basal leaves, smaller upper leaves, and yellow flowers in head-like clusters. This member of the carrot family (Apiaceae) can be found in wet to dry adobe clay soils of coastal prairie and coastal sage scrub plant communities. Its distribution is centered in the coastal hills of San Luis Obispo County with additional historical records from the San Francisco Bay Area.

Fewer than ten occurrences are still extant and all but one, located in Los Padres National Forest, are privately owned and unprotected. Adobe sanicle lacks a species management plan and would benefit from studies to determine its ecological requirements.

**More information is needed in order to assign a trend to adobe sanicle.**

## Rock sanicle

*(Sanicula saxatilis)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Broadleaved Upland Forest
• Chaparral

Rock sanicle is a low, stout, perennial herb in the carrot family (Apiaceae), with numerous dissected basal leaves and small pale yellow flowers borne in round stalked clusters. It can be found on rocky soil, rock outcrops, and talus slopes, usually within the chaparral plant community.

Fewer than ten occurrences of rock sanicle are known. In Contra Costa County, this species occurs on the main and north peaks in Mount Diablo State Park. In Santa Clara County, rock sanicle is known from the vicinity of Mount Hamilton, on privately owned land or on property of the University of California (Lick Observatory). In 1987 a new population was discovered at Henry Coe State Park in Santa Clara County.

**Although the overall trend for rock sanicle has been one of decline, several populations along trails at Mount Diablo appear stable and receive few impacts from hikers.**

## Gander's butterweed

*(Senecio ganderi)*

CA - Rare (1982)
FED - Candidate 2

General Habitat: • Chaparral

Gander's butterweed is a member of the sunflower family (Asteraceae). This basal-leaved perennial herb has compact yellow-orange flowerheads and leaves suffused with purple. It is usually found on recently burned sites or in the understory of mature mixed chaparral on gabbro soils. It grows in the foothills and mountains of San Diego County including Tecate, Lawson and Cuyamaca peaks, and McGinty and El Cajon mountains.

Fewer than a dozen occurrences of Gander's butterweed exist today. Some are in remote and undisturbed sites, and others occur in areas threatened by ORVs and horticultural collecting. Although this species thrives after fire, it has little tolerance for human disturbance of its habitat. Gander's butterweed does not grow on fire breaks or other cleared sites. Ownership of sites is divided between private landowners, Cleveland National Forest and Cuyamaca Rancho State Park. Management suggestions include protection of undisturbed chaparral, and occasional controlled burns for seedling establishment.

**The trend for Gander's butterweed is one of decline.**

## Layne's butterweed

*(Senecio layneae)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Chaparral
• Cismontane Woodland

Layne's butterweed is a perennial herb, with mostly basal leaves, reduced stem leaves, and flowers in quarter sized yellow heads. It is a member of the sunflower family (Asteraceae). Its habitat is the chaparral and oak woodlands on gabbro and serpentine derived soils in the vicinity of Pine Hill in western El Dorado County and the Red Hills of Tuolumne County. Associated species in El Dorado County include four other State-listed plants: Pine Hill flannelbush (*Fremontodendron decumbens*), El Dorado bedstraw (*Galium californicum* ssp. *sierrae*), Stebbins' morning glory (*Calystegia stebbinsii*), and Pine Hill ceanothus (Ceanothus roderckii).

Although more than thirty occurrences of Layne's butterweed are known, most are privately owned and subject to rapid residential and commercial development near Highway 50 in Cameron Park and Shingle Springs. A habitat conservation program is needed for the Pine Hill gabbro plants. DFG staff is working with El Dorado County planning staff to identify high priority areas that can be protected through the land use planning process. An extensive occurrence is protected at the Department of Fish and Game's Pine Hill Ecological Reserve. A management plan for the reserve has been written, and a prescribed burn monitoring program began in 1983. In 1990, El Dorado National Forest and The Nature Conservancy conducted surveys and completed monitoring prescriptions for this species in the Traverse Creek Botanical Area.

**The recent trend for Layne's butterweed is one of decline.**

## Owens Valley checkerbloom

*(Sidalcea covillei)*

CA - Endangered (1979)
FED - Candidate 2

General Habitat: • Meadows and Seeps

Owens Valley checkerbloom, a member of the mallow family (Malvaceae), is a several-stemmed, herbaceous perennial, with mostly lobed basal leaves and pinkish-lavender flowers in an elongated flower stalk. This species is endemic to moist alkaline meadows and freshwater seeps in Owens Valley, east of the Sierra Nevada, in Inyo County.

Most of the occurrences of Owens Valley checkerbloom are found on land owned by the Los Angeles Department of Water and Power; the others are owned by BLM, the Bureau of Indian Affairs, and private landowners. A major threat to this species is loss of suitably moist habitat in the Owens Valley. Habitat is lost through groundwater pumping and meadow draining, which lowers water tables. Drought tolerant species invade the once moist meadows and may be able to outcompete the checkerbloom. Also, Owens Valley has traditionally experienced heavy cattle grazing. Livestock grazing continues to threaten several of the checkerbloom occurrences. Management suggestions include studies of the effects of cattle grazing, reducing hydrologic alteration, and monitoring occurrence vigor. Although many new populations of this species have been discovered in the past ten years, consistent monitoring has not been undertaken.

**The trend for Owens Valley checkerbloom is probably one of stability.**

## Cuesta Pass checkerbloom

*(Sidalcea hickmanii* **ssp.** *anomala)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Closed-cone Conifer Forest

Cuesta Pass checkerbloom is a perennial herb in the mallow family (Malvaceae) distinguished by its covering of grayish star-shaped hairs, rounded basal leaves and deeply lobed stem leaves, and pinkish-lavender flowers above broad bracts. It grows in open sites on serpentine rock and soils at the edge of a Sargent cypress forest. It is restricted to a small area of San Luis Obispo County.

There are only three known occurrence records of Cuesta Pass checkerbloom, located on Cuesta Ridge in the Los Padres National Forest. Two of the these are within the Cuesta Ridge Botanical Area, and the third is close by. The Botanical Area was established primarily because of the unique stand of Sargent cypress, but the area supports eight more rare plant species. No specific management strategies have been initiated for any of these rare species. There are no immediate threats to this plant, although it should be monitored regularly due to its extremely restricted habitat and distribution. Additional biological information is needed before a management plan can be written for this plant.

**The overall trend for Cuesta Pass checkerbloom is one of stability.**

## Parish's checkerbloom

*(Sidalcea hickmanii* **ssp.** *parishii)*

CA - Rare (1979)
FED - Candidate 2

General Habitat: • Chaparral
• Lower Montane Conifer Forest

Parish's checkerbloom is a woody root-crowned perennial covered with coarse, gray hairs. This member of the mallow family (Malvaceae) has rounded leaves with scalloped edges and elongated inflorescences of pinkish-lavender flowers. It grows in burned or cleared areas on dry, rocky slopes of both scrub oak and yellow pine forest communities in the San Bernardino Mountains, San Bernardino County, and in several ranges of Santa Barbara County. Most sites are on land owned by the USFS.

Although nearly 20 occurrences of Parish's checkerbloom are known, only a few have been seen recently. Fire suppression may threaten this species because it is an early successional plant requiring openings for establishment.

Controlled burns and chaparral removal may be effective for habitat enhancement. Surveys should be conducted to determine the current status of historical occurrences.

**The overall trend for this Parish's checkerbloom is one of decline, possibly due to fire suppression.**

## Kenwood Marsh checkerbloom

*(Sidalcea oregana* **ssp.** *valida)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Marshes and Swamps

Kenwood Marsh checkerbloom, a member of the mallow family (Malvaceae), is a many-stemmed perennial herb with deeply lobed stem leaves and dense, spike-like inflorescences of pink to mauve flowers. Only two occurrences of this California endemic are known, one in Kenwood Marsh and the other in Knights Valley, both in Sonoma County.

Both sites are located on private land and have been adversely affected by nearby housing development, cattle grazing, and agricultural practices, resulting in alteration of local hydrology and elimination of habitat. In 1988, field surveys were conducted for both known occurrences of Kenwood Marsh checkerbloom. There are no management agreements with the private landowners. Conservation easements or acquisition of habitat will be necessary to prevent further impacts and alteration of the marsh environment.

**The overall trend for Kenwood Marsh checkerbloom is one of decline due to development and habitat destruction.**

## Bird-footed checkerbloom

*(Sidalcea pedata)*

CA - Endangered (1982)
FED - Endangered (1984)

General Habitat: • Meadows and Seeps
• Pebble Plain

Bird-footed checkerbloom is a many-stemmed, slender, pinkish-rose flowered perennial in the mallow family (Malvaceae). This species is restricted to moist pebble plain meadows and sparsely vegetated drier meadows in Big Bear Valley, San Bernardino County. A large number of endemic species occur in the area, including the State and Federally- endangered slender-petaled thelypodium (*Thelypodium stenopetalum*). Most occurrences are privately owned, although some of these are voluntarily protected through TNC's Registry of Natural Areas. The other occurrences are on property owned by the City of Big Bear, USFS and DFG.

Bird-footed checkerbloom was probably more widespread in the region before the construction of a dam in the 1890s that flooded much of bird-footed checkerbloom's meadow habitat and created Big Bear Lake. Two-thirds of the sixteen recorded sites for this plant have been extirpated or are damaged and declining. The chief threats are residential development near Big Bear and Baldwin lakes, horse grazing, and alteration of water flow into the meadows. In 1988, transplantation as mitigation for habitat lost to development was conducted, and monitoring in 1990 indicated partial success. DFG, in conjunction with The Nature Conservancy, acquired habitat at Baldwin Lake for an Ecological Reserve that protects bird-footed checkerbloom and other rare, endemic plant species. The Wildlife Conservation Board, in 1990, approved acquisition of a parcel adjacent to the existing reserve. The acquisition is significant because it will protect the entire watershed for the pebble plains and wet meadow community. California Endangered Species Tax Check-off funds were used to prepare a management plan for this reserve, and a Federal Section 6 grant-in-aid and Tax Check-off funds are being used to implement some of the management recommendations. In 1991 the County of San Bernardino District Attorney sued a private individual who allegedly scraped an acre of his land and killed as many as two hundred checkerblooms.

**The trend for bird-footed checkerbloom is one of rapid decline.**

## Scadden Flat checkerbloom

*(Sidalcea stipularis)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Marshes and Swamps

Scadden Flat checkerbloom is a perennial herb in the mallow family (Malvaceae). It grows from elongated rhizomes, has basal leaves without lobes, and mauve flowers in densely branched inflorescences. This taxon was described as a distinct species in 1974. It grows in a wet montane marsh habitat fed by local springs, which also supports many plants normally found at higher elevations.

Scadden Flat checkerbloom is known from only two occurrences in the vicinity of Grass Valley, Nevada County. Any change in the local hydrological regime of the marshes that support populations would adversely affect plants. Introduced weedy plants compete with native marsh plants, and an increase in cattail populations may become a threat. CalTrans owns approximately half of one population, and modified the realignment plans for Highway 20 to avoid impacts to it. The private owners of this occurrence have voluntarily agreed to protect the habitat on their property through The Nature Conservancy's Register of Natural Areas. The second population, of less than ten individuals, was discovered in 1990 on private land during a survey for another road widening project. Caltrans is aware of this population and negotiated with DFG in 1991 to avoid impacts to Scadden Flat checkerbloom.

**The overall trend for Scadden Flat checkerbloom is one of decline to stability since one population is part of TNC's monitoring program.**

## Red Mountain catchfly

*(Silene campanulata* **ssp.** *campanulata)*

CA - Endangered (1982)
FED - Candidate 1

General Habitat: • Lower Montane Conifer Forest

Red Mountain catchfly, a member of the pink family (Caryophyllaceae), is a short, much-branched perennial herb with long narrow leaves, short glandular hairs, and cream to greenish or pink flowers. It occurs on rocky, dry serpentine soils within lower montane coniferous forest and montane chaparral communities on Red Mountain and Little Red Mountain in Mendocino County. Among its associates in Mendocino County is McDonald's rock cress (*Arabis macdonaldiana*), which is State and Federally-listed as endangered. A population of Red Mountain catchfly was discovered on serpentine soils in the vicinity of Cook Springs, Colusa County, in 1989.

There are less than ten occurrences of Red Mountain catchfly. It occurs on private land in Colusa County, and on mining company land, public land administered by BLM, and on DFG's Little Red Mountain Ecological Reserve in Mendocino County. Although there are no active mining claims in the Red Mountain area, all of the occurrences owned privately and by BLM are subject to mineral extraction by strip mining operations for nickel and chromium. Red Mountain has been designated an Area of Critical Environmental Concern by BLM, but this does not protect plants from existing mining claims.

**The general trend for Red Mountain catchfly is one of stability, but because mining claims exist over much of its restricted habitat, this species continues to warrant listing as endangered.**

## Tiburon jewelflower

*(Streptanthus niger)*

CA - Endangered (1990)
FED - Candidate 1

General Habitat: • Valley and Foothill Grassland

Tiburon jewelflower is a slender annual herb in the mustard family (Brassicaceae). The purplish-black flowers, which appear at the end of May, zig-zag along the branches. The long, narrow seed pods open in late June, releasing dormant seed. Seedlings appear in March and April. This species grows on shallow, rocky soils derived from serpentine rock on south to west-facing slopes within a native bunchgrass plant community.

Tiburon jewelflower is known from only two occurrences. Its entire range occupies less than one third of a square mile on the Tiburon Peninsula in Marin County. Combined, the two occurrences contain approximately 12 acres of habitat. It is likely that this species was once more widespread, and has declined as a result of urbanization. Populations at each existing site have fluctuated between lows of less than 50 individuals to highs of 1000 to 1500 individuals. Both occurrences have multiple landowners. A small portion of one occurrence is protected by the Tiburon Landmark Society, and part of the other occurrence is on designated open space owned by the Town of Tiburon. However, the majority of each occurrence is unprotected. In the immediate future, urbanization may eliminate 45% to 55% of the species' habitat. In addition, this species is at risk of extirpation by a random or chance event such as drought, disease outbreak, or fire. In 1990 a management strategy for Tiburon jewelflower was developed by DFG.

**The overall trend for Tiburon jewelflower is one of decline.**

## Eureka Valley dune grass

*(Swallenia alexandrae)*

CA - Rare (1981)
FED - Endangered (1978)

General Habitat: • Desert Dunes

Eureka Valley dune grass is a stiff, branched, perennial member of the grass family (Poaceae). This species grows from a long, branched, scaly rhizome which spreads through the sandy substrate. Eureka Valley dune grass is confined to a few occurrences on the active desert dunes of Eureka Valley, Inyo County.

The Bureau of Land Management, which owns and manages the habitat for Eureka Valley dune grass, closed the Eureka Valley Dunes to off-road vehicle use in 1979 to protect the dune grass and its associated species. Since the closure, the dunes have recovered dramatically. However, illegal entry by ORVs is still a threat to dune vegetation. Recent research, done under contract to DFG using Federal endangered species funds, revealed that although seed production in Eureka Valley dune grass is low and variable, seeds and plants are long-lived.

**The trend for Eureka Valley dune grass is one of stability.**

## Slender-petaled thelypodium

*(Thelypodium stenopetalum)*

CA - Endangered (1982)
FED - Endangered (1984)

General Habitat: • Meadows and Seeps

Slender-petaled thelypodium, a member of the mustard family (Brassicaceae), is a much-branched biennial herb with an open flower stalk of purple-white flowers. This native mustard is endemic to Big Bear Valley in San Bernardino County and grows in seasonally moist alkaline clay soils associated with seeps and springs in the pebble plains. A large number of endemic species occur in the area including the State and Federally endangered bird-footed checkerbloom (*Sidalcea pedata*).

There are about a dozen known occurrences of slender-petaled thelypodium; at least a third of these are declining or have been extirpated. The major threats to this species include urban and recreational development, grazing, off-road vehicles, and alteration of local drainage patterns. Occurrences are owned privately, by the USFS, and DFG. The Nature Conservancy and DFG cooperated to acquire habitat at Baldwin Lake for an Ecological Reserve to protect rare, endemic plant species, including slender-petalled thelypodium. The Wildlife Conservation Board, in 1990, approved the acquisition of an additional parcel adjacent to the existing reserve. This acquisition is significant in that the whole watershed for this pebble plains and wet meadow community will be protected. California Endangered Species Tax Check-off funds were used to prepare a management plan for this reserve, and a Federal Section 6 grant-in-aid and Tax Check-off funds are being used to implement some of the management recommendations. California Endangered Species Tax Check-off funds will also be used for further field studies, isozyme analysis to determine genetic composition within and between local populations, and for development of a plan for habitat enhancement and experimental introductions in unoccupied, suitable habitat. In 1991 San Bernardino National Forest completed an administrative study plan for this species that will be implemented in 1992.

**The overall trend for slender-petaled thelypodium is one of decline.**

## Santa Ynez false-lupine

*(Thermopsis macrophylla* **var.** *agnina)*

CA - Rare (1981)
FED - Candidate 2

General Habitat: • Chaparral

Santa Ynez false-lupine is a stout herbaceous perennial with woolly stems and leaves and spikes of yellow flowers. It reaches a height of about 1.8 meters. This member of the pea family (Fabaceae) occurs in the San Ynez Mountains of Santa Barbara County. It can be seen growing in disturbed sites and openings in the chaparral and it germinates well after fire. The occurrences are entirely within Los Padres National Forest.

There are fewer than a dozen known occurrences for the Santa Ynez false-lupine; only five have been seen since 1960. This species may suffer from the effects of fire suppression policies. Knowledge about population trends and fire ecology is needed for proper management and protection. Although recognized as a sensitive species, Santa Ynez false-lupine lacks active management programs. Los Padres National Forest is developing a management guide for the species. A change in listed status to threatened may be appropriate for this species.

**The trend for Santa Ynez false-lupine is difficult to assess, but seems to be one of decline.**

## Pacific Grove clover

*(Trifolium polyodon)*

CA - Rare (1979)
FED - Candidate 1

General Habitat: • Closed-cone Conifer Forest
• Meadows and Seeps

Pacific Grove clover is a low annual herb in the pea family (Fabaceae). This small clover has muted purple flowers with lighter tips and occurs in moist grassy openings in the closed cone pine forest near Pacific Grove on the Monterey Peninsula, Monterey County. All of the habitat for Pacific Grove clover is in private ownership without permanent protection or preservation measures.

Only three occurrences of Pacific Grove clover were ever known and one was destroyed by golf course construction. One occurrence near a road is subject to impacts from foot traffic and road maintenance activities. A second occurrence is near a recreation area and is partially disturbed. This species has always been rare, and its present condition warrants a change to endangered status. Cooperative efforts with the landowner (the Pebble Beach Foundation) are needed to preserve this species.

**The overall trend for Pacific Grove clover is one of decline.**

## Monterey clover

*(Trifolium trichocalyx)*

CA - Endangered (1979)
FED - Candidate 1

General Habitat: • Closed-cone Conifer Forest

Monterey clover is a small, low-growing, branched, herbaceous annual with wedge-shaped leaflets and small, pale purple flowers. This member of the pea family (Fabaceae) has an extremely limited distribution. It is confined to a small portion of the Monterey Peninsula in the pygmy cypress plant community. Nutrient-poor ancient podzol-like soils in this habitat are poorly drained and underlain with hardpan.

Pressures from urbanization have reduced Monterey clover's numbers and eliminated much of its potential habitat. There are only four occurrences remaining, one of which was discovered in 1988 in a recent burn area. This large population and one other small one are the only two which have been seen in recent years. Both are owned by the Pebble Beach Company and are threatened by development. One of the occurrences is found within the Morse Botanical Preserve, but this population consists of only a few plants. Measures are being pursued to include the other occurrence as part of the Preserve also. This plant appears to be a fire-follower, but more surveys and biological research are needed to determine fire's role in its distribution and ecology.

**The overall trend for Monterey clover is one of decline due to urbanization.**

## Greene's Orcutt grass

*(Tuctoria greenei)*

CA - Rare (1979)
FED - Candidate 1

General Habitat: • Vernal Pools
• Valley and Foothill Grassland

Greene's Orcutt grass is a pale green, hairy, tufted annual grass. This unusual member of the grass family (Poaceae) grows in the dried bottoms of vernal pools in open grasslands of the Central Valley. It is currently found in Butte, Merced, Tehama and Shasta counties, and is believed to be extirpated from Fresno, Madera, San Joaquin, Stanislaus, and Tulare counties. Associated species in some locations include the State-listed hairy Orcutt grass (*Orcuttia pilosa*) and slender Orcutt grass (*O. tenuis*).

Over half of the nearly forty known Greene's Orcutt grass occurrences have been extirpated by conversion of habitat to irrigated agriculture or by intensive cattle grazing. Greene's Orcutt grass continues to be threatened by destruction of vernal pools for agriculture and residential development in the Central Valley. In 1989, the USFWS released a status survey on the Central Valley Orcuttieae, including Greene's Orcutt grass. This study indicated that only 5 of the extant occurrences are considered stable. Most of the occurrences are privately owned, and none of the vernal pool habitat in the San Joaquin Valley is currently protected. In the Sacramento Valley, The Nature Conservancy manages several occurrences at Vina Plains Preserve in Tehama County. According to TNC's 1990 Element Monitoring Report, of the ten vernal pools surveyed on the Preserve, Greene's Orcutt grass was present in only three. In addition, these populations are threatened by cocklebur, an invasive annual grass. Greene's Orcutt grass was reported in 1991 for the first time in Shasta County, near Lassen National Forest. This population is at a significantly higher elevation than the other occurrences in the Central Valley.

**The general trend for Greene's Orcutt grass is one of decline as a result of habitat alteration and destruction.**

## Crampton's tuctoria

*(Tuctoria mucronata)*

CA - Endangered (1979)
FED - Endangered (1978)

General Habitat: • Vernal Pools

Crampton's tuctoria, a member of the grass family (Poaceae), is a sticky, aromatic annual grass, with a dense spike of overlapping flower spikelets that emerge from the

upper leaves. It grows in the clay bottoms of drying vernal pools and lakes of Central Valley grasslands. This grass is found in only two locations several miles south of Dixon in Solano County.

Crampton's tuctoria probably had a wider distribution in the past in annually flooded depressions on the west side of the Sacramento Valley. Most of these depressions were converted to agriculture before the species was discovered, and there is little suitable habitat remaining. Threats to the two known occurrences include alternation of local drainage patterns which feed the pools, off-road vehicle recreation, local farming operations, and trampling by livestock. Roads and transmission corridors have also degraded the habitat. Most Crampton's tuctoria habitat is privately owned. The Nature Conservancy owns and protects a portion of the habitat at the Jepson Prairie Preserve. The plant has not been seen during annual monitoring efforts at the Preserve since 1987, perhaps because of drought conditions. In 1991, California Endangered Species Tax Check-off funds were used to repair fences and post informative signs at the Preserve. The USFWS has prepared a recovery plan for Crampton's tuctoria which provides management recommendations.

**The trend for Crampton's tuctoria is one of decline.**

## Big-leaved crown-beard

*(Verbesina dissita)*

CA - Threatened (1990)
FED - None

General Habitat:
- Coastal Scrub
- Chaparral

Big-leaved crown-beard is a semi-woody perennial shrub in the sunflower family (Asteraceae). It grows up to 3 feet (1 meter) tall and bears terminal clusters of bright yellow flowers. This species occurs primarily on steep, rocky, north-facing slopes within 1.5 miles of the ocean, in a maritime chaparral plant community. The densest populations are found on shaded slopes under a layer of shrubs. Native occurrences of big-leaved crown-beard are in two widely disjunct areas. In the United States, this species is restricted to a few canyons in southern Laguna Beach, Orange County. It also occurs in Baja California, about 90 miles south of San Diego. Baja populations receive impacts from slash and burn practices, and resort and residential development.

In California, only two big-leaved crown-beard sites occur. They are located two miles from each other and cover about 20-25 acres. The primary threat to the continued survival of big-leaved crown-beard is destruction and modification of its habitat for development. In California, small scale residential development continues to destroy and fractionalize suitable habitat. Other threats are grading, fire break maintenance, and fuel modification zones.

**The overall trend for big-leaved crown-beard is one of decline.**

# APPENDICES

DPG photo

# APPENDIX A

## Numbers of Plants and Animals Listed by the California Fish and Game Commission as Rare, Threatened and Endangered (Sections 670.2 and 670.5, Title 14, CCR ).*

| | Rare | Threatened | Endangered | TOTAL |
|---|---|---|---|---|
| Mammals | -- | 10 | 6 | 16 |
| Birds | -- | 5 | 17 | 22 |
| Reptiles | -- | 5 | 3 | 8 |
| Amphibians | -- | 6 | 2 | 8 |
| Fish | -- | 2 | 13 | 15 |
| Crustaceans | -- | -- | 2 | 2 |
| Gastropods | -- | 1 | -- | 1 |
| Plants | 68 | 18 | 124 | 210 |
| TOTAL | 68 | 47 | 167 | 282 |

*Refer to the lists of rare, threatened, and endangered plants and animals, which are updated periodically as changes are made, for the most current information. These lists are available from the Natural Heritage Division, 1416 Ninth Street, Sacramento, California 95814.

# APPENDIX B

## Federally Listed Plants and Animals of California not Listed by the California Fish and Game Commission

### MAMMALS

- Point Arena mountain beaver: Endangered
- Gray whale: Endangered
- Humpback whale: Endangered
- Sei whale: Endangered
- Right whale: Endangered
- Finback whale: Endangered
- Sperm whale: Endangered
- Blue whale: Endangered
- Southern sea otter: Threatened
- Northern (Steller) sea lion: Threatened

### BIRDS

- Aleutian Canada goose: Threatened
- Northern spotted owl: Threatened
- San Clemente loggerhead shrike: Endangered
- San Clemente sage sparrow: Threatened

### REPTILES

- Leatherback sea turtle: Endangered
- Green sea turtle: Threatened
- Loggerhead sea turtle: Threatened
- Olive Ridley sea turtle: Threatened
- Island night lizard: Threatened

### FISHES

- Little Kern golden trout: Threatened
- Lahontan cutthroat trout: Threatened
- Paiute cutthroat trout: Threatened

### INSECTS

- Oregon silverspot butterfly: Threatened
- Bay checkerspot butterfly: Threatened
- Mission blue butterfly: Endangered
- Lotis blue butterfly: Endangered

- Palos Verdes blue butterfly: Endangered
- El Segundo blue butterfly: Endangered
- Smith's blue butterfly: Endangered
- San Bruno elfin butterfly: Endangered
- Lange's metalmark butterfly: Endangered
- Kern primrose sphinx moth: Threatened
- Delta green ground beetle: Threatened
- Valley elderberry longhorn beetle: Threatened

# PLANTS

- San Benito evening primrose *(Camissonia benitensis):* Threatened
- Spring-loving centaury (Centaurium *namophilum):* Threatened
- Ash Meadows gumplant (Grindelia *fraxino-pratensis*): Threatened
- Kern mallow *(Eremaiche kernensis*): Endangered
- Hoover's woolly-star *(Eriastrum hooveri*): Threatened
- San Joaquin woolly-threads *(Lembertia congdonii):* Endangered

# APPENDIX C

## Glossary of Abbreviations and Technical Terms

| | |
|---|---|
| **Annual** | A plant which completes its life-cycle in a single season |
| **Bight** | Contiguous body of water |
| **BLM** | U.S. Bureau of Land Management |
| **Bulb** | An underground leaf-bud with thickened scales or coats like an onion* |
| **CalTrans** | California Department of Transportation |
| **Carapace** | A long bony hard protective outer covering |
| **Caudal peduncle** | Posterior stalk or stalklike part |
| **CCC** | California Conservation Corps |
| **CDF** | California Department of Forestry and Fire Protection |
| **Corm** | A short, bulblike, underground stem, as the "bulb" of gladiolus* |
| **Critical Habitat** | Habitat essential to the survival of a species. Critical Habitat is officially designated by the USFWS for some species. |
| **DFG** | California Department of Fish and Game |
| **Dioecious** | Having male and female flowers on different plants* |
| **Diurnal** | Active during the day |
| **Dorsal** | Pertaining to the upper surface or back of the body |
| **DPR** | California Department of Parks and Recreation |
| **Ecotones** | Transition zone between two communities |
| **Edaphic** | Pertaining to or influenced by soil |
| **EPP** | Endangered Plant Program, DFG |
| **Estivation** | To spend the summer dormant or inactive |
| **Extirpation** | Destroy or remove from a location |
| **Facultative biennial** | A plant which lives two years in favorable climates |

| | |
|---|---|
| **Fecundity** | Fertility |
| **Federal candidate 1** | Taxa for which USFWS has substantial information on species vulnerability and threats to propose listing |
| **Federal candidate 2** | Taxa for which there is evidence of vulnerability, but not enough data to support a proposal for listing |
| **Federal candidate 3** | Taxa which were once considered for listing, but are no longer because they are extinct, they do not meet the Act's definition of "species" or they have been proven to be more abundant or widespread or not threatened as was formerly believed. |
| **Federal proposed listing** | Taxa which have advanced from candidate status to actual proposal for listing |
| **Fossorial** | Adapted to digging* |
| **FGC** | California Fish and Game Commission |
| **FWS** | U.S. Fish and Wildlife Service |
| **Gabbroic** | Pertaining to basic igneous rock low in silica and high in magnesium iron silicates |
| **Gorse** | Exotic spiny shrubs of the genus *Ulex* |
| **Gular** | Located on the throat |
| **HCP** | See definition for Section 10 |
| **Hibernate** | To spend the winter dormant or inactive |
| **Hydrophitic** | Plants that grow only in water or saturated soil |
| **Inflorescence** | The flower-cluster of a plant* |
| **Kaolinitic** | Aluminium silicate clay |
| **Microphyllous** | Pertaining to microscopic or small leaved plants |
| **Metavolcanic** | Volcanic rock metamorphosed by heat and/or pressure |
| **Monocarpic** | A plant that produces one fruit per flower |
| **Monotypic** | A genus with only one species |
| **MOU** | Memorandum of Understanding, a document of cooperation between two parties |
| **Nocturnal** | Active during the night |
| **NPS** | U.S. National Park Service |
| **Olivaceous** | Olive green in color |

| | |
|---|---|
| **ORV (or OHV)** | Off-road vehicle or off-highway vehicle |
| **Papillae** | Small, cone-shaped projection or protuberance |
| **Perennial** | A plant which grows for more than one season, overwinters in a dormant condition and resumes growth the following season |
| **Plastron** | Under side of a turtle or tortoise shell |
| **Recovery Plan** | A USFWS document which sets forth a plan to recover a Federally listed species |
| **Recovery Team** | A group of experts convened by the USFWS to recover Federally listed species |
| **Regions 1, 2, 3, 4, 5** | DFG geographic administrational boundaries, see Appendix F |
| **Rhizome** | An underground stem or rootstock with scales at the nodes which produces leafy shoots on the upper side and roots the lower side* |
| **Section 6** | An element of the Federal Endangered Species Act providing for coordination with states and grant-in-aid funding for species recovery programs. |
| **Section 7** | A provision of the Federal Endangered Species Act requiring Federal agencies to consult with the USFWS when their involvement might affect a Federally listed species. |
| **Section 10(a)/ Habitat Conservation Plan (HCP)** | A provision for incidental taking of Federally listed species during the undertaking of otherwise lawful activities. However, incidental take is only permitted if the applicant has submitted an acceptable plan (HCP) for the species' habitat conservation, enhancement and protection |
| **Seral** | Succession of communities in a particular area from outset through to the climax community |
| **Species of Special Concern** | DFG-generated lists of species and subspecies that are declining or are vulnerable to extirpation and may be considered for listing or for special management and protection measures. |
| **SWRCB** | State Water Resources Control Board |
| **Sympatric** | Occupying the same range |
| **Tax Check-off of Fish & Game** | A voluntary contribution on the State personal income tax form. Contributions are administered through the Department's California Endangered Species Tax Check-off Progam. |
| **Taxon (taxa, pl)** | A taxonomic category, such as order or genus |
| **TNC** | The Nature Conservancy (a private land conservation organization) |
| **Type locality** | The locality from which the first specimens describing the taxa came. |
| **Umbel** | A flat or convex flower-cluster in which the flower stems arise from a common point, like rays from an umbrella* |
| **USFWS** | U.S. Fish and Wildlife Service, federal agency responsible for non-marine threatened and endangered species |
| **Ventral** | Pertaining to the lower surface of the body |
| **WCB** | Wildlife Conservation Board |

* After definitions in a CALIFORNIA FLORA AND SUPPLEMENT by Munz and Keck

# APPENDIX D

## Plant and Animal Species for Which Five-year Reviews Have Been Completed*

### MAMMALS

| | |
|---|---|
| Mohave ground squirrel | 1987 |
| San Joaquin antelope squirrel | 1987 |
| Morro Bay kangaroo rat | 1990 |
| Giant kangaroo rat | 1988 |
| Stephens' kangaroo rat | 1987 |
| Fresno kangaroo rat | 1990 |
| Amargosa vole | 1989 |
| Sierra Nevada red fox | 1987 |
| Island fox | 1987 |
| Wolverine | 1987 |
| California bighorn sheep | 1987 |
| Peninsular bighorn sheep | |

### BIRDS

| | |
|---|---|
| California brown pelican | 1990 |
| Bald eagle | 1988 |
| Swainson's hawk | 1988 |
| Peregrine falcon | 1989 |
| California black rail | 1987 |
| Greater sandhill crane | 1988 |
| Western yellow-billed cuckoo | 1987 |
| Elf owl | 1987 |
| Great gray owl | 1987 |
| Inyo brown towhee | 1987 |
| Belding's savannah sparrow | |

### REPTILES

| | |
|---|---|
| Barefoot banded gecko | 1987 |
| Coachella Valley fringe-toed lizard | 1990 |
| Blunt-nosed leopard lizard | 1990 |
| Southern rubber boa | 1987 |
| Alameda whipsnake | 1987 |
| San Francisco garter snake | 1990 |
| Giant garter snake | 1987 |

# AMPHIBIANS

| | |
|---|---|
| Santa Cruz long-toed salamander | 1990 |
| Siskiyou mountain salamander | 1987 |
| Desert slender salamander | 1990 |
| Kern Canyon slender salamander | 1987 |
| Tehachapi slender salamander | 1987 |
| Limestone salamander | 1987 |
| Shasta salamander | 1987 |
| Black toad | 1987 |

# FISH

| | |
|---|---|
| Bull trout | 1987; Rev. 1988 |
| Mohave tui chub | 1990 |
| Owens tui chub | 1990 |
| Bonytail | 1990 |
| Colorado squawfish | 1990 |
| Lost River sucker | 1987 |
| Modoc sucker | 1990 |
| Shortnose sucker | 1987 |
| Razorback sucker | 1987 |
| Desert pupfish | 1990 |
| Cottonball Marsh pupfish | 1987 |
| Owens pupfish | 1990 |
| Tecopa pupfish (extinct) | 1987 |
| Unarmored threespine stickleback | 1990 |
| Rough sculpin | 1987 |

# INVERTEBRATES

| | |
|---|---|
| Trinity bristle snail | 1987 |
| California freshwater shrimp | 1987 |
| Shasta crayfish | 1987 |

# PLANTS

| | |
|---|---|
| *Acanthomintha ilicifolia* (San Diego thornmint) | 1987 |
| *Acanthomintha obovata* ssp. *duttoni* | 1990 |
| *Amsinckia grandiflora* | 1990 |
| *Arabis macdonaldiana* (MacDonald's rock cress) | 1988 |
| *Arctostaphylos densiflora* (Vine Hill manzanita) | 1988 |
| *Arctostaphylos hookeri* ssp. *hearstionum* (Hearst's manzanita) | 1987 |
| *Arctostaphylos hooker* ssp. ravenii (Presidio manzanita) | 1989 |
| *Arctostaphylos imbricata* (San Bruno Mountain manzanita) | 1987 |
| *Arctostaphylos pacifica* (Pacific manzanita) | 1987 |
| *Arctostaphylos pallida* (Alameda manzanita) | 1987 |
| *Astragalus agnicidus* (Humboldt milk-vetch) | 1987 |
| *Astragalus lentiginosus* var. *sesquimetralis* (Sodaville milk-vetch) | 1987 |
| *Astragalus magdalenae* var. *peirsonii* (Peirson's milk-vetch) | 1987 |
| *Astragalus tener* var. *titi* (coastal dunes milk-vetch) | 1987 |

| | |
|---|---|
| *Atriplex tularensis* (Bakersfield saltbush) | Draft 1991 |
| *Brodiaea coronaria* ssp. *rosea* (Indian Valley brodiaea) | 1987 |
| *Brodiaea filifolia* (threadleaf brodiaea) | 1987 |
| *Brodiaea insignis* (Kaweah brodiaea) | 1987, Draft 1991 |
| *Brodiaea pallida* (Chinese Camp brodiaea) | 1987 |
| *Calochortus tiburonensis* (Tiburon mariposa-lily) | 1987 |
| *Calystegia stebbinsii* (El Dorado morning glory) | 1987 |
| *Carex albida* (white sedge) | 1987, Draft 1991 |
| *Castilleja grisea* (San Clemente Island Indian paintbrush) | 1988 |
| *Castilleja uliginosa* (Pitkin Marsh Indian paintbrush) | 1987 |
| *Cercocarpus traskiae* (Santa Catalina Island mahogany) | 1987 |
| *Chorizanthe orcuttiana* (Orcutt's spineflower) | 1987 |
| *Cirsium ciliolatum* (Ashland thistle) | 1987 |
| *Cirsium fontinale* var. *fontinale* (fountain thistle) | 1987 |
| *Clarkia franciscana* (Presidio clarkia) | 1987 |
| *Clarkia imbricata* (Merced farewell to spring) | 1987, Draft 1991 |
| *Clarkia springvillensis* (Springville clarkia) | 1988 |
| *Cordylanthus maritimus* ssp. *maritimus* (salt marsh bird's-beak) | Draft 1991 |
| *Cordylanthus palmatus* (Ferri's birds-beak) | 1987 |
| *Cordylanthus rigidus* ssp. *littoralis* (Seaside bird's-beak) | 1988 |
| *Delphinium kinkiense* (San Clemente Island larkspur) | 1987 |
| *Dichanthelium lanuginosum* var. *thermale* (geysers panicum) | 1987 |
| *Downingia concolor* var. *brevior* (Cuyamaca Lake downingia) | 1987 |
| *Dudleya brevifolia* (short-leaved live-forever) | 1987 |
| *Eriodictyon altissimum* (Indian Knob Mountain balm) | 1987 |
| *Eriogonum alpinum* (Trinity buckwheat) | 1987, Draft 1991 |
| *Eriogonum apricum* var. *apricum* (Ione buckwheat) | Draft 1991 |
| *Eriogonum apricum var. prostratum* (Irish hill buckwheat) | 1987 |
| Eriogonum *ericifolium* var. *thornei* (Thorne's buckwheat) | 1987 |
| *Eriogonum grande* ssp. *timorum* (San Nicolas Island buckwheat) | 1987 |
| *Eriogonum kelloggii* (Kellogg's buckwheat) | 1987 |
| *Eryngium aristulatum* var. *parishii* (San Diego coyote-thistle) | 1987 |
| *Eryngium racemosum* (Delta coyote-thistle) | 1988 |
| *Erysimum capitatum* var. *angustatum* (Contra Costa wallflower) | 1989 |
| *Erysimum menziesii* (Menzies' wallflower) | 1987 |
| *Erysimum teretifolium* (Santa Cruz wallflower) | 1987 |
| *Fritillaria roderickii* (Roderick's fritillary) | 1987 |
| *Galium catalinense* ssp. *acrispum* (San Clemente Is. bedstraw) | 1987 |
| *Gratiola heterosepala* (Boggs Lake hedge-hyssop) | 1987 |
| *Helianthus niveus* ssp. *tephrodes* (Algodones sunflower) | 1987 |
| *Hemizonia conjugens* (Otay tarplant) | 1987 |
| *Hemizonia mohavensis* (Mojave tarplant) | 1987 |
| *Hesperolinon didymocarpum* (Lake County dwarf-flax) | 1987 |
| *Holocarpha macradenia* (Santa Cruz tarplant) | 1987 |
| *Lasthenia burkei* (Burke's goldfields) | 1987 |
| *Lilium occidentale* (western lily) | 1987, Draft 1991 |
| *Lilium pitkinense* (Pitkin Marsh lily) | 1987 |
| *Limnanthes douglasii* var. *sulphurea* (Point Reyes meadowfoam) | 1987 |
| *Limnanthes floccosa* ssp. *californica* (Butte County meadowfoam) | 1987 |
| *Limnanthes gracilis* var. *parishii* (Parish's slender meadowfoam) | |

| | |
|---|---|
| *Limnanthes vinculans* (Sebastopol meadowfoam) | 1987 |
| *Lithophragma maximum* (San Clemente Island woodland star) | 1987 |
| *Lotus argophyllus* ssp. *adsurgens* (San Clemente Is. silver hosackia) | 1987 |
| *Lotus dendroideus* var. *traskiae* (San Clemente Island broom) | 1988 |
| *Lotus argophyllus* ssp. *niveus* (Santa Cruz Island silver hosackia) | 1987 |
| *Mahonia sonnei* | 1990 |
| *Mahonia pinnata* ssp. *insularis* (island barberry) | 1987 |
| *Malacothamnus fasciculatus* var. *nesioticus* (Santa Cruz Is. bush-mallow) | 1987 |
| *Monardella linoides* ssp. *viminea* (willowy monardella) | 1987 |
| *Navarretia plieantha* (many-flowered navarretia) | 1987 |
| *Neostapfia colusana* (Colusa grass) | 1987 |
| *Nitrophila mohanensis* | 1990 |
| *Nolina interrata* (Dehesa beargrass) | 1987 |
| *Oenothera deltoides* ssp. *howellii* (Antioch Dunes evening primrose) | 1988 |
| *Orcuttia californica* (California Orcutt grass) | 1987 |
| *Orcuttia inaequalis* (San Joaquin Valley Orcutt grass) | 1987 |
| *Orcuttia pilosa* (hairy Orcutt grass) | 1987 |
| *Orcuttia tenuis* (slender Orcutt grass) | 1987 |
| *Orcuttia viscida* (sticky Orcutt grass) | 1987 |
| *Orthocarpus campestris* var. *succulentus* (succulent owl's-clover) | 1987 |
| *Plagiobothrys diffusus* (San Francisco popcorn-flower) | 1987 |
| *Poa napensis* (Napa blue grass) | 1987 |
| *Pogogyne abramsii* (San Diego mesa mint) | 1988 |
| *Pogogyne clareana* (Santa Lucia mint) | 1987 |
| *Potentilla hickmanii* (Hickman's cinquefoil) | 1987 |
| *Pseudobahia bahiifolia* (Hartweg's pseudobahia) | 1987 |
| *Rorippa subumbellata* (Tahoe yellow cress) | 1987 |
| *Sidalcea covillei* (Owens Valley checkerbloom) | 1987 |
| *Sidalcea pedata* (bird-footed checkerbloom) | 1989 |
| *Sidalcea stipularis* (Scadden Flat checkerbloom) | 1987 |
| *Silene capanulata* ssp. *capanulata* (Red Mountain catchfly) | 1987 |
| *Thelypodium stenopetalum* (slender-petaled thelypodium) | 1989 |
| *Trifolilum trichocalyx* (Monterey clover) | 1987 |
| *Tuctoria mucronata* (Crampton's tuctoria) | 1988 |

*Copies can be obtained from the Natural Heritage Division, Department of Fish and Game, 1416 Ninth Street, Sacramento, California 95814.

# APPENDIX E

# General Habitat Descriptions[1]

## INTRODUCTION

"General Habitat" indicates one or more habitats in which a candidate rare, threatened, or endangered species is typically found. The types listed are very broad; each taxon occupies only a portion of the general type. This information was compiled from field survey forms, unpublished reports, original descriptions, floras, and wildlife references. Habitat information based upon field observations was given priority whenever possible. Habitat discussions for terrestrial communities and wetlands emphasize observable differences in vegetation which reflect underlying differences in the physical environment. Major drainages and types of features such as lakes and streams are used for aquatic habitats. Common English words and phrases have been used in both terrestrial and aquatic environments when standardized types did not adequately describe the general habitat of the taxon.

Please refer to R. F. Holland (1986)[2] for a more complete discussion of terrestrial types and their classification. Moyle and Ellison (in press)[3] classifies aquatic habitats. The numerical reference code used by the Natural Diverisity Data Base found in Holland (1986), follows each terrestrial habitat name.

## Coastal Dunes (21000)

Herbs or shrubs on coastal sand deposits from Del Norte to San Diego counties. Cover usually low near the beach, increasing with distance from salt spray and blowing sand.

## Desert Dunes (22000)

Sand accumulations east of the Pacific Crest from Modoc to Imperial counties. Vegetation on desert dunes varies considerably. Active dunes usually support only sparse herbs and grasses.

## Inland Dunes (23000)

Mostly herbs, although shrubs may be locally important. Sand accumulations in and around the Great Valley.

## Coastal Bluff Scrub (31000)

Dense shrubs, prostrate to 3-6.5 feet tall. Typically on fairly steep, rocky sites exposed to considerable wind and salt spray because of proximity to the ocean. Many plants are succulent, especially to the south. Found from Del Norte to San Diego counties.

## Coastal Scrub (32000)

Dense shrubs 1.5 - 6.5 feet tall with scattered grassy openings. Many plants dormant, even deciduous, during periods of water stress. Most sites have shallow rocky soils, frequently with a southern or western exposure. Many taxa adapted to fire by stump sprouting or high seed production.

## Sonoran Desert Scrub (33000)

Widely scattered creosote shrubs with the considerable space between them sometimes occupied by ephemeral, colorful shows of annuals following particularly wet winters. Succulents and microphyllous trees conspicuous, especially in rocky environments. Found roughly south of the San Bernardino-Riverside county line.

## Mojavean Desert Scrub (34000)

Widely scattered creosote shrubs with the considerable space between them sometimes occupied by ephemeral, colorful shows of annuals following particularly wet winters. At elevations of 2000' or higher, succulents or small-leaved trees lacking.

## Great Basin Scrub (35000)

Shrubs, ranging in height from very short, 8 inches, on very cold sites or shallow soils to 3 - 6.5 feet tall on warmer sites where soils are deeper. Perennial grasses occupy much of the space between shrubs. Found on the Modoc Plateau, high Cascade Range, Warner Mountains, High Sierra Nevada, and North Coast Ranges.

## Chenopod Scrub (36000)

Usually gray, intricately branched, small-leaved shrubs most commonly on fine-textured, alkaline and/or saline soils in areas of impeded drainage. Diversity usually low; saltbushes and greasewood frequently dominate. This vegetation occurs from Modoc County south to Mexico, including parts of the Great Valley and Inner South Coast Ranges.

## Chaparral (37000)

Impenetrably dense, evergreen, leathery-leaved shrubs that are active in winter, dormant in summer, and adapted to frequent fires either through resprouting or seed carry-over. Fire-following annuals and short-lived perennials characteristic. Mature stands may exceed 11 - 13 feet in height. It occurs on diverse substrates, many of which support distinctive suites of edaphic indicators. Chaparral may be successional to conifer forests or oak woodlands, as tree seedlings can be found beneath the shrub canopies.

## Coastal Prairie (41000)

Dense, fairly tall (3 feet) perennial sod- and tussock-forming grasses and grass-like herbs. They occur in two distinct settings: sandy marine terraces within the zone of coastal fog (usually 1000 feet elevation, within a matrix of Northern coastal scrub), or on fine-textured soils of ridgetops beyond coastal fogs (usually 2,500 feet, within a matrix of Mixed evergreen or North coastal conifer forests). Intermittent from the Santa Cruz area north to southern Oregon.

## Valley and Foothill Grassland (42000)

Introduced, annual Mediterranean grasses and native herbs. On most sites the native species, such as needle grass, have been largely or entirely supplanted by introductions. Stands rich in natives usually found on unusual substrates, such as serpentine or somewhat alkaline soils.

## Great Basin Grassland (43000)

Perennial sod-forming and bunch grasses. Presumed to have once been widespread on the Modoc Plateau and northeastern California.

## Vernal Pools (44000)

Amphibious environments dominated by annual herbs and grasses adapted to germination and early growth under water. Spring desiccation triggers flowering and fruit set, resulting in colorful concentric bands around the drying pools.

## Meadows and Seeps (45000)

More or less dense grasses, sedges, and herbs that thrive, at least seasonally, under moist or saturated conditions. They occur from sea level to forestline and on many different substrates. They may be surrounded by grasslands, forests, or shrublands.

## Playas (46000)

Non-vascular plants and sparse, gray shrubs on poorly drained soils with usually high salinity and/or alkalinity, due to evaporation of water from closed basins. Found from the Modoc Plateau to Sonoran Desert and in the San Joaquin Valley.

## Pebble or Pavement Plain (48000)

Herb- and grass-dominated openings of low cover, dominated by several cushion-forming plants endemic to dense, clay soils armored by a lag gravel of quartzite pebbles. Many of the dominant taxa are themselves rare plants, found in the San Bernardino Mountains.

## Bogs and Fens (51000)

Wetlands, typically occupying sites subirrigated by cold, frequently acidic, water. Plant growth dense and low growing, dominated by perennials herbs or low shrubs. Saturated soils frequently allow substantial accumulations of "peat." From the Klamath Ranges to North Coast Ranges, along the North Coast and in the northern Sierra Nevada.

## Marshes and Swamps (52000)

Emergent, somewhat woody herbs adapted to seasonally or permanently saturated soils. These include salt, brackish, alkali, and fresh water marshes, as well as swamps, with their woody dominants and hydrophytic herbs. Found throughout California.

## Riparian Forest (61000)

Broadleaved, winter deciduous trees, forming closed canopies, associated with low- to mid-elevation perennial and intermittent streams. Most stands even-aged, reflecting the flood-mediated, episodic reproduction. These habitats can be found in every county and climate in California.

## Riparian Woodland (62000)

Broadleaved, winter deciduous trees with open canopies associated with low- to mid-elevation streams. Most stands even-aged, reflecting the flood-controlled, episodic

reproduction. This type tends to occupy more intermittent streams, often with cobbly or bouldery bedloads.

## Riparian Scrub (63000)

Streamside thickets dominated by one or more willows, as well as by other fast-growing shrubs and vines. Most plants recolonize following flood disturbance.

## Cismontane Woodland (71000)

Trees deciduous, evergreen or both, with open canopies. Broadleaved trees dominate, although conifers may be present in or emergent through the canopy. Understories may be open and herbaceous or closed and shrubby. This type occurs on a variety of sites below the conifer forests in Mediterranean California.

## Pinon and Juniper Woodland (72000)

Open stands of round-topped conifers to 16 feet. Understories frequently comprised of shrubs and herbs seen in adjacent stands lacking trees. They often form broad ecotones between higher elevation forests and lower elevation scrublands or grasslands.

## Joshua Tree Woodland (73000)

Joshua trees with open canopies are usually the only treelike species present. Shrubstories typically diverse mixtures of small-leaved, evergreen shrubs, semideciduous shrubs, semisucculents, and succulents.

## Sonoran Thorn Woodland (75000)

Succulents, small-leaved herbs and shrubs, especially of rocky environments. Tree-like plants the visual dominant.

## Broadleaved Upland Forests (81000)

Stands of evergreen or deciduous, broadleaved trees 16 feet or more tall, forming closed canopies. Many, but not all, with very poorly developed understories. Several are seral to montane conifer forests. It includes the "mixed evergreen forest" of the Coast Ranges.

## North Coast Conifer Forests (82000)

Needle-leaved evergreen trees in usually quite dense stands that may attain impressive heights. Usually on well drained, moist sites within the reach of summer fogs, but not experiencing much winter snow. This type occurs in the wetter parts of the North Coast Ranges.

## Closed-cone Conifer Forest (83000)

Dense, even-aged stands dominated by conifers with cones which remain on the tree, closed until an environmental trigger, often fire, causes them to open. Most stands are even-aged due to establishment following fire. Usually associated with sterile, rocky soils, strong and steady winds, and impaired drainage. Many open stands have understories composed of chaparral or coastal scrub species from surrounding areas. Found in most areas, except for the Great Valley or deserts.

## Lower Montane Conifer Forest (84000)

Open to dense stands of conifers found at lower and middle elevations in the mountains. Broadleaved trees may be present in the understory. Shrubstories may be dense assemblages of chaparral species, especially in seral stands. The upper limit of lower montane coniferous forests more or less coincides with the elevation of maximum annual precipitation.

## Upper Montane Conifer Forest (85000)

Open to dense conifer forests, found at high elevations in the mountains. Trees tend to be somewhat shorter than at lower elevations. Shrubstories tend to be open, drawn from adjacent montane chaparral species, or lacking. Above the elevation of maximum precipitation, with growing seasons curtailed by winter snow accumulations.

## Subalpine Conifer Forest (86000)

Conifer forests and associated clearings of highest elevations of tree establishment. This type occurs in areas where substantial snowpack accumulation and cold temperatures limit the growing season to three months or less.

## Alpine Boulder and Rock Field (91000)

Fell-fields, talus slopes, and meadows found above forest line. Favorable sites may develop continuous turf, but in most areas plants are tucked between large nurse rocks that provide protection from harsh winter conditions.

## Alpine Dwarf Scrub (94000)

Compact, woody subshrubs above forest line, adapted to short growing seasons resulting from snow accumulation or harsh winter winds.

[1] Terrestrial section reprinted, following minor revision, with permission from Smith, J.P. and K. Berg (Eds.) 1988. *Inventory of Rare and Endangered Vascular Plants of California.* Special Publication No. 1 (4th Edition), California Native Plant Society, Sacramento, CA 95814

[2] Holland, R.F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California.* Natural Heritage Program, California Department of Fish and Game, Sacramento, California. 150 p.

[3] Moyle, P.B. and J.P. Ellison (in press). *A Classification System for California's Inland Waters.* California Fish and Game. California Department of Fish and Game, Sacramento, California. (To be published Spring, 1992).

# APPENDIX F

## Natural Communities

### TERRESTRIAL SECTION

#### 20000 DUNE COMMUNITY

**21000 Coastal Dunes**

- 21100 Active Coastal Dunes
- 21200 Foredunes
  - 21210 Northern Foredunes
    - 21211* Northern Foredune Grassland
  - 21230 Southern Foredunes
- 21300 Backdune scrub
  - 21310* Northern Dune Scrub
  - 21320* Central Dune Scrub
  - 21330* Southern Dune Scrub

**22000 Desert Dunes**

- 22100* Active Desert Dunes
- 22200* Stabilized and Partially-Stabilized Desert Dunes
- 22300* Stabilized and Partially-Stabilized Desert Sand Fields

**23000 Interior Dunes**

- 23100* Stabilized Interior Dunes
- 23200* Relictual Interior Dunes
- 23300* Monvero Residual Dunes

#### 30000 SCRUB AND CHAPARRAL

**31000 Coastal Bluff Scrub**

- 31100* Northern Coastal Bluff Scrub
- 31200* Southern Coastal Bluff Scrub

**32000 Coastal Scrub**

- 32100 Northern (Franciscan) Coastal Scrub
  - 32110 Northern Coyote Bush Scrub
  - 32120 Northern Salal Scrub
  - 32130 Northern Silk-tassel Scrub

Terrestrial Section based on Natural Community classification developed by Cheatham and Haller (1975) as modified by Glen Holstein, Deborah Jensen, and Robert Holland.

*Communities with highest inventory priorities

32200 Central (Lucian) Coastal Scrub
32300 Venturan Coastal Sage Scrub
32400* Maritime Succulent Scrub
32500* Diegan Coastal Sage Scrub
32600 Diablan Sage Scrub
32700* Riversidian Sage Scrub
32710* Riversidian Upland Sage Scrub
32720* Riversidian Alluvial Fan Sage Scrub
32730* Riversidian Desert Scrub

**33000 Sonoran Desert Scrub**
33100 Sonoran Creosote Bush Scrub
33200 Sonoran Desert Mixed Scrub
33210 Sonoran Mixed Woody Scrub
33220 Sonoran Mixed Woody and Succulent Scrub

**34000 Mojavean Desert Scrub**
34100 Mojave Creosote Bush Scrub
34200 Mojave Mixed Scrub and Steppe
34210 Mojave Mixed Woody Scrub
34220 Mojave Mixed Steppe
34230 Mojave Yucca Scrub and Steppe
34240 Mojave Mixed Woody and Succulent Scrub
34250 Mojave Wash Scrub
34300 Blackbush Scrub

**35000 Great Basin Scrub**
35100 Great Basin Mixed Scrub
35200 Sagebrush Scrub
35210 Big Sagebrush Scrub
35220 Subalpine Sagebrush Scrub
35300 Sagebrush Steppe
35400 Rabbitbrush Scrub
35410* Mono Pumice Flat

**36000 Chenopod Scrub**
36100 Desert Chenopod Scrub
36110 Desert Saltbush Scrub
36120 Desert Sink Scrub
36130 Desert Greasewood Scrub
36140 Shadscale Scrub

36200 Great Valley Chenopod Scrub
36210* Valley Sink Scrub
36220* Valley Saltbush Scrub
36300 Foothill Chenopod Scrub
36310* Sierra-Tehachapi Saltbush Scrub
36320* Interior Coast Range Saltbush Scrub

*Communities with highest inventory priorities

## 37000 Chaparral

- 37100 Upper Sonoran Mixed Chaparral
  - 37110 Northern Mixed Chaparral
    - 37111* Gabbroic Northern Mixed Chaparral
  - 37120 Southern Mixed Chaparral
    - 37121* Granitic Southern Mixed Chaparral
    - 37122* Mafic Southern Mixed Chaparral
- 37200 Chamise Chaparral (Chamisal)
- 37300 Red Shank Chaparral
- 37400 Semi-Desert Chaparral
- 37500 Montane Chaparral
  - 37510 Mixed Montane Chaparral
  - 37520 Montane Manzanita Chaparral
  - 37530 Montane Ceanothus Chaparral
    - 37531 Deer Brush Chaparral
    - 37532 Whitethorn Chaparral
    - 37533 Tobacco Brush Chaparral
  - 37540 Montane Scrub Oak Chaparral
    - 37541 Shin Oak Brush
    - 37542 Huckleberry Oak Chaparral
  - 37550 Bush Chinquapin Chaparral
- 37600 Serpentine Chaparral
  - 37610* Mixed Serpentine Chaparral
  - 37620* Leather Oak Chaparral
- 37700* Island Chaparral
- 37800 Upper Sonoran Ceanothus Chaparral
  - 37810 Buck Brush Chaparral
  - 37820 Blue Brush Chaparral
  - 37830 Ceanothus crassifolius Chaparral
  - 37840 Ceanothus megacarpus Chaparral
- 37900 Scrub Oak Chaparral
- 37A00 Interior Live Oak Chaparral
- 37B00 Upper Sonoran Manzanita Chaparral
- 37C00 Maritime Chaparral
  - 37C10* Northern Maritime Chaparral
  - 37C20* Central Maritime Chaparral
  - 37C30* Southern Maritime Chaparral
- 37D00* Ione Chaparral
- 37E00 Mesic North Slope Chaparral
  - 37E10 Northern North Slope Chaparral
  - 37E20 Southern North Slope Chaparral
- 37F00 Poison-Oak Chaparral
- 37G00 Coastal Sage-Chaparral Scrub
- 37H00 Alluvial Fan Chaparral
- 37J00 Flannel Bush Chaparral

*Communities with highest inventory priorities

**38000 Montane Dwarf Scrub**

**39000 Upper Sonoran Subshrub Scrub**

## 40000 GRASSLANDS, VERNAL POOLS, MEADOWS, AND OTHER HERB COMMUNITIES

**41000 Coastal Prairie**
- 41100* Coastal Terrace Prairie
- 41200* Bald Hills Prairie

**42000 Valley and Foothill Grassland**
- 42100 Native Grassland
  - 42110* Valley Needlegrass Grassland
  - 42120* Valley Sacaton Grassland
  - 42130* Serpentine Bunchgrass
  - 42140 Valley Wildrye Grassland
  - 42150* Pine Bluegrass Grassland
- 42200 Non-native Grassland
- 42300* Wildflower Field

**43000* Great Basin Grassland**

**44000 Vernal Pool**
- 44100 Northern Vernal Pool
  - 44110* Northern Hardpan Vernal Pool
  - 44120* Northern Claypan Vernal Pool
  - 44130* Northern Volcanic Vernal Pool
    - 44131* Northern Basalt Flow Vernal Pool
    - 44132* Northern Volcanic Mud Flow Vernal Pool
- 44300 Southern Vernal Pool
  - 44310* Southern Interior Basalt Flow Vernal Pool
  - 44320* San Diego Mesa Vernal Pool
    - 44321* San Diego Mesa Hardpan Vernal Pool
    - 44322* San Diego Mesa Claypan Vernal Pool

**45000 Meadow and Seep**
- 45100 Montane Meadow
  - 45110 Wet Montane Meadow
  - 45120 Dry Montane Meadow
- 45200 Subalpine and Alpine Meadow
  - 45210* Wet Subalpine or Alpine Meadow
  - 45220* Dry Subalpine or Alpine Meadow
- 45300 Alkali Meadows and Seeps
  - 45310* Alkali Meadow
  - 45320* Alkali Seep
- 45400* Freshwater Seep

*Communities with highest inventory priorities

**46000* Alkali Playa Community**

**47000* Pebble Plain Community**

## 50000 BOG AND MARSH

### 51000 Bog and Fen

- 51100 Bog
  - 51110* Sphagnum Bog
  - 51120* Darlingtonia Seep
- 51200* Fen

### 52000 Marsh and Swamp

- 52100 Coastal Salt Marsh
  - 52110* Northern Coastal Salt Marsh
  - 52120* Southern Coastal Salt Marsh
- 52200* Coastal Brackish Marsh
- 52300 Alkali Marsh
  - 52310* Cismontane Alkali Marsh
  - 52320* Transmontane Alkali Marsh
- 52400 Freshwater Marsh
  - 52410* Coastal and Valley Freshwater Marsh
  - 52420* Transmontane Freshwater Marsh
  - 52430* Montane Freshwater Marsh
- 52500* Vernal Marsh
- 52600* Freshwater Swamp
  - 5251A* Ledum Swamp

## 60000 RIPARIAN AND BOTTOMLAND HABITAT

### 61000 Riparian Forests

- 61100 North Coast Riparian Forest
  - 61110* North Coast Black Cottonwood Riparian Forest
  - 61120* North Coast Alluvial Redwood Forest
  - 61130* Red Alder Riparian Forest
- 61200 Central Coast Riparian Forest
  - 61210* Central Coast Cottonwood-Sycamore Riparian Forest
  - 61220* Central Coast Live Oak Riparian Forest
  - 61230* Central Coast Arroyo Willow Riparian Forest
- 61300 Southern Riparian Forest
  - 61310* Southern Coast Live Oak Riparian Forest
  - 61320* Southern Arroyo Willow Riparian Forest
  - 61330* Southern Cottonwood-Willow Riparian Forest
- 61400 Great Valley Riparian Forest
  - 61410* Great Valley Cottonwood Riparian Forest
  - 61420* Great Valley Mixed Riparian Forest
  - 61430* Great Valley Valley Oak Riparian Forest
- 61500 Montane Riparian Forest
  - 61510* White Alder Riparian Forest
  - 61520* Aspen Riparian Forest
  - 61530* Montane Black Cottonwood Riparian Forest

*Communities with highest inventory priorities

61600 Modoc-Great Basin Riparian Forest
61610* Modoc-Great Basin Cottonwood-Willow Riparian Forest
61700* Mojave Riparian Forest
61800 Colorado Riparian Forest
61810* Sonoran Cottonwood-Willow Riparian Forest
61820* Mesquite Bosque

### 62000 Riparian Woodlands

62100* Sycamore Alluvial Woodland
62200* Desert Dry Wash Woodland
62300* Desert Fan Palm Oasis Woodland
62400* Southern Sycamore-Alder Riparian Woodland

### 63000 Riparian Scrubs

63100* North Coast Riparian Scrub
63110* Woodwardia Thicket
63200* Central Coast Riparian Scrub
63300* Southern Riparian Scrub
63310 Mule Fat Scrub
63320* Southern Willow Scrub
63400 Great Valley Riparian Scrub
63410* Great Valley Willow Scrub
63420* Great Valley Mesquite Scrub
63430* Buttonbush Scrub
6344O* Elderberry Savanna
63500* Montane Riparian Scrub
63600* Modoc-Great Basin Riparian Scrub
63700 Mojave Desert Wash Scrub
63800 Colorado Riparian Scrub
63810 Tamarisk Scrub
63820 Arrowweed Scrub

## 70000 WOODLAND

### 71000 Cismontane Woodland

71100 Oak Woodland
71110 Oregon Oak Woodland
71120 Black Oak Woodland
71130* Valley Oak Woodland
71140 Blue Oak Woodland
71150 Interior Live Oak Woodland
71160 Coast Live Oak Woodland
71170 Alvord Oak Woodland
71180 Engelmann Oak Woodland
71181* Open Engelmann Oak Woodland
71182* Dense Engelmann Oak Woodland
71190* Island Oak Woodland
71200 Walnut Woodland
71210* California Walnut Woodland
71220* Hinds Walnut Woodland
71300 Digger Pine Woodland

*Communities with highest inventory priorities

71310 Open Digger Pine Woodland
71320 Digger Pine-Chaparral Woodland
71321 Serpentine Digger Pine-Chaparral Woodland
71322 Non-Serpentine Digger Pine-Chaparral Woodland

71400 Mixed Cismontane Woodland
71410 Digger Pine-Oak Woodland
71420 Mixed North Slope Cismontane Woodland
71430 Juniper-Oak Cismontane Woodland

### 72000 Piñon and Juniper Woodlands

72100 Great Basin Woodlands
72110 Northern Juniper Woodland
72120 Great Basin Piñon and Juniper Woodlands
72121 Great Basin Piñon-Juniper Woodland
72122 Great Basin Piñon Woodland
72123 Great Basin Juniper Woodland and Scrub
72200 Mojavean Piñon and Juniper Woodlands
72210 Mojavean Piñon Woodland
72220 Mojavean Juniper Woodland and Scrub
72300 Peninsular Piñon and Juniper Woodlands
72310 Peninsular Piñon Woodland
72320 Peninsular Juniper Woodland and Scrub
72400 Cismontane Juniper Woodland and Scrub

### 73000 Joshua Tree Woodland

### 75000 Sonoran Thorn Woodland

75100* Elephant Tree Woodland
75200* Crucifixion Thorn Woodland
75300* All-thorn Woodland
75400* Arizonan Woodland

## 80000 FOREST

### 81000 Broadleaved Upland Forest

81100 Mixed Evergreen Forest
81200* California Bay Forest
81300 Oak Forest
81310 Coast Live Oak Forest
81320 Canyon Live Oak Forest
81330 Interior Live Oak Forest
81340 Black Oak Forest
81400 Tan-Oak Forest
81500 Mixed North Slope Forest
81600* Walnut Forest
81700* Island Ironwood Forest
81800 Cherry Forest
81810* Island Cherry Forest
81820* Mainland Cherry Forest



*Communities with highest inventory priorities

81900 Silk-tassel Forest
81A00 Red Alder Forest
81B00 Aspen Forest

## 82000 North Coast Coniferous Forest

82100 Sitka Spruce-Grand Fir Forest
82200 Western Hemlock Forest
82300 Redwood Forest
82320 Upland Redwood Forest
82400 Douglas-Fir Forest
82410* Coastal Douglas-Fir-Western Hemlock Forest
82420* Upland Douglas-Fir Forest
82500* Port Orford Cedar Forest

## 83000 Closed-cone Coniferous Forest

83100 Coastal Closed-cone Coniferous Forest
83110* Beach Pine Forest
83120 Bishop Pine Forest
83121* Northern Bishop Pine Forest
83122* Southern Bishop Pine Forest
83130* Monterey Pine Forest
83140* Torrey Pine Forest
83150* Monterey Cypress Forest
83160 Pygmy Cypress Forest
83161* Mendocino Pygmy Cypress Forest
83162* Monterey Pygmy Cypress Forest
83200 Interior Closed-cone Coniferous Forest
83210* Knobcone Pine Forest
83220* Northern Interior Cypress Forest
83330* Southern Interior Cypress Forest

## 84000 Lower Montane Coniferous Forest

841000 Coast Range and Klamath Coniferous Forest
84110 Coast Range Mixed Coniferous Forest
84120* Santa Lucia Fir Forest
84130 Coast Range Ponderosa Pine Forest
84131 Upland Coast Range Ponderosa Pine Forest
84132* Maritime Coast Range Ponderosa Pine Forest
84140 Coulter Pine Forest
84150 Bigcone Spruce-Canyon Oak Forest
84160 Ultramafic White Pine Forest
84170 Ultramatic Jeffrey Pine Forest
84171 Northern Ultramafic Jeffrey Pine Forest
84172* Southern Ultramafic Jeffrey Pine Forest
84180 Ultramafic Mixed Coniferous Forest
84200 Sierran Coniferous Forest
84210 Westside Ponderosa Pine Forest
84220* Eastside Ponderosa Pine Forest
84221* Ponderosa Dune Forest
84230 Sierran Mixed Coniferous Forest
84240 Sierran White Fir Forest
84250* Big Tree Forest

*Communities with highest inventory priorities

### 85000 Upper Montane Coniferous Forest

- 85100 Jeffrey Pine Forest
- 85200 Upper Montane Mixed Coniferous Forest
  - 85210 Jeffrey Pine-Fir Forest
  - 85220* Washoe Pine-Fir Forest
- 85300 Upper Montane Fir Forest
  - 85310 Red Fir Forest
  - 85320 Southern California White Fir Forest
  - 85330* Desert Mountain White Fir Forest
- 85400 Klamath Enriched Coniferous Forest
  - 85410* Siskiyou Enriched Coniferous Forest
  - 85420* Salmon-Scott Enriched Coniferous Forest

### 86000 Subalpine Coniferous Forest

- 86100 Lodgepole Pine Forest
- 86200 Sierran Mixed Subalpine Coniferous Forest
  - 86210 Whitebark Pine-Mountain Hemlock Forest
  - 86220 Whitebark Pine-Lodgepole Pine Forest
- 86300* Foxtail Pine Forest
- 86400* Bristlecone Pine Forest
- 86500 Southern California Subalpine Forest
- 86600 Whitebark Pine Forest
- 86700 Limber Pine Forest

## 90000 ALPINE HABITAT

### 91000 Alpine Boulder and Rock Field

- 91100 Alpine Fell-Field
  - 91110 Klamath-Cascade Fell-Field
  - 91120 Sierra Nevada Fell-Field
  - 91130 Southern California Fell-Field
  - 91140 White Mountains Fell-Field
- 91200 Alpine Talus and Scree Slope
  - 91210 Wet Alpine Talus and Scree Slope
  - 91220 Dry Alpine Talus and Scree Slpoe
- 91300 Alpine Smowbank Margin

### 93000 Alpine Snow and Ice Habitat

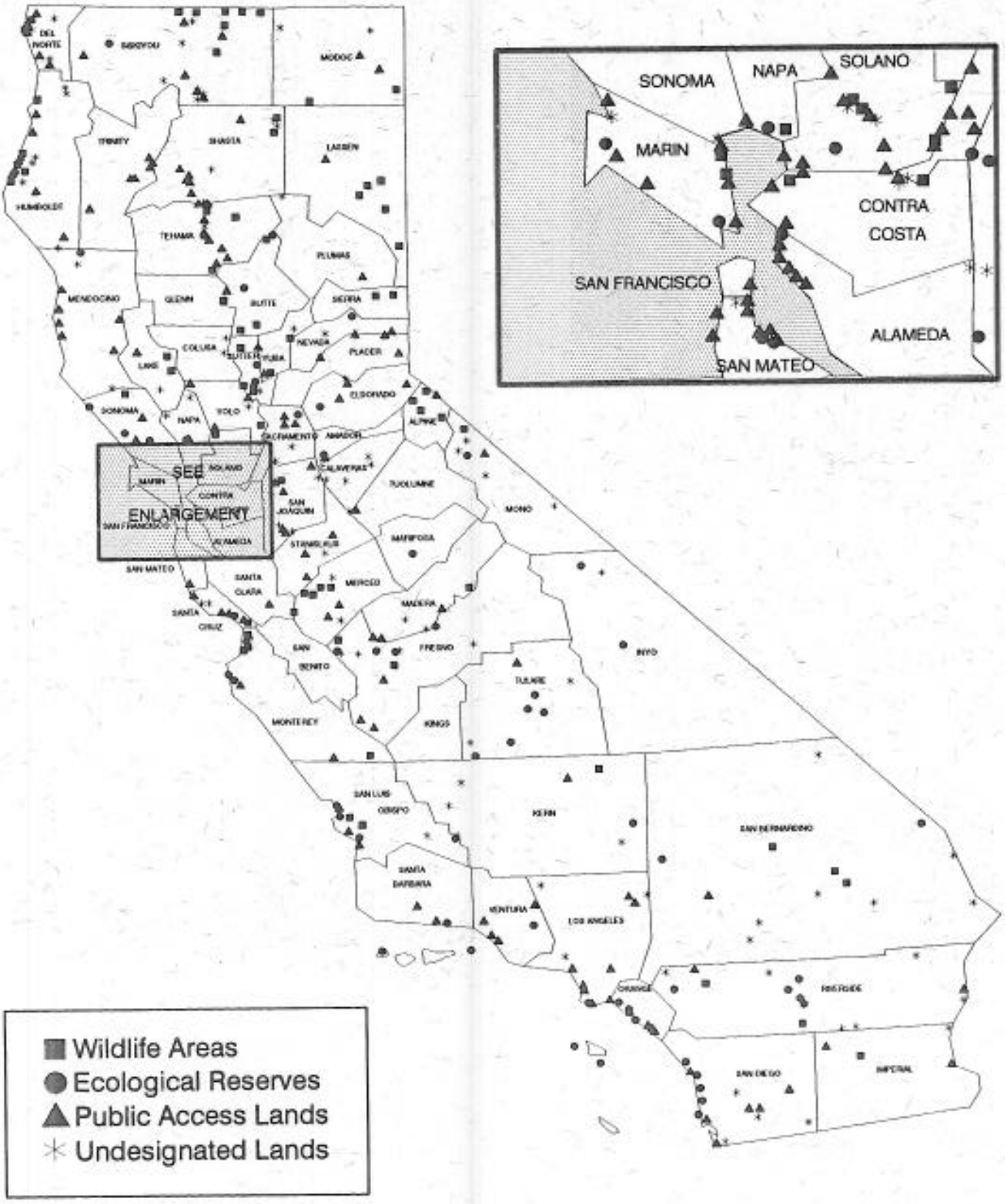
- 93100 Alpine Snowfield
- 93200 Alpine Glacier

### 94000 Alpine Dwarf Scrub

*Communities with highest inventory priorities

# APPENDIX G

## Map of Lands Administered by the Department of Fish and Game



# APPENDIX H

## Map of Ecological Reserves


| REGION 1 | | ACRES |
|---|---|---|
| 59 | CHINA POINT (SIS) | 239 |
| 67 | OFFSHORE ROCKS AND PINNACLES | |
| 38 | TABLE BLUFF (HUM) | 186 |

| REGION 2 | | ACRES |
|---|---|---|
| 30 | APRICUM HILL (AMA) | 35 |
| 50 | BOBELAINE (SUT) | 430 |
| 61 | BUTTE CREEK CANYON (BUT) | 291 |
| 62 | BUTTE CREEK HOUSE (BUT) | 320 |
| 24 | CORRAL HOLLOW (SJQ) | 92 |
| 33 | MACKLIN CREEK (NEV) | 32 |
| 36 | PHOENIX FIELD (SAC) | 8 |
| 34 | PINE HILL (ELD) | 240 |
| 57 | WOODBRIDGE (SJQ) | 353 |

| REGION 3 | | ACRES |
|---|---|---|
| 53 | ALBANY MUDFLATS (ALA) | 160 |
| 55 | BAIR ISLAND (SMT) | 1039 |
| 26 | CARMEL BAY (MNT) | 1642 |
| 25 | CORTE MADERA MARSH (MRN) | 621 |
| 5 | DEL MAR LANDING (SON) | 60 |
| 54 | ELKHORN PLAINS (SLO) | 160 |
| 37 | ELKHORN SLOUGH (MNT) | 1368 |
| 4 | FAGAN MARSH (NAP) | 292 |
| 66 | HARRISON GRADE (SON) | 32 |
| 40 | LAGUNA DE SANTA ROSA (SON) | 357 |
| 42 | LITTLE BUTTE (MEN) | 402 |
| 41 | MORRO DUNES (SLO) | 50 |
| 12 | MORRO ROCK (SLO) | 30 |
| 20 | NAPA RIVER (NAP) | 73 |
| 27 | PEYTONIA SLOUGH (SOL) | 506 |
| 29 | PISMO LAKE (SLO) | 69 |
| 13 | POINT LOBOS (MNT) | 776 |
| 19 | REDWOOD SHORES (SMT) | 172 |
| 15 | SANTA CRUZ LONG-TOED SAL (SCR) | 180 |
| 17 | TOMALES BAY (MRN) | 482 |
| 67 | OFFSHORE ROCKS AND PINNACLES | |

| REGION 4 | | ACRES |
|---|---|---|
| 35 | ALKALI SINK (FRE) | 930 |
| 43 | ALLENSWORTH (TUL) | 3362 |
| 44 | BLUE RIDGE (TUL) | 1656 |
| 64 | FREMONT VALLEY (KER) | 640 |
| 52 | KAWEAH (TUL) | 98 |
| 58 | KERMAN (FRE) | 1775 |
| 10 | LIMESTONE SAL (MPA) | 120 |
| 69 | PANOCHE HILLS (FRE) | 596 |
| 70 | SAN JOAQUIN RIVER (FRE) | 286 |
| 60 | SPRINGVILLE (TUL) | 4 |
| 22 | YAUDANCHI (TUL) | 162 |

| REGION 5 | | ACRES |
|---|---|---|
| 21 | ABALONE COVE (LAX) | 124 |
| 31 | ANACAPA ISLAND (VEN) | 9113 |
| 23 | BALDWIN LAKE (SBD) | 140 |
| 47 | BATIQUITOS LAGOON (SDG) | 134 |
| 56 | BLUE SKY (SDG) | 317 |
| 1 | BOLSA CHICA (ORA) | 536 |
| 2 | BUENA VISTA LAGOON (SDG) | 196 |
| 61 | BY DAY CREEK (MNO) | 460 |
| 30 | CARRIZO CANYON (RIV) | 1021 |
| 45 | COACHELLA VALLEY (RIV) | 845 |
| 3 | COLDWATER CANYON (VEN) | 59 |
| 6 | FARNSWORTH BANK (LAX) | 24 |
| 7 | FISH SLOUGH (INY/MNO) | 188 |
| 48 | GOLETA SLOUGH (SBA) | 344 |
| 8 | HEISLER PARK (ORA) | 30 |
| 9 | HIDDEN PALMS (RIV) | 136 |
| 49 | LAKE MATHEWS (RIV) | 2565 |
| 11 | MAGNESIA SPRING (RIV) | 1285 |
| 58 | PIUTE CREEK (SBD) | 136 |
| 14 | SALINE VALLEY (INY) | 520 |
| 16 | SAN DIEGO/LA JOLLA (SDG) | 514 |
| 65 | SAN DIEGUITO (SDG) | 107 |
| 46 | SAN ELIJO (SDG) | 804 |
| 28 | SAN MIGUEL ISLAND (SBA) | 17930 |
| 32 | SANTA BARBARA ISL. (SBA) | 7922 |
| 18 | UPPER NEWPORT BAY (ORA) | 751 |
| 63 | W. MOHAVE DESERT (SBD) | 7074 |
| 67 | OFFSHORE ROCKS AND PINNACLES | |

# APPENDIX I

## Wildlife Areas


| REGION 1 | ACRES |
|---|---|
| 60 ASH CREEK (MOD) | 13697 |
| 27 BASS HILL (LAS) | 3516 |
| 54 BATTLE CREEK (SHA) | 252 |
| 22 BIG LAGOON (HUM) | 1600 |
| 9 BISCAR (LAS) | 548 |
| 44 BUTTE VALLEY (SIS) | 13028 |
| 28 CINDER FLATS (SHA) | 720 |
| 39 CRESCENT CITY MARSH (DNT) | 339 |
| 6 DOYLE (LAS) | 13969 |
| 3 EEL RIVER (HUM) | 1432 |
| 86 ELK RIVER (HUM) | 87 |
| 36 EUREKA SLOUGH (HUM) | 3 |
| 79 FALL RIVER (SHA) | 1 |
| 69 FAY SLOUGH (HUM) | 484 |
| 49 GRASS LAKE (SIS) | 30 |
| 13 HONEY LAKE (LAS) | 6495 |
| 26 HORSESHOE RANCH (SIS) | 5017 |
| 4 INDIAN TOM (SIS) | 59 |
| 37 LAKE EARL (DNT) | 5344 |
| 74 MAD RIVER SLOUGH (HUM) | 547 |
| 32 MERRILL'S LANDING (TEH) | 296 |
| 52 MOUTH OF COTTONWOOD CR. (SHA) | 316 |
| 50 MUD LAKE (SIS) | 35 |
| 84 SHASTA VALLEY (SIS) | 4657 |
| 5 SHEEPY RIDGE (SIS) | 320 |
| 51 SPANNUS GULCH (SIS) | 132 |
| 34 SURPRISE VALLEY (MOD) | 460 |
| 7 TEHAMA (TEH) | 46956 |
| 80 WILLOW CREEK (LAS) | 3087 |

| REGION 2 | ACRES |
|---|---|
| 42 ANTELOPE VALLEY (SIS) | 4480 |
| 87 COLLINS EDDY (SUT/YOL) | 56 |
| 41 COON HOLLOW (BUT) | 731 |
| 82 DAUGHERTY HILL (YUB) | 2372 |
| 68 DECKER ISLAND (SOL) | 33 |
| 77 FAY CANYON (ALP) | 368 |
| 30 FEATHER R. (YUB/SUT) | 2291 |
| 45 FREMONT WEIR (SUT/YOL) | 214 |
| 14 GRAY LODGE (BUT) | 8340 |
| 81 HALLELUJAH JCT (LAS/SIE) | 3471 |
| 53 HEENAN LAKE (ALP) | 1853 |
| 72 HOPE VALLEY (ALP) | 2650 |
| 24 LOWER SHERMAN IS. (SAC) | 3115 |
| 46 MINER SLOUGH (SOL) | 37 |
| 8 OROVILLE (BUT) | 12435 |
| 47 PUTAH CREEK (SOL) | 699 |
| 70 RED LAKE (ALP) | 780 |
| 71 SACRAMENTO BYPASS (YOL) | 360 |
| 31 SACRAMENTO R. (GLE/BUT/COL) | 2597 |
| 65 SMITHNECK CREEK (SIE) | 1365 |
| 2 SPENCEVILLE (NEW/YUB) | 11421 |
| 1 SUTTER BYPASS (COL/SUT) | 5239 |
| 85 UPPER BUTTE BASIN (BUT/GLE) | 7035 |
| 83 WARNER VALLEY (PLU) | 689 |
| 43 WHITE SLOUGH (SJC) | 580 |

| REGION 3 | ACRES |
|---|---|
| 23 BIG SANDY (MNT/SLO) | 812 |
| 88 CACHE CREEK (LAK) | 1519 |
| 15 GRIZZLY ISLAND (SOL) | 12220 |
| 35 HILL SLOUGH (SOL) | 1795 |
| 73 INDIAN VALLEY (LAK) | 5120 |
| 61 LAKE SONOMA (SON) | 8000 |
| 62 LOS PANCHOS (SLO) | 2 |
| 63 MORO COJO (MNT) | 26 |
| 57 MOSS LANDING (MNT) | 656 |
| 25 NAPA-SON. MARSHES (NAP/SOL) | 2392 |
| 36 PETALUMA MARSH (MRN/SON) | 2988 |
| 58 POINT EDITH (CCA) | 761 |
| 20 SALINAS (MNT) | 518 |
| 56 SAN LUIS OBISPO (SLO) | 450 |
| 21 SAN PABLO BAY (MRN) | 11117 |
| 59 WATSONVILLE (SCR) | 109 |

| REGION 4 | ACRES |
|---|---|
| 29 COTTONWOOD CREEK (MER/SCL) | 6316 |
| 64 KINSMAN FLAT (MAD) | 450 |
| 10 LITTLE PANOCHE RES. (FRE) | 825 |
| 16 LOS BANOS (MER) | 5586 |
| 17 MENDOTA (FRE) | 11602 |
| 11 O'NEILL FOREBAY (MER) | 700 |
| 12 SAN LUIS RESERVOIR (MER/SCL) | 868 |
| 78 SOUTH FORK (KRN) | 1217 |
| 19 VOLTA (MER) | 3003 |

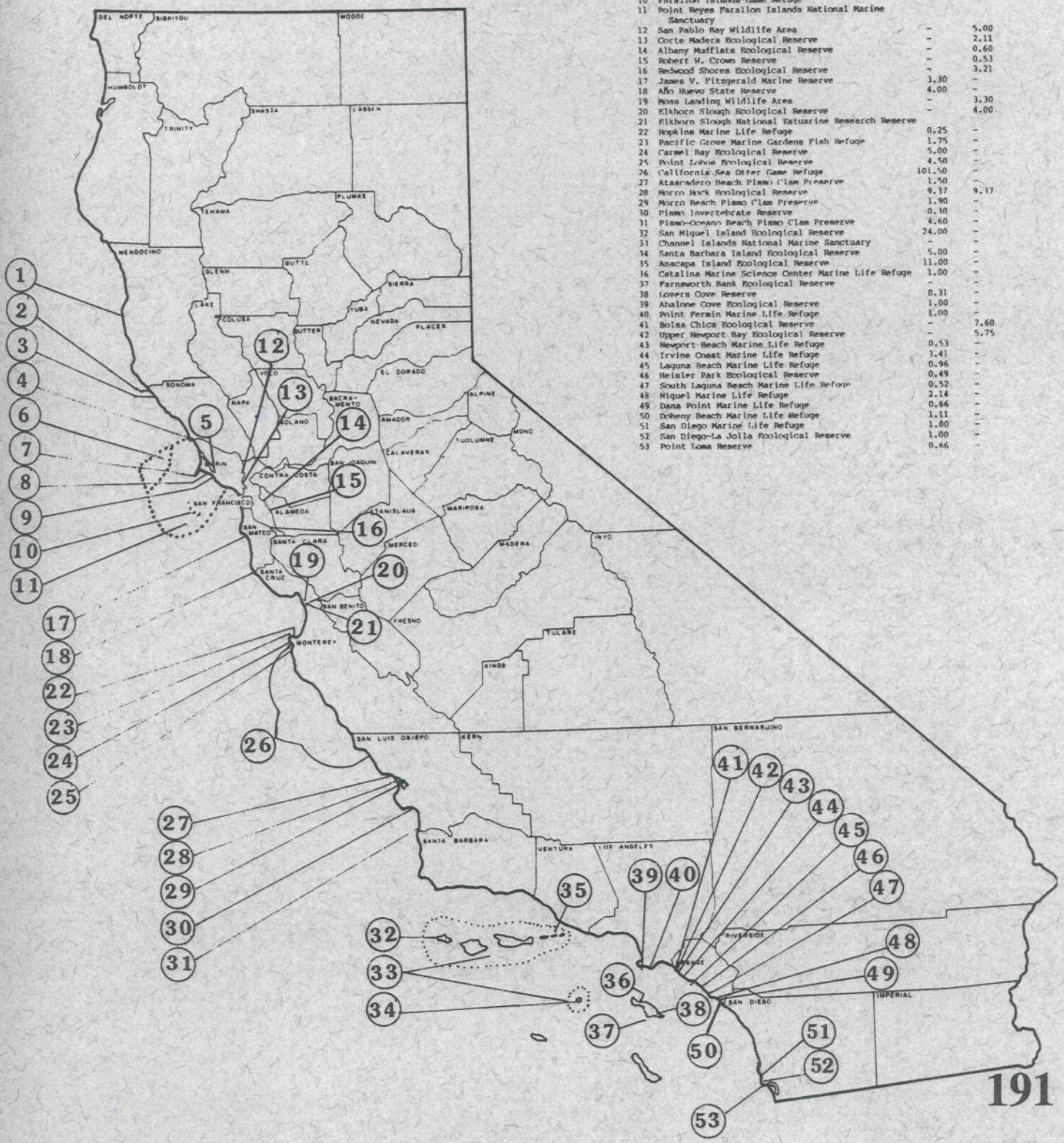
| REGION 5 | ACRES |
|---|---|
| 40 CAMP CADY (SBD) | 1548 |
| 18 IMPERIAL (IMP) | 6134 |
| 76 KELSO PEAK & OLD DAD MTNS. (SBD) | * |
| 75 MARBLE MNTS. (SBD) | * |
| 48 SAN JACINTO (RIV) | 5934 |
| 55 SANTA ROSA (RIV) | 25486 |
| 33 SLINKARD/LITTLE ANTELOPE (MNO) | 11867 |

*Cooperatively managed with BLM for bighorn sheep hunting boundaries and is excluded from department totals.

# APPENDIX J

## Marine Life Refuges and Reserves

| | DESIGNATION | FRONTAGE IN MILES | |
|---|---|---|---|
| | | Ocean | Bay |
| 1 | Point Cabrillo Reserve | 0.38 | - |
| 2 | Del Mar Landing Ecological Reserve | 0.59 | - |
| 3 | Gerstle Cove Reserve | 0.25 | - |
| 4 | Bodega Marine Life Refuge | 1.00 | 0.75 |
| 5 | Tomales Bay Reserve | - | 5.25 |
| 6 | Cordell Bank National Marine Sanctuary | - | - |
| 7 | Point Reyes Headlands Reserve | 3.50 | - |
| 8 | Estero de Limantour Reserve | - | 7.90 |
| 9 | Duxbury Reef Reserve | 2.10 | - |
| 10 | Farallon Islands Game Refuge | - | - |
| 11 | Point Reyes Farallon Islands National Marine Sanctuary | | |
| 12 | San Pablo Bay Wildlife Area | - | 5.00 |
| 13 | Corte Madera Ecological Reserve | - | 2.11 |
| 14 | Albany Mudflats Ecological Reserve | - | 0.60 |
| 15 | Robert W. Crown Reserve | - | 0.53 |
| 16 | Redwood Shores Ecological Reserve | - | 3.21 |
| 17 | James V. Fitzgerald Marine Reserve | 3.30 | - |
| 18 | Año Nuevo State Reserve | 4.00 | - |
| 19 | Moss Landing Wildlife Area | - | 3.30 |
| 20 | Elkhorn Slough Ecological Reserve | - | 4.00 |
| 21 | Elkhorn Slough National Estuarine Research Reserve | | |
| 22 | Hopkins Marine Life Refuge | 0.25 | - |
| 23 | Pacific Grove Marine Gardens Fish Refuge | 1.75 | - |
| 24 | Carmel Bay Ecological Reserve | 5.00 | - |
| 25 | Point Lobos Ecological Reserve | 4.50 | - |
| 26 | California Sea Otter Game Refuge | 101.50 | - |
| 27 | Atascadero Beach Pismo Clam Preserve | 1.50 | - |
| 28 | Morro Rock Ecological Reserve | 9.17 | 9.17 |
| 29 | Morro Beach Pismo Clam Preserve | 1.90 | - |
| 30 | Pismo Invertebrate Reserve | 0.10 | - |
| 31 | Pismo-Oceano Beach Pismo Clam Preserve | 4.60 | - |
| 32 | San Miguel Island Ecological Reserve | 24.00 | - |
| 33 | Channel Islands National Marine Sanctuary | - | - |
| 34 | Santa Barbara Island Ecological Reserve | 5.00 | - |
| 35 | Anacapa Island Ecological Reserve | 11.00 | - |
| 36 | Catalina Marine Science Center Marine Life Refuge | 1.00 | - |
| 37 | Farnsworth Bank Ecological Reserve | - | - |
| 38 | Lovers Cove Reserve | 0.31 | - |
| 39 | Abalone Cove Ecological Reserve | 1.00 | - |
| 40 | Point Fermin Marine Life Refuge | 1.00 | - |
| 41 | Bolsa Chica Ecological Reserve | - | 7.60 |
| 42 | Upper Newport Bay Ecological Reserve | - | 5.75 |
| 43 | Newport Beach Marine Life Refuge | 0.53 | - |
| 44 | Irvine Coast Marine Life Refuge | 1.41 | - |
| 45 | Laguna Beach Marine Life Refuge | 0.96 | - |
| 46 | Heisler Park Ecological Reserve | 0.49 | - |
| 47 | South Laguna Beach Marine Life Refuge | 0.52 | - |
| 48 | Niguel Marine Life Refuge | 2.14 | - |
| 49 | Dana Point Marine Life Refuge | 0.66 | - |
| 50 | Doheny Beach Marine Life Refuge | 1.11 | - |
| 51 | San Diego Marine Life Refuge | 1.00 | - |
| 52 | San Diego-La Jolla Ecological Reserve | 1.00 | - |
| 53 | Point Loma Reserve | 0.66 | - |



# APPENDIX K

## State of California Department of Fish and Game Regions


***REGION I***
HEADQUARTERS

601 Locust Street
Redding, CA 96001
ATSS # 8-442-2300
PUBLIC # (916) 225-2300

***REGION II***
HEADQUARTERS

1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670
ATSS # 8-438-0978
PUBLIC # (916) 355-0978

***REGION III***
HEADQUARTERS

P.O. Box 47
Yountville, CA 94599
ATSS # 8-547-5500
PUBLIC # (707) 944-5500

***REGION IV***
HEADQUARTERS

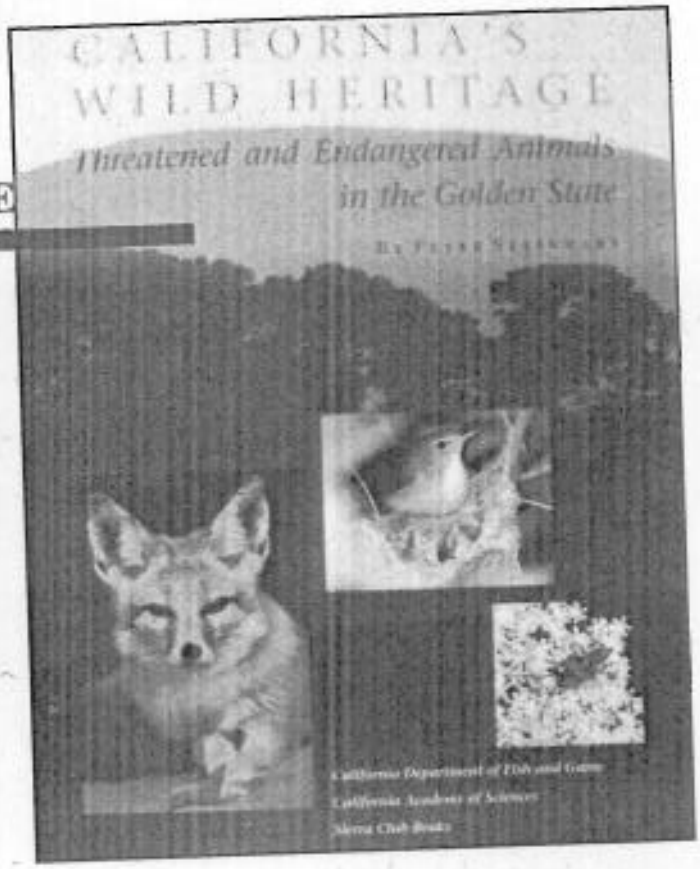
1234 E. Shaw Avenue
Fresno, CA 93710
ATSS # 8-421-5415/5416
PUBLIC # (209) 222-3761

***REGION V***
HEADQUARTERS

330 Golden Shore, Suite 50
Long Beach, CA 90802
ATSS # 8-635-5132
PUBLIC # (213) 590-5114

# CALIFORNIA'S WILD HERITAGE

**Threatened and Endangered Animals in the Golden State**




*"Tellingly and poetically written by Peter Steinhart, "California's Wild Heritage: Threatened and Endangered Animals in the Golden State," may be the most anatomically correct book on the subject ever written."* **Tom Harris, the Sacramento Bee**

*"...it's crucial reading for those who love nature and want to halt extinction of precious species."* **Jane Kay, San Francisco Examiner**

For the first time under one cover, California's Wild Heritage (Sierra Club Books, 112 pages) documents the plight of the state's more than 100 threatened and endangered animals – mammals, birds, reptiles, amphibians, insects, mollusks, crustaceans and fish. Filled with 125 color photographs and line drawings, the book contains descriptive essays of each animal's life cycle and habitat, its biological and cultural significance and the full range of impacts leading to its endangerement.

The project began within the Department of Fish and Game (DFG) as an effort to answer public inquiries about threatened and endangered species:

- How many are there?
- What is the significance of their decline?
- What is being done to protect them?

According to DFG biologist Paul Kelly, "The Department compiles an administrative document on threatened and endangered species every year as required by the Endangered Species Act of 1984, but we wanted to present that information to the general public in a comprehensive and appealing format."

California's Wild Heritage is the only publication to compile photos, natural history and management information about all of California's threatened and endangered animal species. The book was funded by Californians through contributions to the endangered Species Tax Check-Off program. Proceeds from book sales will be returned to the fund to support projects benefiting threatened and endangered species.

To order your copy(ies) of *"California's Wild Heritage: Threatened and Endagered Animals in the Golden State"* at $12.95 per copy, please fill out this form and mail it with payment to:

**California Department of Fish and Game**
**Endangered and Threatened Species Publications**
**Attention: Cashier**
**1416 9th Street**
**Sacramento, Ca 95814**

**NAME:** _____

**ADDRESS:** _____

**CITY:** _____

**STATE:** _____ **ZIP:** _____

Please send _____ copy(ies) at $12.95 each (includes tax and shipping.) I am enclosing a check or money order made out to Department of Fish and Game in the amount of $_____